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**SARDAR KAUREY KHAN PUBLIC HIGHER SECONDARY SCHOOL  
MUZAFFARGARH**

Syllabus    English    Class 9th    Teacher :    Malik Arif    July 2020

## **Lecture 1      Grammar; Present continuous Tense**

**Structure:** Subject+is, am, are+ing form of the verb+object

Solved    exercise to be done by the student.

Exercise 1: 1: It is drizzling.

2: The well is working. Or The Persian wheel is working.

3. I am taking rest at present/at this time.

4. Smoke is rising out of the hearth.

5. We are collecting old coins.

6. I am feeling dizzy.

7. You are saying good-bye to your friend.

8. He is diving into the river.

9. Children are making a great noise.

10. Akbar is harvesting wheat.

11. The woman is boiling milk.

12. Students are decorating the school.

13. He is coming to see me.

14. The government is opening new schools.

15. Pakistan is making progress by leaps and bounds.

## LECTURE 2

EXERCISE 2: Negative ; We use not after the auxiliary verbs **is, am, are**

1. You are not giving me your address. 2. He is not leading the procession.
3. The Governor is not leading the procession.
4. He is not working honestly.
5. You are not criticizing my opinion.
6. This officer is not neglecting his duties. 7. The labourers are not shirking work.
8. We do not smell flowers.
9. The girls are not dozing in the class.
10. He is not repenting of his sin.
11. The cook is not preparing meal.
12. The boys are not drinking sugar-cane juice.
13. The is not calling for help.
14. Amjad is not changing his dress.
15. The woman is not working grindstone.

**Lesson 2.INTERROGATIVE;** we use helping verbs before the subject to make the sentence interrogative and use question mark"?" at the end of the sentence.

1. Is the moon appearing? 2. Are the bad boys throwing stones at buses?
3. Are the labourers digging soil?
4. Why are you selling your house?
5. Is Basher buying a new motor-cycle?
- .6.Where are women washing clothes?
7. How many people are sharing this business?
8. How much money are you withdrawing from the bank?
9. Who is inviting me to supper?

10. Where are poor refugees going?
11. Is the shopkeeper overcharging the customer?
12. Whose message are you carrying?
13. When is the contractor setting to work?
14. Who is knocking at the door?
15. Which magazine are you reading?

### **LESSON: PRESENT PERFECT TENSE**

**Formation:** subject+has, have+3<sup>rd</sup> form of the verb+object

Any complete activity is mentioned in this tense. SOLVED EXERCISE must be prepared from the text book.

**EX 2:**1. The clock has struck four. 2. The candidates have solved the paper.

3. The guest of honor has given away the prizes.
4. The principal has given away the certificates to the students.
5. The teams have played the match.
6. The court has decided in my favour.
7. The board has declared the result.
8. The thieves have broken into the house.
9. I have sold this picture.
10. Naseema has passed the examination.
11. Basher has won the scholarship.
12. All the birds have flown away.
13. We have fired the gun.
14. The match has ended in a draw.
15. The army has captured the fort.

LESSON :4PRESENT PERFECT CONTINUOUS TENSE

STRUCTURE: SUBJECT+ HAS been, HAVE been+ING FORM (PRESENT PARTICIPAL)+OBJECT WITH SINCE ,FOR TO SHOW TIME

**NOTE:** Since is used with appointed time (point of time) It is always in singular form e.g. morning, days of the week months names 2020 etc.

2: For is used with period of time which is always plural. Two days, three hours, ten years etc.

**EXERCISE: 12: +SOLVED EXERCISE**

1: Akbar has been learning tables for several hours.

2: You have been writing letters to your friends since 6 o' clock.

3: The patient has been crying for ten minutes.

4: The doctor has been examining the patient for two hours.

5:The watchman has been keeping watch for five hours.

6:You have been sharpening knife for five minutes.

7:The farmer has been harvesting crops for two months.

8:The draftsmen have been drawing the map of the building for two months.

9:The players have been making preparations to play a match for several days.

10:I have been repairing the T.V. set since Wednesday.

11:He has been getting pension since 1983.

12:Some people have been enjoying exhibition since evening.

13:All the people have been embracing one another for an hour.

14:The girls have been making garlands since 7 o' clock.

15:All the Muslims have been fasting since the first of Ramadan.

**LESSON :5****EXERCISE 13: NEGATIVE**

STRUCTURE: SUB +HAS, HAVE +NOT+ BEEN+ ING FORM+ OBJECT+ SINCE, FOR & TIME

- 1: It has not been raining in Lahore since yesterday.
- 2:The frogs have not been croaking in the pond since evening.
- 3: We have not believed in rumours since April.
- 4: This man has not been moving grass since evening.
- 5: The farmer has not been buying a new tractor for several months.
- 6: Asghar has not been telling a lie for twenty days.
- 7: I have not been writing a new novel since December.
- 8:My friends have not been sending gifts for several years.
- 9:The hens have not been laying eggs since June.
- 10: Our cow has not been yielding milk since Monday.
- 11:The cock has not been crowing since yesterday.
- 12: The ox has not been eating fodder for two days.
- 13:His brother has not been offering Namaz for two days.
- 14:The patient has not been taking medicine for two days.
- 15:The lion has not been attacking the cattle since Monday.

**LESSON: 6****INTERROGATIVE: EXERCISE 14**

STRUCTURE: HAS, HAVE+ SUB+ BEEN+ING VERB +OBJ+SINCE, FOR.

- 1:Has it been raining since evening?
- 2:Has the crowd been raising slogans since noon?
- 3: Why have the children been spoiling books since morning?
- 4:In which factory has my brother been working since 11<sup>th</sup> of this month/11<sup>th</sup> instant?
- 5:Has he been reading a novel for twenty minutes?

6:Where have the labourers been working for five hours?

7:Which road has the road-roller been repairing for two days?

8:Have the musicians been singing songs since Tuesday?

9:Since when has the gardener been planting new trees?

10:Why have the shopkeepers been decorating shops for three days?

11:has the child not been playing with toys since morning?

12: Has the patient not been taking a bath for four days?

13: Has he not been advising you for two months?

14: Have the people been joining in the procession since 5 o' clock?

## **LESSON 7            USE OF CORRECT FORM OF VERB**

The Simple Present Tense is used :

1:To express a habitual action or a repeated activity that denotes Past,Present,or Future.e.g.    My watch **keeps** good time.

2:To indicate routine:

e.g. The office closes at 4 P.M.

3:For universal truth or law of nature.

The sun rises in the east.

4:For activity that is going at present.

**DO YOU UNDERSTAND NOW?**

5:For a fixed future activity:

The train leaves at 5:20.

6:WE use simple present in conditional clause of first conditional type sentence:

If he works hard he will succeed.

7 : With these adverbs we use simple present:

**Often, seldom, never , always, usually , generally, daily, rarely, etc.**

## LESSON:8

## PRESENT CONTINUOUS TENSE

**USE: 1:** For an action going on at the time of speaking;as,

She is singing. He is writing an important essay.

**2:**For a temporary action(to describe present in general)

He is writing a book these days.

**3:** For future planning.e.g.

I am going to the cinema tonight.

**4:** With “always,continually,constantly”to show something which persists:e.g.

My dog is very silly; he is always running out into the road.

**5:**We use Present Continuous Tense with these adverbs.

Now, at present, now-a-days, at the moment, at this time, these days.

**6:** The following verbs , on account of their meaning, are not normally used in the continuous form:

like,love,hate,want,need,prefer,know,realize,suppose,mean,understand,believe,

Remember, belong, fit, contain, consist, seem

## LESSON 9

### SOLVED EXERCISE OF PTB:

1: She.....her cat very much.

(A). Love (B) Loves (C) Loving (D) have loved

2:He.....to school every day.

(A)Went (B) Go (C)GOES (D)has gone

3:It.....at present.

(A)IS raining (B)Rains (C)Rained (D)rain

4: They .....tea every morning.

(A)Drinks (B) Drink (C) Drinking (D) has drunk

5: Good students always...hard.

(A)WORK (B)WORKS(C)WORKING(D)WORKED

6: The earth.....around the sun.

(A)Revolve (B)Revolved (C)Revolves (D)Have revolved

7: She .....French at present.

(A)Learns (B) Learn (C) **IS LEARNING** (D) LEARNT

8: They.....do their work regularly.

(A)DO NOT (B) Does not (c) has not (D) has not been

9: Shahida.....a sad song daily.

(A)Sung (B) Singing (C) have sung (D) **SINGS**

10:They always....back home late

.(A)Comes (B)coming (C)has come (D)**COME**

11:She.....English now.

(A)**IS SPEAKING** (B) Spoken (C) SPEAK (D) Speaks

12:She.....English quite well.

(A)Have been speaking (B)Have spoken (C)Speak (D)**Speaks.**

13:The baby .....for milk now.

(A)am crying (B)**is crying** (C)Has been cried (D)Have cried

14:They..... To sleep at ten.

(A)goes (B)Gone (C) **GO** (D)has went

15:He.....me waiting.

(A)Do not keep (B)Did not kept (C)Have not keep (D)**DOES NOT KEEP**

**Muzaffar Garh**

**JUNE JULY 2020 ASSESSMENT PAPER ENGLISH**

**OBJECTIVE:**

**MARKS:19**

**. Q:1 A:Choose the correct form of verb.**

1:I -----him for a long time.

(A)know (B)Knew (C)has known (D)Have known

2: He-----to school every day.

(A)go (B)goes (C)went (D)gone

3: She-----French at present.

(A) Learns (B) learn (C) is learning (D) learnt

4: He ----- me waiting.

(A)Do not keep (B)Did not kept (C)Have not keep (D)Does not keep

5:The baby -----for milk now.

(A)am crying (B)is crying (C)Has been cried (D) have cried

**B:Choose the word with correct spellings.**

6:(A)eloquent (B)elokuant (C)eleqant (D)illoquente

7:(A)entegrity (B)intrigity (C)integrity (D)integrati

8:(A) geered (B) gearad (C)geored (D)gearned

9:(A) resolute (B)reselote (C)resalot (D)rasilut

**C: Choose the correct meanings of the underlined words.**

10: Abu Jehl began knocking at the door violently.

(A) Politely (B) slowly (C) forcefully (D) happily

11: Their eloquence and memory found expression in their poetry.

(A) Weak (B) strong (C) healthy (D) fluency

12: We are a nation he affirmed.

(A) Told (B) said emphatically (C) broke in (D) voice

13: Flamboyant means:

(A) Showy (B) colorless (C) fade (D) dim

14: Vindictive means: (A) Malicious (B) helpful (C) text (D) dedicate

**D: Choose the correct option according to Grammar.**

15: Ashfaq Ahmad was a-----writer. Put right adjective.

(A) Famed (B) famous (C) famously (D) infamous

16: Teach him to learn. The given sentence is a/an-----sentence.

(A) optative (B) exclamatory (C) assertive (D) imperative

17: He showed courage in the war. The underlined noun is -----noun.

(A) proper (B) COMMON (C) collective (D) abstract

18: The boy laughs loudly. The underlined word is a/an-----.

(A) intransitive verb (B) transitive verb (C) regular verb (D) irregular verb

19: I don't want that burnt toast. The underlined is a/an---

(A) gerund (B) infinitive (C) present participle (D) past participle

Paper English (Subjective) Section 1

Marks 56

Q2: Answer any five of the following questions. 10

1: For which ability were the Arabs famous for? 2: What are the qualities of a patriot?

3: What is the important function that media performs? 4: Why was Abu Jehl

furious? 5: What was the ideology of Pakistan in view of Quid-e-Azam?

#### SECTION-2

Q3: Translate the following paragraphs into Urdu:

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(a) Quid-e-Azam Muhammad Ali Jinnah was a nation builder and a great patriot. He wanted to protect the values, culture and traditions of the Muslims of the

subcontinent. He gave the Muslims a sense of identity by securing a separate homeland for them.

(b) In the evening, a large number of tourists and Turks gather in the park facing the Masjid to hear the call to the evening prayers. The Masjid is flooded with lights and so are the hearts of the believers with divine love.

Q4: Write the summary of the poem "Daffodils" by William Wordsworth. 5

Q5: Use any five of the following words/phrases/idioms in your own sentences: 5

1. Mad with anger 2. Bits and pieces 3. To keep an eye 4. Resolute 5. Fall a prey

Q6: Write a letter to your father requesting him to send you some extra funds for payment of hostel dues. 08

**Q7: Read the following passage carefully and answer the questions given at the end. 10**

For three years, the master and all his relatives lived in this valley. Many of the Muslims too joined them. All supplies to the valley were cut off. The Makkans saw to it that no food or drink reached Banu Hashim. The poor Banu Hashim had to live on the leaves and roots of trees and bushes. The condition of the children was particularly pitiable. At last some kind-hearted Makkans took pity on the Banu Hashim. They tore to pieces the agreement hanging in the Kaaba. The hunger-stricken Banu Hashim were thus able to come back to their homes.

1: Who lived for three years in the valley?

2: Who joined the master and his relatives?

3: What did the Makkans do?

4: How did the Banu Hashim live?

5: Who took pity on the Banu Hashim?

Q8: Translate the following sentences into English. 05

۱۔ غریب آدمی مشکل سے گزر بسر کرتا ہے ۲۔ یہ دکاندار گھٹیا مال بیچتا ہے ۳۔ تم میری رائے پر نکتہ چینی نہیں کر رہے ہو۔ ۴۔ عدالت میرے حق میں فیصلہ دے چکی ہے۔ ۵۔ چور گھر میں نقب لگا چکے ہیں

Q9: Change the voice of the following. 05

1: They have bought a horse. 2: They are buying this house.

3: The boy makes the picture. 4: Why is he mending the chair?

5: This house is being bought by them.



# SARDAR KAUREY KHAN

## PUBLIC HIGHER SECONDARY SCHOOL

### Translation - Unit No. 6

### "The Quad's Vision and Pakistan"

### لیکچر نمبر 1

ظہورِ پاکستان کے ابتدائی اور کٹھن وقتوں کے دوران قائدِ اعظم محمد علی جناح نے ملک گیر دورہ کیا۔ ان کا مقصد لوگوں میں جذبہ ابھارنا تھا۔ لاہور میں انہوں نے ایک تقریر میں کہا، "کام کی بہتات سے مغلوب نہ ہوں۔"

"تاریخ میں (ایسی) نوخیز اقوام کی کئی مثالیں ملتی ہیں جنہوں نے محض پختہ عزم اور قوتِ کردار سے خود کو ترقی دی۔ تم نہایت ہی عمدہ مواد سے بنے ہو اور تم کسی سے کمتر نہیں۔ اپنا حوصلہ بحال رکھو۔ موت سے خوفزدہ مت ہوں۔ پاکستان اور اسلام کے وقار کو بچانے کے لیے ہمیں بہادری سے اس کا سامنا کرنا چاہیے۔ اپنا فرض بجالاؤ اور پاکستان پر بھروسہ رکھو، یہ قائم رہنے کے لیے بنا ہے۔"

## لیکچر نمبر 2

برصغیر کے مسلمانوں کے لیے ایک الگ وطن کی خاطر عظیم رہنما کی جدوجہد کا پورا سفر مسلمانوں کے بطور ایک قوم کے اتحاد و اتفاق کے بنیادی نقطہ پر مبنی تھا۔ انہوں نے پاکستان سے متعلق بات اتنے واضح الفاظ میں بیان کی کہ عام آدمی اُسے سمجھ سکے۔

ظہورِ پاکستان سے تین سال پہلے انہوں نے وثوق سے کہا، "ہم ایک امتیازی تہذیب و ثقافت، زبان و ادب، فن اور فن تعمیر، نام اور اصطلاحات، اقدار و متناسبت کا شعور، قانونی قاعدے و اخلاقی ضابطے، رواج و تقویم، تاریخ و ادب، اندازِ فکر و تمنائیں رکھنے والی قوم ہیں۔ المختصر زندگی سے متعلق ہمارا اپنا ایک امتیازی نقطہ نظر (سوچ، نظریہ) ہے۔"

نظریہ پاکستان اسی بنیادی اصول پر استوار (قائم) تھا کہ مسلمان ایک الگ قوم ہیں۔ ان کے قومی اور سیاسی تشخص کو (کسی دوسری قوم کے تشخص میں) ضم کرنے کی کسی بھی کوشش کی بھرپور مزاحمت کی جائے گی۔

### لیکچر نمبر 3

قائدِ اعظم پختہ عقیدہ اور اعتقاد والے انسان تھے۔ انہیں پختہ یقین تھا کہ اسلامی اصولوں پر مبنی ظہور (نمودار) ہوتی پاکستان کی نئی ریاست مجموعی طور پر معاشرے کی اصلاح کر دے گی۔ ستمبر 1945ء کو اپنے عید کے پیغام میں قائدِ اعظم نے کہا، "اسلام پورے مسلم معاشرے اور زندگی کے ہر شعبے کو اجتماعی اور انفرادی طور پر باقاعدہ بنانے والا ایک مکمل ضابطہ ہے۔"

آج قائد کا پاکستان بے شمار مشکلات کا سامنا کر رہا ہے۔ ہم بھول چکے ہیں کہ قائدِ اعظم محمد علی جناح کی بھرپور قیادت میں مسلمانوں نے کس قدر جدوجہد کی۔ قائدِ اعظم کے سنہری اصول "ایمان، اتحاد اور نظم و ضبط" پر عمل پیرا ہو کر ہم موجودہ مشکلات پر قابو پاسکتے ہیں۔ نوجوانوں سے ان کی اس نصیحت کا تذکرہ کر کے ہم اپنی قوم کو مضبوط بنا سکتے ہیں کہ "اب یہ تم پر انحصار کرتا ہے کہ کام کرو، کام کرو اور کام کرو اور (تب) ہمارا کامیاب ہونا یقینی ہے۔"



# SARDAR KAUREY KHAN

## PUBLIC HIGHER SECONDARY SCHOOL

### Translation - Unit No. 7

### "The Sultan Ahmad Masjid"

#### لیکچر نمبر 4

مسجد سلطان احمد دُنیا کی جاذبِ نظر (پُرکشش) قدیم عمارتوں میں سے ایک ہے۔ اُن نیلی ٹائلوں کی وجہ سے جو اس کے اندوں کی زیب و زینت بنتی ہیں یہ نیلی مسجد کے طور پر بھی مشہور ہے۔ استنبول، جو کہ ترکی کا سب سے بڑا شہر ہے اور جو 1453ء سے لے کر 1923ء تک سلطنتِ عثمانیہ کا دارالخلافہ رہا ہے، میں موجود یہ (مسجد) سیاحوں کی فریفتگی (گرویدگی، توجہ، پسندیدگی) کا مقبول ترین مقام بن گئی ہے۔

اسے احمد اول کے دورِ حکومت میں 1609ء اور 1616ء کے دوران تعمیر کیا گیا۔ رواج کے مطابق، اپنے زمانے کی دوسری مسجدوں کی طرح یہ مسجد اپنے بانی کا مقبرہ، ایک مدرسہ اور ایک مسافر خانہ پر مشتمل ہے۔

مسجد کی تعمیر 1609ء میں شروع ہوئی۔ سلطان نے شاہی ماہر تعمیرات "صد فکر محمد آغا" کو اس منصوبے کا نگران مقرر کیا۔ 1616ء میں افتتاحی تقریب منعقد کی گئی۔ بد قسمتی سے سلطان اپنی زندگی میں اس مسجد کی تکمیل نہ سیکھ سکا۔ یہ اس کے جانشین مصطفیٰ اول کے عہدِ حکومت میں مکمل ہوئی۔

نیلی مسجد سلطنتِ عثمانیہ کی مسجد اور باز نطنی (قسطنطنیہ کا پرانا نام باز نطین اور نیا استنبول ہے) گر جاگھر دونوں کے فن تعمیر کے طرز کی مظہر (ظاہر کرتی) ہے۔ مسجد "آیا صوفیہ / ہا گیا صوفیہ / ہایا صوفیہ، (جو کہ) مسلم فن تعمیر کی عجائبات میں سے ایک تھی،" کو بھی نمونے کے طور پر نظر میں رکھا گیا۔ نیلی مسجد شان و شوکت، عظمت اور قد و قامت میں آج بھی بے مثل سمجھی جاتی ہے۔

## لیکچر نمبر 5

مسجد کا ایک وسیع و عریض بیرونی صحن ہے جو ایک مسلسل محرابی قبہ دار راہداری سے گھرا ہوا ہے۔ اس کے دونوں اطراف میں وضو کی سہولیات موجود ہیں۔ (صحن کے) مرکز میں فوارہ ہے جو صحن کی وسعت کے برعکس قدرے چھوٹا ہے۔ مغربی طرف صحن کے دروازے کے اوپری حصے میں لوہے کی ایک بھاری زنجیر لٹکائی گئی ہے۔ یہ سمت صرف بادشاہ (سلطان) کے لیے مخصوص تھی۔ زنجیر وہاں اس لیے لٹکائی گئی تھی تاکہ جب کبھی بادشاہ صحن میں داخل ہو اُسے اپنا سر جھکانا پڑے۔ قوتِ ربی کے سامنے فرماں روا (حکمران) کی انکساری کو یقینی بنانے کے لیے یہ ایک علامتی اشارہ تھا۔

مسجد کے اندرونی حصے کے نچلے مقام (مراد فرش) پر گل لالہ کے پچاس سے زیادہ مختلف نمونوں میں ہاتھ سے بنی 20 ہزار سے زیادہ چینی مٹی کی ٹائلوں سے لکیریں لگائی گئی ہیں۔ گیلری کے مقام پر پھولوں، پھلوں اور سرو کے پودوں کی نمائندگی کے ساتھ نقشہ (منظر) حیرت انگیز حد تک رنگین ہو جاتا ہے۔

اندرونی حصے کے اوپر کا مقام نیلے روغن سے آراستہ (سجا) ہے۔ اس کے اندرونی حصے کو روشن کرنے کے لیے دو سو سے زائد رنگدار پیچیدہ نمونوں والی شیشے کی کھڑکیاں قدرتی روشنی اندر آنے دیتی ہیں اور فانوس اپنی چمک دمک سے اسے مزید منور کرتے ہیں۔ تزئین و آرائش میں کلامِ پاک کی آیات شامل ہیں۔ فرش غالیچوں (قالینوں) سے ڈھکے ہیں۔

## لیکچر نمبر 6

مسجد کے اندرونی حصے کا سب سے اہم جزو محراب ہے جو کہ عمدگی سے نقش و نگار کیے گئے سنگِ مرمر سے بنا ہے۔ محراب کے دائیں طرف خوب آراستہ پیراستہ منبر ہے۔ مسجد کا نقشہ ایسا بنایا گیا ہے کہ جب یہ انتہائی کھچا کھچ بھری ہو تب بھی مسجد میں موجود ہر شخص امام کو سن اور دیکھ سکتا ہے۔ شاہی کمرہ جنوب مشرقی کونے میں واقع ہے۔ اس کا اپنا منبر ہے جسے سبز قیمتی نگینوں اور گلابوں سے سجایا جاتا ہے۔

نیلی مسجد کے چھ مینار ہیں۔ چار مینار ایک ایک کر کے مسجد کے چاروں کونوں پر کھڑے ہیں۔ پنسل کی شکل کے ان میناروں میں سے ہر ایک میں تین بالکونیاں (چھبے) ہیں، جبکہ بیرونی صحن کے اختتام پر باقی دو میناروں میں صرف دو بالکونیاں ہیں۔ شام کو بڑی تعداد میں سیاح اور ترک شام کی نماز کے لیے اذان سننے مسجد کے سامنے والے پارک میں جمع ہو جاتے ہیں۔ مسجد روشنیوں سے اور مومنوں کے دلِ عشقِ ربی سے سیراب ہو جاتے ہیں۔ اگرچے نیلی مسجد کا بہت کچھ گزشتہ ماہ و سال کی نذر ہو چکا ہے، مگر یہ اپنے سیاحوں کی محبت سے محروم نہیں ہوئی۔ یہ مسجد ابھی تک دُنیا کی اُن یادگاروں میں سے ایک ہے جہاں لوگ سب سے زیادہ آتے ہیں۔



# SARDAR KAURAY KHAN PUBLIC HIGHER SECONDARY SCHOOL MUZAFFARGARH

- Chapter Cell cycle
- MCQs

Class: 9<sup>th</sup>

Subject: Biology

Submitted by Sadia Bashir

### Breakdown of syllabus for July 2020

1 <sup>st</sup> week 1 4	Monday	Tuesday	Wednesday	Thursday Pg.# 87 88	Friday Pg.# 89	Saturday Pg.# 90 99
2 <sup>nd</sup> week 6 11	Pg.# 92	Pg.#93	Pg.#95 96	Pg.# 97	Pg.# 98 99	Pg.#100
3 <sup>rd</sup> week 13 18	Pg.# 101	Pg.#102 103	Pg.# 104	Pg.# 105	Pg.#107	Pg.# 108
4 <sup>th</sup> week 20 25	Pg.# 109	Pg.#110	Pg.#111	Pg.#113	Pg.# 115	Pg.# 116
5 <sup>th</sup> week 27 31	_____	Revision	+ self ass.	essment	_____	_____

### 1 In which phase of cell cycle spindle fibers are formed?

A-G2 phase B-interphase. C -prophase D- metaphase

### 2 Which phase of cell division is very different in plants and animals?

A-Metaphase. B-anaphase C-telophase D- cytokinesis

### 3 In which stage of the cell cycle cells spend most of their lives?

A-Prophase. B-metaphase C-interphase D- telophase

### 4 Which of the following distinguishes meiosis and mitosis?

A-Chromosomes number is reduced

B-Chromosomes undergo crossing over

C-The daughter cells are genetically different from the parents cells

D-All these

### 5 Chromosomes are visible during

A-Interphase B- G1 phase. C-S phase D- cell division

### 6 duplication of chromosomes take place in phase

A-G1 B-G2. C-S phase D- M phase

**7**In \_\_\_\_\_ phase cells have temporarily or permanently stopped dividing

A-G1 phase. B- M phase C- S phase D-G0 phase

**8** during which phase in metabolic activities of cell are very high?

A-Prophase B-metaphase C-interphase D- anaphase

**9**at which stage of cell cycle cell stop dividing

KipA-G0. B- G1 C-G2 D- S

**10** at which stage cell doubles its chromosomes?

A-G 1 phase. B-S phase C-G2 phase D- G0 phase

**11**during which phase of a mitosis spindles are formed?

A\_G2. B\_interphase. C\_prophase. D\_metaphase

**12** the phase of cell cycle in which cell prepares itself for division is called

A\_Prophase. B\_interphase. C\_metaphase. D\_telophase

**13** whose cells never enter in G\_0 phase?

A\_Liver B\_kidney C\_nervous D\_epithelial

**14** the division of nucleus is called

A\_Synapsis B\_cytokinesis C\_karyokinesis D\_interphase

**15** the division of cytoplasm is called

A\_Karyokinesis B\_cytokinesis C\_mitosis D\_kinetokore

**16** mitosis is divided into \_\_\_\_\_ major phases

A\_2 B\_3. C\_4. D\_5

**17** complete set of spindle fibre is known as

A\_Centrosome B\_mitotic spindle C\_centromere D\_none of these

**18** the chromosomes arrange themselves along the equator of the cell in phase

A\_Prophase B\_metaphase C\_anaphase D\_telophase

**19** Chiasmata is formed during

A\_Metaphase B\_anaphase C\_prophase D\_telophase

**20** in which phase of mitosis nuclear envelope of a cell is broken down

A\_Prophase B\_metaphase C\_anaphase D\_telophase

**21** chromosomes are composed of

A\_ Lipids      B\_ DNAC\_ RNA      D\_ DNA and protein

**22** regeneration process is found in

A\_ Hydra      B\_ funaria      C\_ moss      D\_ sea\_star

**23** the animal which produces lost part with the process of regeneration is

A\_ Paramecisam      B\_ Sea\_star.      C\_ Sea lion      D\_ sea urchin

**24** which organism regenerates it's lost parts through mitosis

A\_ Sea star      B\_ horse      C\_ mosquito      D\_ frog

**25** budding process is found in

A\_ Fern      B\_ onion      C\_ cockroach      D\_ Hydra

**26** Error in the control of mitosis may cause

A\_ Cough      B\_ constipation      C\_ ulcer      D\_ cancer

**27** A sexual reproduction in hydra takes place by

A\_ Spores      B\_ mitosis      C\_ budding      D\_ cutting

**28** Process of formation of new tumors is known as

A\_ Synapsis      B\_ crossing      C\_ metastasis      D\_ regeneration

**29** A tumor which remains in their original location is called

A\_ Malignant      B\_ metastasis      C\_ benign      D\_ all are same terms

**30** Oscar Hertwing discovered meiosis in

A\_ 1875      B\_ 1876      C\_ 1877      D\_ 1878

**31** Meiosis was discovered for the first time by

A\_ Rudolph Virchow.      B\_ Walther Flemming.      C\_ August weismann      D\_ Oscar Hertwing

**32** The word meiosis is derived from a Greek word meion which means

A\_ To make smaller      B\_ to make bigger      C\_ to cut      D\_ to duplicate

**33** Which phase is the longest in meiosis

A\_ Prophase II.      B\_ Prophase I.      C\_ Telophase II.      D\_ Metaphase I

**34** The phase in which crossing over occurs

A\_ Anaphase      B\_ metaphase      C\_ prophase II.      D\_ Prophase I

**35** The exchange of parts of chromatids of homologous chromosomes is called

A\_ Chiasmata      B\_ crossing      C\_ over linkage      D\_ phragmoplast

**36** In 1911 \_\_\_\_\_ observed crossing over in a fruit fly

A\_ Morgan. B\_ Weisman. C\_ Mendel. D\_ Lamark

**37** During meiosis one cell divides into daughter cells

A\_ 2 B\_ 3 C\_ 4 D\_ 8

\_\_\_\_\_ is reversal of prophase

A\_ Metaphase B\_ anaphase C\_ interphase D\_ telophase

**38** Cells which form the body of organism are called

A\_ Germ cells B\_ gametes C\_ somatic cell D\_ parent cell

**39** Accidental death of cells and living tissues is known as

A\_ Cancer B\_ apoptosis C\_ necrosis D\_ both A and C

**40** The accidental death of cell is called

A\_ Synapsis B\_ somatic cell C\_ apoptosis D\_ necrosis

**41** Cells die each day by apoptosis in an adult human

A\_ 50\_100 billion B\_ 50\_80 billion C\_ 50\_90 billion D\_ 50\_70 billion

**42** During apoptosis cell membrane makes a irregular buds called

A\_ Apoptotic bodies. B\_ Blebs C\_ chromatin bodies. D\_ Tumors

**43** In which organism the Thomas hunt Morgan observed the phenomenon of crossing over

A\_ Bat B\_ mosquito C\_ fruit fly D\_ sparrows

## Short questions

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### 1 What is cytokinesis?

Cytokinesis is the division of the cytoplasm. Cytokinesis process is different in animal cell as compared to the plant cell.

### 2 How is cytokinesis different in plant cell as compared to animal cell?

#### Cytokinesis in animals

In animal cells cytokinesis occur by a process known as cleavage. A cleavage furrow develops where the metaphase plate used to be. The furrow deepens and eventually pinches the parent cell into two daughter cells.

#### Cytokinesis in plants

Cytokinesis in plant cells occur differently. Vesicles derived from the Golgi apparatus move to the middle of the cell and fuse to form a membrane bound disc called the cell plate or phragmoplast. The plate grows outward and more vesicle fuse with it. Finally the membranes of the cell plate fuse plasma membrane and its contents join the parental cell wall. The result is two daughter cells each bounded by its own plasma membrane and cell wall.

### 3 Define cell cycle

The series of events from the time a cell is produced until it completes mitosis and produces new cells is called cell cycle

### 4 What are major phases of cell cycle?

Cell cycle consists of two major phase interphase and mitotic phase . The mitotic phase is shorter than interphase.

### 5 Write four phases of karyokinesis

The division of the nucleus is further divided into four phases these are

1. Prophase

2. Metaphase
3. Anaphase
4. Telophase

### **6 What is meant by G1 phase in a cell cycle?**

After its production a cell starts its cell cycle in G1 phase during this phase the cell increases its supply of proteins increases the number of many of its organelles and grows in size .This phase is also marked by the synthesis of various enzymes that are required in the next phase. For example S phase for the duplication of chromosome

### **7 Write down the importance of G1 phase**

1. After its production a cell starts its cell cycle in G1 phase.
2. During this phase the cell increases its supply of proteins increases the number of many of its organelles and grows in size
3. This phase is also marked by the synthesis of various enzymes that are required in the next phase for example S phase for the duplication of chromosomes.

### **8 What happens in S phase?**

In S phase cell duplicate its chromosomes. As a result each chromosome consists of two sister chromatids.

### **9 What happens in G2 phase?**

In G2 phase the cell prepares proteins that are essential for mitosis mainly for the production of spindle fibres.

### **10 Explain G0 phase**

1. In multicellular eukaryotes cells enter the G0 state from G1 and stop dividing.
2. Some cells remain in G0 for indefinite period for example neuron
3. Some cells enter G0 phase semi permanently for example some cells of liver and kidney.
4. Many cells do not enter G0 and continue to divide throughout an organisms life for example epithelial cells.

### **11 Who suggested the name of mitosis?**

In 1880s , German biologist Walther Flemming observed that in a dividing cell nucleus passes through a series of changes which he called mitosis

### **12 Define somatic cells**

The cells which form the body of organisms are called somatic cells

### **13 Define germ line cells**

The cells which give rise to gametes are called germ line cells

### **14 Differentiate between chromatin and chromosomes.**

#### **Chromatin**

Genetic material in the nucleus is in a loose thread like form it is called chromatin.

#### **Chromosomes**

At the onset of prophase chromatin condenses into highly ordered structures, these are called chromosomes

### **15 Define mitosis in which cell does it occur**

Mitosis is the type of cell division in which a cell divides into two daughter cells each with the same number of chromosomes as well present in parent cell .mitosis occurs only in eukaryotic cells in multicellular organisms the somatic cells undergo mitosis

### **16 Write the names of mitosis major phases**

The process of mitosis is complex and highly regulated. There are two major divisions for example

**Karyokinesis.** The division of the nucleus

**Cytokinesis.** Division of the cytoplasm

### **17 What is kinetokore?**

The division of nucleus is called karyokinesis. Further divided into four phases for example prophase metaphase anaphase telophase.

### **18 What is cytokinesis?**

The division of cytoplasm during mitosis is called cytokinesis.

### **19 What is phragmoplast?**

Vesicles derived from the Golgi apparatus move to the middle of the cell and fuse to form a membrane bounded disc called the cell plate or phragmoplast.

### **20 What is the function of phragmoplast in plant cell?**

The Phragmoplast or cell plate grows outward and more vesicles fuse with it .finally membranes of cell plates used with plasma membrane and its contents join the parental cell the result is two daughter cells is bounded by its on plasma membrane and cell wall.

### **21 How is metaphase plate formed ?**

chromosomes arrange themselves along the equator of cell forming a plate called metaphase plate

### **22 Define cleavage furrow**

A cleavage furrow develops where the metaphase plate used to be. The furrow deepens pinches the parent cell into two daughter cell

### **23 How are the spindle fibres formed during prophase of mitosis?**

**Mitosis.** Mitosis is the type of cell division in which a cell divides into two daughter cells each with the same number of chromosomes as were present in the parent cell

**Mitotic spindle.** There are two centrioles close to nucleus. each centriole is duplicated and thus two daughter Centrosomes are formed. Both centrosome migrate to the opposite poles of a cell. Here they give rise to microtubules by joining tubulin protein present in cytoplasm. The microtubules thus formed are called spindle fibres. Complete set of spindle fibres is known as mitotic spindle

### **24 Write types of reproduction?**

**Types of reproduction** there are two main type of reproduction these are :

1 sexual reproduction. 2 Asexual reproduction

## 25 Explain briefly how a sexual reproduction occur in hydra?

**Asexual reproduction in hydra :** some organism produce genetically similar off springs show a sexual reproduction. Mitosis is the mean of a sexual reproduction. For example, hydra reproduce asexually by budding. The cells at the surface of hydra undergo mitosis and form a mass called bud. Mitosis continuous in the cell of bird and it grows into a new individual. The same division happens during a sexual reproduction (vegetative propagation) in plants.

## 26. What is alternation of generation?

**Alternation of generation.** Plants life cycle shows alternation of generation. The cell of diploid sporophyte generation undergo meiosis to produce haploid spores which grows into haploid gametophyte generations.

Gametophyte generation produce haploid gametes through mitosis. The gametes combined to produce the diploid zygote. Zygote undergoes repeated mitosis to become diploid this phenomenon is known as alternation of generation.

## 27. What is binary fission?

binary fission is a process of asexual reproduction in which cell divides into two halves in this is called binary fission.

## 28. What error main occur in mitosis ?

Errors in the control of mitosis main cause cancer. All cells have genes that control the timing and number of mitosis sometimes mutation occur inside genes and cells continue to divide. IIT results in growth of abnormal cells called tumor.

## 29. Give the importance of mitosis

**Importance of mitosis.** The importance of mitosis is the maintenance of the chromosomal set i.e. each daughter cell receives chromosomes that are alike in composition and equal in number to the chromosomes of the parent cell.

## 30 . What is the role of mitosis in development and growth.?

**Role of mitosis in development and growth.** The number of cells within an organism increased by mitosis. This is the basic of the development of a multicellular body from a single cell i.e. zygote and also the basic of growth of multicellular body.

**31 .What is meant by regeneration?**

some organism can regenerate parts of their bodies the production of new cells is achieved by mitosis for example sea start regenerates its lost arm through mitosis.

**32. What are tumor?**

An outgrowth formed due to abnormal cell divisions is called tumor for example cancer ,etc

**33. What is the difference between benign and malignant tumor?**

A tumor which remains in there original location is called benign and if a tumor invades other tissues it is called malignant and their cells are called cancer cells.

**34. Why are tumors dangerous for human body?**

As long as tumors remain in there original location they are called benign tumors but they invaded other tissues they are called malignant tumors and there cells are called cancer cells such tumors can send cancer cells to other parts in body where new tumors may form. This phenomenon is called metastasis.

**35. Define metastasis**

The process in which malignant cells send the cancer cells to other parts of body where new tumors may form ,is called metastasis.

**36. Define meiosis**

The process by which one diploid eukaryotic cell divides to generate four haploid daughter cells is called Meiosis. Meiosis was discovered by German biologist August Weismann in 1890.

**37. Define crossing over**

The process in which exchange of genetic material takes place between non sister chromatids of homologous chromosomes is called crossing over.

### **38. What is synapsis where it occurs?**

In the prophase 1 the non sister chromatids of homologous chromosomes exchange their segments and the phenomenon is called is known as crossing over.

### **39. Define chiasmata**

During prophase 1 the two non sister chromatids of homologous chromosomes join each other at certain points along the length these points of attachment are called chiasmata

### **40. What is haploid cell?**

Haploid means the cells with half the number of chromosomes for example chromosomes are not in the form of pairs.

### **41. Define meiosis and mitosis**

#### **Meiosis**

The process by which one diploid eukaryotic cell divides to generate four haploid daughter cells is called meiosis

**Mitosis** It is the type of cell division in which a cell divides into two daughter cells each with the same number of chromosomes as well present in parent cell

### **42. What is the significance of meiosis?**

Meiosis reduces the number of chromosomes in gametes so that chromosome number is maintained

It also brings about genetic variations to handle the changes in the environment

### **43. What is the difference between disjunction and nondisjunction?**

The normal separation of chromosomes is called is disjunction and when separation is not normal this is called nondisjunction . Nondisjunction is the error of meiosis.

#### **44. What is importance of crossing over in meiosis?**

During meiosis pairs of chromosomes of every parent cell undergo crossing over therefore genetic changes occur in daughter cell are gametes .when these gametes combine two forms zygote their genetic makeup will be different from their parents in this way meiosis provides us genetic changes in next generation. Better genetic changes help us to adopt more efficiently to the environmental changes

#### **45. What are the effects of errors in meiosis?**

During anaphase 1 chromosome separate and go to opposite poles while during anaphase II sister chromosome separate. It is called Odisjunction sometimes separation is not normal and it is called nondisjunction this result in the production of gametes which have either more or less than the normal number of chromosomes. It results abnormal chromosome number in next generation for example 47 or 45 chromosomes in human.

#### **46. What are the differences between mitosis and meiosis 1?**

##### **Mitosis**

Homologous chromosomes do not form pairs there is no crossing over.

Single chromosome align to form metaphase plate.

Daughter cell contain diploid number of chromosomes

##### **Meiosis 1**

Pairing of chromosomes crossing over between homologous chromosomes

Homologous pair align to form metaphase plate.

Daughter cells contain haploid number of chromosomes.

#### **47. When and who discovered crossing over in Drosophila Melanogaster?**

In 1911 American geneticist Thomas Hunt Morgan observed the phenomenon of crossing over in fruit fly Drosophila Melanogaster

#### **48. Define apoptosis**

Apoptosis is one of the main types of programmed cell death

**49. Define blebs**

During apoptosis cell membrane makes irregular buds known as blebs

**50. Define necrosis**

Necrosis is accidental death of cells and living tissue. Necrosis is less sequential than apoptosis.

**51. When can apoptosis occur?**

Apoptosis occur when a cell is damaged or undergoes stress condition

**52. What is the significance of apoptosis?**

- Apoptosis removes the damaged cell preventing it from getting further nutrients or to prevent the spread of infection
- Apoptosis also gives advantage during development. For example during the formation of fingers the cells between them undergo apoptosis and the digits separates

**53. What is apoptotic bodies?**

Blebs break off from the cell and are now called apoptotic bodies

**54. Differentiate between apoptosis and necrosis****Apoptosis**

Apoptosis is one of the main types of programmed cell death.

**Necrosis**

Necrosis is a accidental death of cells and living tissue. Necrosis is less sequential than apoptosis

**55. Write down the causes of necrosis**

There are many causes of necrosis including injury infection cancer etc

- Necrosis may occur when a cell is given hypoxic environment.
- Necrosis may be due to lack of proper care to wound site.
- Spider bites also cause necrosis in some areas

**56. What is the role of lysosome in necrosis?**

During necrosis there is a release of special enzymes from lysosomes.

Lysosomal enzymes break cellular components and may also be released outside cell to break the surrounding cells. Cells that die by necrosis may also release harmful chemicals that damage other cells.

## 57. Differentiate between apoptosis and blebs

### Apoptosis

Apoptosis is one of the main types of programmed cell death.

### Blebs

During apoptosis cell membrane makes irregular buds known as blebs.

## Long questions unit 5 cell cycle

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**Q:1** what is cell cycle? Explain different phases of interphase with the help of diagram.

**Cell cycle:** is the series of events from the time a cell is produced until it completes mitosis and produces new cells. Cell cycle consists of two major phases i.e. interphase and mitotic phase (M phase). Mitotic phase is a relatively short period of cell cycle. It alternates with the much longer interphase, where cell prepares itself for division.

**Interphase:** is the time when a cell's metabolic activity is very high, as it performs its various functions.

It is divided into three phases, G1 (first gap), S (synthesis), and G2 (second gap).

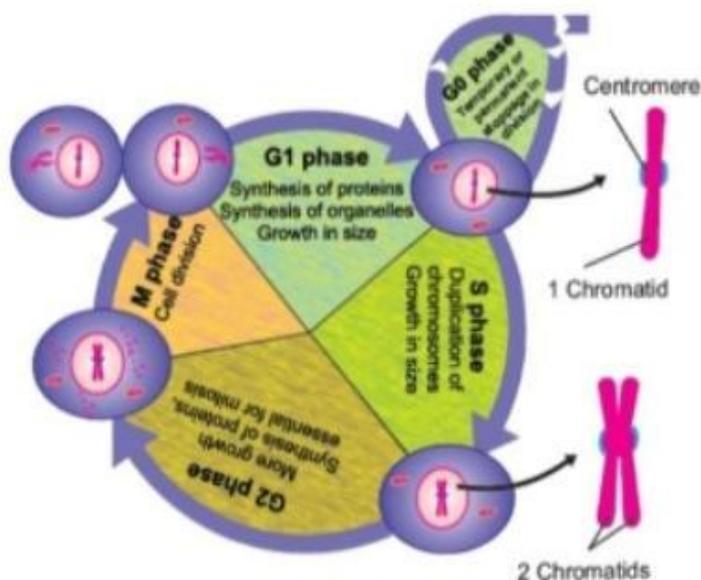
**G1 phase:** After its production, a cell starts its cell cycle in G1 phase. During this phase, cell increases its supply of proteins, increases the number of its organelles (such as mitochondria, ribosomes), and grows in size. This phase is also marked by the synthesis of various enzymes that are required in next phase i.e. S phase for the duplication of chromosomes.

Typically, interphase lasts for at least 90 percent of the total time required for the cell cycle.

**S phase:** In this phase, cell duplicates its chromosomes. As a result, each chromosome consists of two sister chromatids.

**G 2 phase:** In the G2 phase, cell prepares proteins that are essential for mitosis, mainly for the production of spindle fibres.

After the G2 phase of interphase, cell enters the division phase i.e. M phase. It is characterized by mitosis, in which cell divides into the two daughter cells.



Cells that have temporarily or permanently stopped dividing are said to have entered a state of quiescence, called G0 phase.

#### Inhibition of protein synthesis during G2 phase prevents cell from undergoing mitosis

**In G0 phase:** In multicellular eukaryotes, cells enter G0 phase of G1 and stop dividing. Some cells remain in G0 for indefinite period e.g. neurons. Some cells enter G0 phase semi permanently e.g.

some cells of liver and kidney. Many cells do not enter G0 and continue to divide throughout an organism's life, e.g. epithelial cells.

The events of cell cycle are ordered and directional for example each event occurs in sequential fashion and it is impossible to reverse the cycle .

#### Q:2 what is mitosis? Explain the prophase in detail

In 1880s, a German biologist Walther Flemming observed that in a dividing cell, nucleus passes through a series of changes which he called mitosis. **Mitosis** the type of cell division in which a cell divides into two daughter cells, each with the same number of chromosomes as were present in parent cell.

Mitosis occurs only in eukaryotic cells. In multicellular organisms, the somatic cells undergo mitosis.

### **Prophase**

Normally, the genetic material in nucleus is in a loose thread-like form called chromatin. At the onset of prophase, chromatin condenses into highly ordered structures called chromosomes.

Since the genetic material has already been duplicated earlier in S phase, each chromosome is made of two sister chromatids, bound together at the same centromere. Each chromosome also has kinetochore at centromere. Kinetochore is a complex protein structure that is the point where spindle fibers attach.

Prokaryotes do not have proper nucleus and do not form spindles during division. That is why their division is not called mitosis.

There are two centrioles (collectively called a centrosome) close to nucleus. Each centriole duplicates and thus two daughter centrosomes are formed. Both centrosomes migrate to the opposite poles of cell. Here, they give rise to microtubules by joining tubulin proteins present in cytoplasm. The microtubules thus formed are called spindle fibres.

Complete set of spindle fibres is known as mitotic spindle. By this time, nucleolus and nuclear envelope have degraded, and spindle fibres have invaded the central space.

In highly vacuolated plant cells, nucleus has to migrate to the Centre of cell before prophase. The cells of plants lack centrioles. So, spindle fibres are formed by the aggregation of tubulin proteins on the surface of nuclear envelope during prophase.

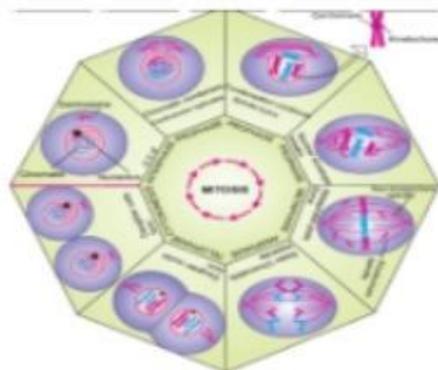
**Q :3 explain metaphase and anaphase with the help of diagram.**

### **Metaphase:**

When spindle fibres have grown to sufficient length, some spindle fibres, known as kinetochore fibres, attach with the kinetochores of chromosomes. Two kinetochore fibres from opposite poles attach with each chromosome. Chromosomes arrange themselves along the equator of cell forming a metaphase plate. A number of other fibres (non-kinetochore) from the opposite centrosomes attach with each other.

### **Anaphase:**

Anaphase When a kinetochore spindle fibre connects with the kinetochore of chromosome, it starts to pull toward the originating centrosomes. The pulling force divides the chromosomes sister chromatids and they separate. These sister chromatids are now sister chromosomes, and they are pulled apart toward the respective centrosomes. The other spindle fibres (non-kinetochore) also elongate. At the end of anaphase, cell has succeeded in separating identical copies of chromosomes into two groups at the opposite poles.

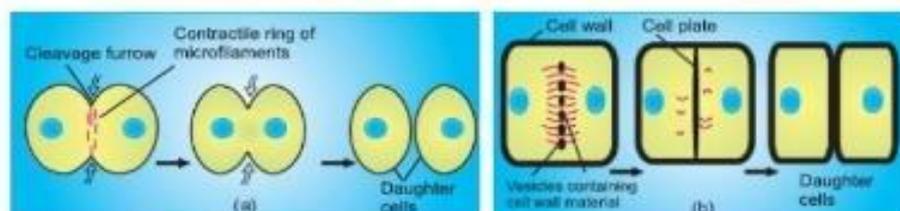


#### Q:4 explain cytokinesis in detail with the help of diagram

##### Cytokinesis

Cytokinesis is the division of cytoplasm. In animal cells, cytokinesis occurs by a process known as cleavage. A cleavage furrow develops where the metaphase plate used to be. The furrow deepens and eventually pinches the parent cell into two daughter cells.

Cytokinesis in plant cells occurs differently. Vesicles derived from the Golgi apparatus move to the middle of cell and fuse to form a membrane-bounded disc called cell plate or phragmoplast



The plate grows outward and more vesicles fuse with it. Finally, membranes of cell plate fuse with plasma membrane and its contents join the parental cell wall. The result is two daughter cells, each bounded by its own plasma membrane and cell wall .

#### Q:5 explain the significance of mitosis in detail

##### Significance of mitosis

Importance of mitosis is the maintenance of chromosomal set i.e. each daughter cell receives chromosomes that are alike in composition and equal in number to the chromosomes of parent cell.

Following are the occasions in the lives of organisms where mitosis happens.

##### Development and growth:

The number of cells within an organism increase by mitosis. This is the basis of the development of a multicellular body from a single cell i.e. zygote and also the basis of the growth of multicellular body.

##### Cell replacement

In some parts of body, e.g. skin and digestive tract, cells are constantly sloughed off and replaced by new ones. New cells are formed by mitosis and so are exact copies of the cells being replaced.

Similarly, red blood cells have short life span (about 4 months) and new red blood cells are formed

##### Regeneration:

Some organisms can regenerate parts of their bodies. The production of new cells is achieved by mitosis. For example; sea star regenerates its lost arm through mitosis.

##### A sexual reproduction:

Some organisms produce genetically similar offspring through asexual reproduction, Mitosis is a mean of asexual reproduction. For example, hydra reproduces asexually by budding. The cells at the surface of hydra undergo mitosis and form a mass called bud. Mitosis continues in the cells of bud and it grows into a new individual. The same division happens during asexual reproduction (vegetative propagation) in plants.

### Q:6 Explain Errors in Mitosis

#### Errors in mitosis:

Errors in the control of mitosis may cause cancer. All cells have genes that control the timing and number of mitosis. Sometimes mutations occur in such genes and cells continue to divide.

It results in growth of abnormal cells called tumors. As long as these tumors remain in their original location, they are called benign tumors. But if they invade other tissues, they are called malignant (cancerous) tumors and their cells are called cancer cells. Such tumors can send cancer cells to other parts in body where new tumors may form. This phenomenon is called metastasis (spreading of disease).

### Q:7 what is Meiosis? Explain the prophase 1 in detail.

#### Meiosis I:

In meiosis I, the homologous chromosomes in a diploid cell separate and so two haploid daughter cells are produced. It is the step in meiosis that generates genetic variations. Meiosis I occurs in two main steps i.e. karyokinesis and cytokinesis. The karyokinesis of Meiosis I is subdivided into prophase I, metaphase I, anaphase I, and telophase I.

#### Prophase I:

Prophase is the longest phase in meiosis. During this stage, chromatin condenses into chromosomes.

The homologous chromosomes line up with each other and form pairs by a process called synapsis.

Each pair of homologous chromosomes is called bivalent. Each bivalent has four chromatids, so it may also be called a tetrad. The two non-sister chromatids of homologous chromosomes join each other at certain points along their length. These points of attachment are called chiasmata. In the next stage, the non-sister chromatids of homologous chromosomes exchange their segments and the phenomenon is known as crossing over

The exchange of segments results in the recombination of genetic information. After crossing over, each pair of homologous chromosomes remain as a bivalent.

Chromosomes condense further, the nucleoli disappear, and the nuclear envelope disintegrates.

Centrioles, which were duplicated during interphase, migrate to the two poles and form spindle fibres. The kinetochore spindle fibres attach with the kinetochores of chromosomes. While the non-kinetochore spindle fibres from both sides interact with each other. Two kinetochore spindle fibres (from the opposite poles) attach with a pair of chromosomes. In mitosis, we have seen that two kinetochore spindle fibres attach with one chromosome.

**Q:8 explain the significance of meiosis**

The significance of meiosis for reproduction and inheritance was described in 1890 by German biologist August Weismann. He pointed out that meiosis is necessary not only to maintain the number of chromosomes in the next generation but also to produce variations in next generation,

**Maintenance of the chromosome number in next generation:**

Meiosis is essential for sexual reproduction. In humans, diploid gamete-mother cells or germ line cells undergo meiosis to produce haploid gametes, Male and female gametes unite to form diploid zygote, which undergoes repeated mitosis and develops into a new diploid human. Many haploid fungi and protozoans produce haploid gametes through mitosis. Plants' life cycle shows alternation of generations. The cells of diploid sporophyte generation undergo meiosis to produce haploid spores, which grow into haploid gametophyte generations. Gametophyte generation produces haploid gametes through mitosis. The gametes combine to produce diploid zygote.

Zygote undergoes repeated mitosis to become diploid sporophyte.

**Production of variations in next generation:**

The chromosome pairs of each parent undergo crossing over during meiosis. So daughter cells i.e. gametes have genetic variations. When gametes fuse and form zygote, its genetic make up is different from both parents. Thus meiosis allows a species to bring variations in the next generations.

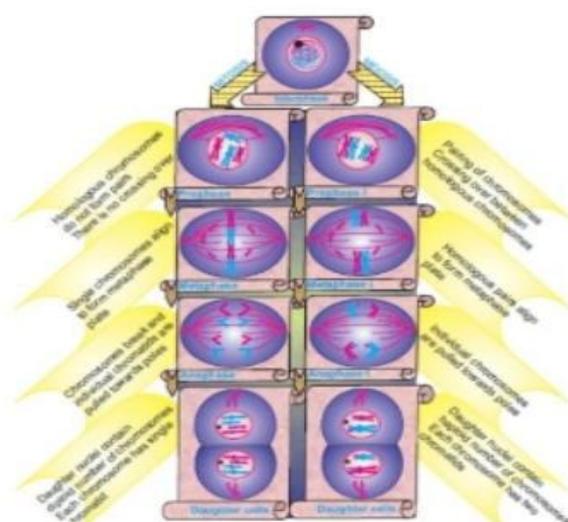
Beneficial variations help organisms to adapt to the changes in environment.

**Q:10 explain the errors in meiosis**

During anaphase, chromosomes separate and go to opposite poles while during anaphase II sister chromosomes separate. It is called disjunction. Sometimes the separation is not normal and it is called non-disjunction. This results in the production of gametes which have either more or less than the normal number of chromosomes. If such abnormal gamete fuses with a normal gamete, it results abnormal chromosome number in next generation, for example 47 or 45 chromosomes in humans.

**Q:11 explain the comparison between mitosis and meiosis**

Meiosis II is similar to mitosis while meiosis I makes the actual difference between these two cell divisions. The following chart describes the main differences between mitosis and meiosis I.



**Q:12 explain apoptosis and necrosis in detail****Apoptosis:**

Apoptosis is one of the main types of programmed cell death. During apoptosis, cell shrinks and becomes rounded due to the breakdown of cytoskeleton by enzymes. Its chromatin undergoes condensation and nuclear envelope breaks. In this in an adult human, 50 way, nucleus spreads in the form membrane makes of several discrete chromatin bodies. Cell to 70 billion cells die irregular buds known as blebs. Blebs break off from the each day by apoptosis. cell and are now called apoptotic bodies, which are then phagocytosed by other cells.

Apoptosis can occur when a cell is damaged or undergoes stress conditions. Apoptosis removes the damaged cell, preventing it from getting further nutrients, or to prevent the spread of infections.

Apoptosis also gives advantages during development. For example during the formation of fingers, the cells between them undergo apoptosis and the digits separate.

**Necrosis**

Necrosis is the accidental death of cells and living tissues. Necrosis is less sequential than apoptosis.

There are many causes of necrosis including injury, infection, cancer etc. Necrosis may occur when a cell is given hypoxic (with less oxygen) environments.

During necrosis, there is a release of special enzymes from lysosomes. Lysosomal enzymes break cellular components and may also be released outside cell to break surrounding cells. Cells that die by necrosis may also release harmful chemicals that damage other cells.

- Spider bites also cause necrosis in some areas.
- Necrosis may be due to lack of proper care to a wound site.

**Unit 6****Enzymes****Mcqs****1 What is true about enzymes?**

- a) They make biochemical reactions to proceed spontaneously
- b) They lower the activation energy of a reaction
- c) They are not very specific in their choice of substrate.
- d) They are needed in large quantities

**2 To what category of molecules do enzymes belong**

- (A) carbohydrates (B) lipids (C) nucleic acid. (D) proteins

**3 What is true about cofactors**

- (A) break hydrogen bonds in protein
- (B) help to facilitate enzyme activity
- c) Increase activation energy
- (D) are composed of proteins

**4 Metabolism is derived from Greek word meaning**

- (A) Division (B) Change (C) Deduction (D) matter

**5 Who presented the concept of metabolism**

- (A) Kuhne (B) Koshland (C) Ibn-e-Nafees. (D) Emil

**6 The term metabolism is derived from which language**

- (A) Latin
- (B) Greek
- (C) German
- (D) Arabic

**7 The biochemical reactions in which larger molecules are synthesized are called:**

- (A) anabolism (C) metabolism (B) catabolism (D) enzymatic reaction

**8 All biochemical reactions occurring in living organism necessary for life are called as**

- (A) metabolism
- (B) anabolism
- (C) catabolism

(D) mutualism

**9 Who used the term enzyme first time**

(A) Oscar Hertwig B) Wilhelm Kühne C) W Flemming D) T.H. Morgan

**10 Which of the following acts as a catalyst for metabolism**

(A) enzymes

(B) vitamin

(C) lipids

(D) proteins

**11 Almost enzymes are**

(A) proteins

(B) vitamins

(C) carbohydrates

(D) fats

**12 Structurally enzymes are made of**

(A) minerals

(B) vitamins

(C) fats

(D) amino acid

**13 The molecules at which enzymes act are called**

(A) products (B) substrates (C) catalyst (D) enzymes

**14 The catalytic region on enzyme is called**

(A) active site

(B) cofactor

(C) coenzyme

(D) metabolic site

**15 Vitamins act as coenzymes**

(A) vitamin B

(B) Vitamin D

(C) vitamin C

D) riboflavin

**16. When organic cofactors are tightly bound to enzymes**

(A) Coenzyme

(B) Apoenzyme

(C) Cofactor

D) prosthetic group

**17 The catalytic region of enzyme is called**

A) coenzyme

(B) inhibitor

C) activator

D) active site

**18 One important coenzyme is is**

A) amylase

B) Sodium

C) Glucose

D) Folic acid

**19 Alcohol is prepared by**

(A) yeast

(B) algae

(C) onions

D) pepper

**20 Enzymes used for cleaning utensils is**

A) Amylase

B) Trypsin

C) Lipase

D) Tylon

**21 Enzyme used for the removal of protein stains from clothes is called**

A) Pepsin

B) Amylase

C) Protease

D) Lipase

**22 Biological detergent is**

Th

- A) Protease
- B) Pepsin
- C) Thiamine
- D) Riboflavin

**23 The name of enzyme used in dish washing is**

- A) Protease
- B) Lipase
- C) Amylase
- D) Pepsin

**24 The optimum temperature for working of human enzymes is**

- A) 58 degree Celsius
- B) 10 degree Celsius
- C) 37 degree Celsius
- D) 40 degree Celsius

**25 Trypsin enzyme shows its activity**

(A) medium pH (B) high pH (C) low pH (D) acidic PH

**26 Who proposed lock and key model for action of enzyme**

(A) Daniel Koshland (B) Emil Fischer. (C) W kuhne (D) W Flemming

**27 Who presented induced fit model**

- (A) Daniel koshland
- (B) Emil Fisher
- (C) Abn-e-Nafees
- (D) Jabir bin Hayan

**28 When did Daniel koshland proposed induced fit model**

- (A) 1894
- (B) 1968
- (C) 1958
- (D) 1985

**29 Emil Fisher introduce to lock and key model in**

- A) 1894 AD
- B) 1794 AD
- C) 1994 AD
- D) 1898 AD

**30 Enzyme pepsin works in**

- (A) mouth
- (B) intestine
- (C) oesophagus
- (D) stomach

**31 In which medium enzyme trypsin works**

- (A) alkaline
- (B) acidic
- (C) neutral
- (D) slightly basic

**32 An enzyme which breaks down starch is**

- (A) protease
- (B) amylase
- (C) tripsin
- (D) Lipase

**33 Lipase enzyme acts on**

- (A) lipids
- (B) proteins
- (C) glucose
- (D) starch

**34 In protein metabolism \_\_\_\_\_ works as a catalyst**

- A) Amylase
- B) Lipase
- C) Pepsin
- D) Tripsin

**35 Enzyme lipase acts only on**

- A) Lipids
- B) Proteins
- C) Carbohydrates
- D) Hormones

**36 The enzyme which acts only on lipids is**

- A) Pepsin
- B) Protease
- C) Lipase
- D) Amylase

**37 The compound which converts inactive pepsinogen into pepsin is called**

- A) Mucus
- B) Water
- C) HCL
- D) Lipase

## Short questions

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### 1 Differentiate between cofactors and coenzyme

#### cofactor

Some Enzymes do not need any additional component to work. However, others require non-protein molecules or ions called cofactors, Cofactors can be either inorganic or organic.

#### Coenzymes

If organic cofactors are loosely attached with enzyme they are called coenzymes.

### 2 What is the role of enzyme in paper industry?

Enzymes break starch to lower its viscosity that aids in making paper.

### 3 Define metabolism

The set of biochemical reactions that occur in living organisms in order to maintain life is called metabolism. The first of all gave the concept of metabolism is Ibn-e-Nafees.

### 4 Differentiate between catabolism and anabolism

#### Anabolism

Anabolism includes the biochemical reactions in which larger molecules are synthesized. Energy is utilized in anabolism.

e.g. photosynthesis, etc.

#### Catabolism

Catabolism includes the biochemical reactions in which larger molecules are broken down usually energy is released in catabolism.

e.g. digestion, respiration, etc.

### 5 Define enzyme

"Enzymes are proteins that catalyze (i.e. speed up) bio-chemical reaction and are not changed during the reaction."

### **6 When and who used the term enzyme first?**

In 1878, German physiologist Winhelm Kuhne first used the term enzyme.

### **7 Define the terms enzyme and substrate**

#### **Enzyme**

"Enzymes are proteins that catalyze bio-chemical reactions and are not changed during the reaction."

#### **Substrate**

The molecules at which enzymes act are called substrates.

### **8 What are substrates and products**

#### **Substrate**

The molecules at which enzymes act are called substrates.

#### **Products**

An enzyme converts the substrates into different molecules which are called products

### **9 Write down the two characteristics of enzymes**

Almost all enzymes are proteins i.e. they are made of amino acid

Most enzyme reaction rates are millions of times faster than those of comparable uncatalyzed reactions. As with all catalysts, enzymes are not consumed by the reactions they catalyze.

### **10 Write name of two enzymes**

(1) Amylase (2) Pepsin

### **11 Define activation energy. How enzymes effect on it ?**

#### **Activation energy**

It is defined as minimum energy required to start a reaction.

All chemical reactions require activation energy. The need for activation energy acts as a barrier to the beginning of reaction.

### **12 Enzymes lower activation energy in several ways. How?**

They may alter shape of substrate and reduce the requirement of energy for this change.

Some Enzymes do so by disrupting the charge distribution on substrates.

Enzymes may also lower activation energy by bringing substrates in the correct orientation to react.

### **13 Write down two benefits of biocatalysts**

Enzymes are crucial to metabolism because they act as biocatalysts and speed up and regulate the metabolic pathways.

Two uses of biocatalysts are as following:

1 Protease enzymes are used for the removal of protein stains from clothes.

2 Amylase enzymes are used in dish washing to remove resistant starch residues.

### **14 What is difference between intracellular and extracellular enzymes?**

#### **Intracellular**

The enzymes which work inside the cell are called intracellular enzyme for example enzymes of glycolysis working in cytoplasm.

#### **Extracellular**

The enzymes which work outside the cell are called extracellular enzymes for example pepsin enzyme working in stomach cavity

### **15 Write down the functions of active site**

Active site recognize substrate

Active site bonds an enzyme with the substrate

### **16 Define active site**

Only a small portion of an enzyme molecule is directly involved in catalysis . This catalytic region is known as active site.

## 17 Write the difference between active site and substrate

### Active site

Only a small portion of an enzyme molecule is directly involved in catalysis. This catalytic region is known as active site. It recognizes and binds substrate and then carries out reaction.

### Substrate

The molecules at which enzymes act are called substrates.

## 18 Define inhibitors

The substances which stop or reduce the activity of enzyme are called inhibitors.

## 19 Define cofactors

The non-protein molecules or ions which are required by enzymes to show full activity are called cofactors.

Types of cofactors are :

1. Inorganic for example metal ions
2. Organic for example Flavin and heme

## 20 Differentiate between prosthetic group and coenzyme

### Prosthetic group

The organic cofactors which are tightly bound to enzymes are called prosthetic groups.

### Coenzymes

If organic cofactors are loosely attached with enzyme they are called coenzymes. For example, some important vitamins for example riboflavin, thiamine and folic acid act as coenzymes.

## 21 What is meant by saturated active site?

At high substrate concentration when all the active sites of an enzyme are occupied and any more substrate molecules do not find free active sites, this state is called saturation of active sites and reaction rate does not increase.

**22 What are the functions of coenzymes?**

Coenzymes transport chemical groups from one enzyme to another some important vitamins for example riboflavin thiamine and folic acid act as coenzymes.

**23 Describe metabolic pathways**

Several enzymes can work together in a specific order creating metabolic pathways in a metabolic pathway one enzyme takes the product of another enzyme as a substrate after the reaction the product is passed on to the next day.

**24 In which industries enzymes are extensively used for fast chemical reactions?**

Enzymes are extensively used in

1. Food industry
2. Paper industry
3. Brewing industry
4. Biological detergents

**25 Name three important vitamins which are used as coenzyme**

- Riboflavin
- Thiamin
- Folic acid

**26 write two any uses of enzyme?****Brewing Industry**

Enzymes break starch and proteins the products are used by yeast for fermentation.

**Food industry**

Enzymes that breaks starch into simple sugars are used in the production of white bread and buns etc

## **Paper industry**

Enzymes break starch to lower its viscosity that aids in making paper.

### **27 Give two uses of biological detergent**

1. Amylase enzymes are used in dish washing to remove resistant starch residues.
2. Protease enzymes are used for the removal of proteins stain from clothes.

### **28 Write the uses of yeast in fermentation**

1. Yeast are for fermentation ( to produce alcohol)
2. Yeast also used to produce bread.

### **29 How soya sauce is made?**

Soya sauce is made by fermentation of soya plants by a fungus asparagus.

### **30 Which are factors that can affect the rate of enzyme reaction?**

Temperature substrate concentration and pH affect the rate of enzyme reaction.

### **31 Define optimum temperature? Also write the optimum temperature for man.**

#### **Optimum temperature**

the specific temperature at which enzyme works at its maximum rate is called as optimum temperature.

#### **Optimum temperature for man**

the optimum temperature for the maximum working speed of human enzymes is 37 degree Celsius.

### **32 What is the effect of temperature on enzymes?**

Increase in temperature speeds up the rate of enzyme catalyzed reactions but only to a point

### **33 What is meant by denaturation of enzyme?**

When temperature is raised above the optimum temperature the heat energy increases the vibrations of atoms of enzyme molecules and global structure of enzyme is lost this is known as denaturation of enzyme.

### **34 What is substrate concentration?**

If enzyme molecules are available in a reaction increase in substrate concentration increase the rate of reaction if enzyme concentration is kept constant and amount of substrate is increased a point is reached where any further increase in substrate does not increase the rate of reaction any more. When the active sites of enzymes are occupied any more substrate molecules do not find free active sites. This state is called saturation of active sites.

### **35 What is optimum pH ? Give an example**

A narrow range of PH at which enzymes work at their maximum rate is called optimum PH .pepsin working in stomach is active in acidic medium(low PH) value while trypsin working in small intestine but shows its activity in alkaline medium (high PH) .

### **36 How pH affects enzyme activity**

All enzyme work at their maximum rate at a narrow range of PH called as the optimum PH. A slight change in this pH causes retardation in enzyme activity or blocks it completely. Every enzyme has its specific optimum PH value for example pepsin working in stomach is active in acidic medium ( low PH) while trypsin working in small intestine shows its activity in alkaline medium (high PH).Change in pH can affect the ionization of the amino acids at the active site.

### **37 In which medium pepsin and trypsin enzymes work?**

#### **Pepsin**

Working in stomach is active in acidic medium (low PH).

#### **Trypsin**

Working in small intestine shows its activity in alkaline medium (high PH).

### **38 Differentiate between protease enzyme and amylase enzyme.**

**Protease enzyme**

The enzyme protease breaks peptide bonds in proteins.

**Amylase enzyme**

The enzyme which works on starch are known as Amylase.

**39 Which models explain the mechanism of enzyme action?**

two models have been proposed to explain the mechanism of enzyme action

1. Lock and key model
2. Induced fit model

**40 What is lock and key model?**

According to this model both enzyme and substrate possess specific shapes that fit exactly into one another. This model explains enzyme specificity.

**41 When and Who presented the induced fit model?**

In 1958 and American biologist Daniel Koshland suggest a modification to lock and key model and proposed induced fit model. According to this model active site is not a rigid structure rather it is molded into the required shape to perform its function. Induced fit model is more acceptable than lock and key model of enzyme action.

**42 What is induced fit model?**

According to this model active site is not a rigid structure rather it is molded into required shape to perform its function induced fit model is more acceptable than lock and key model of enzyme action.

**43 Write benefit of enzyme substrate complex.**

When enzyme attaches with the substrate a temporary enzyme substrate (ES) complex is formed. Enzyme catalyzes the reaction and substrate is transformed into product. After it ES complex breaks and enzyme and product are released.

**44 What do you mean by specificity of enzymes?**

There are over 2,000 known enzymes each of which is involved in one specific chemical reaction. Enzymes are also substrate specific.

#### 45 What is lipase?

It is an enzyme which acts on lipids and fats and converts them into fatty acids.

### Long Questions unit 6 Enzymes

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#### Q:1 Describe characteristics of enzymes

In 1878, German physiologist Wilhelm Kuhne first used the term enzyme. Enzymes are globular proteins. Like all proteins, enzymes are made of long linear chains of amino acids that fold to produce a three-dimensional molecule.

- Almost all enzymes are proteins i.e. they are made of amino acids.
- Most enzyme reaction rates are millions of times faster than those of comparable uncatalyzed reactions. As with all catalysts, enzymes are not consumed by the reactions they catalyze.
- Enzymes are usually very specific for the type of reaction and for the nature of their substrates.
- Only a small portion of enzyme molecule is directly involved in catalysis. This catalytic region is known as active site. It recognizes and binds substrate and then carries out reaction.
- Enzyme production can be enhanced or diminished by a cell according to needs. Enzyme activity can also be regulated by inhibitors and activators.
  - Some enzymes do not need any additional component to work. However, others require non-protein molecules or ions called cofactors. Cofactors can be either inorganic (e.g. metal ions) or organic (e.g. Flavin and heme). Organic cofactors are tightly bound to enzyme, they are called prosthetic groups. Organic cofactors are loosely attached with enzyme, they are called co-enzymes. Coenzymes transport chemical groups from one enzyme to another. Some important vitamins (for example riboflavin, thiamine and folic acid) act as coenzymes.
  - Several enzymes can work together in a specific order creating metabolic pathways. In a metabolic pathway one enzyme takes the

product of another enzyme as a substrate .After the reaction the product is passed on to the next enzyme

**Q:2 write the uses of enzyme**

Enzymes are extensively used in different industries for fast chemical reactions. For example:

**1 . Food industry:**

Enzymes that break starch into simple sugars are used in the production of white bread, buns etc.

**2 . Brewing industry :**

Enzymes break starch and proteins. The products are used by yeast for fermentation (to produce alcohol).

**3.Paper industry:**

Enzymes break starch to lower its viscosity that aids in making paper.

**4. Biological detergent:**

Protease enzymes are used for the removal of protein stains from clothes.

Amylase enzymes are used in dish washing to remove resistant starch residue

**Q: 3 write the factors which affecting the rate of enzyme action**

Enzymes are very sensitive to the environment in which they work. Any factor that can change the chemistry or shape of enzyme molecule, can affect its activity. Some of the factors that can affect the rate of enzyme action are being discussed next.

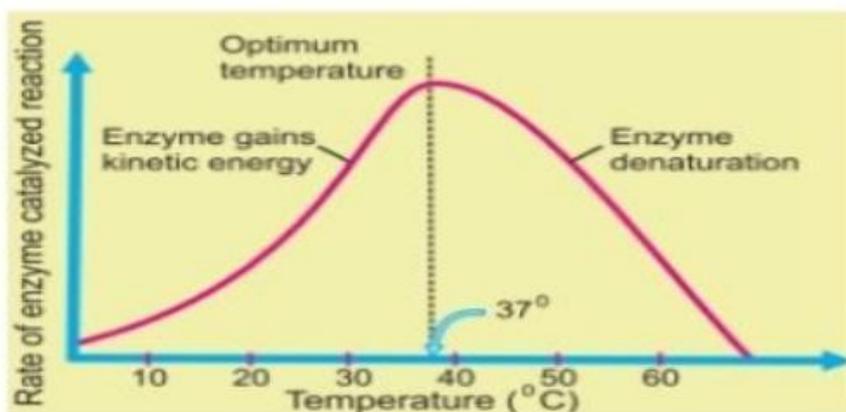
**Temperature:**

Increase in temperature speeds up the rate of enzyme catalyzed reactions, but only to a point . Every enzyme works at its maximum rate at a specific temperature called as the optimum temperature for that enzyme.

When temperature rises to a certain limit, heat adds in the activation energy and also provides kinetic energy for the reaction. So reactions are

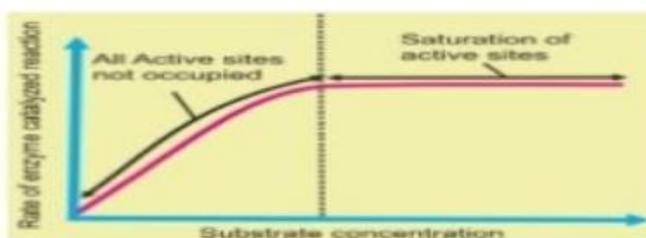
accelerated. But when temperature is raised well above the optimum temperature, heat energy increases the vibrations of atoms of enzyme and the globular structure of enzyme is lost. This is known as the denaturation of enzyme. It results in a rapid decrease in rate of enzyme action and it may be blocked completely.

- The optimum temperature for the maximum working speed of human enzymes is  $37^{\circ}\text{C}$ .



### Substrate concentration:

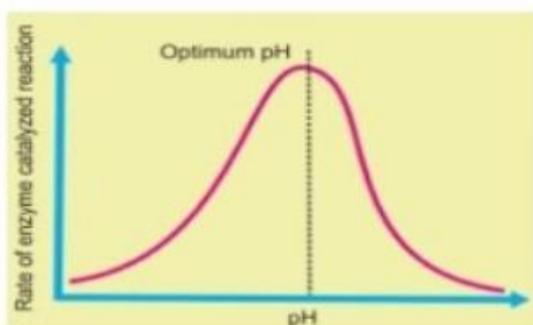
If enzyme molecules are available in a reaction, increase in substrate concentration increases the rate of reaction. If enzyme concentration is kept constant and amount of substrate is increased, a point is reached where any further increase in substrate does not increase the rate of reaction any more. When the active sites of all enzymes are occupied (at high substrate concentration), any more substrate molecules do not find free active sites. This state is called saturation of active sites and reaction and reaction rate does not increase.



**pH:**

All enzymes work at their maximum rate at a narrow range of pH, called as the optimum pH . A slight change in this pH causes retardation in enzyme activity or blocks it completely.

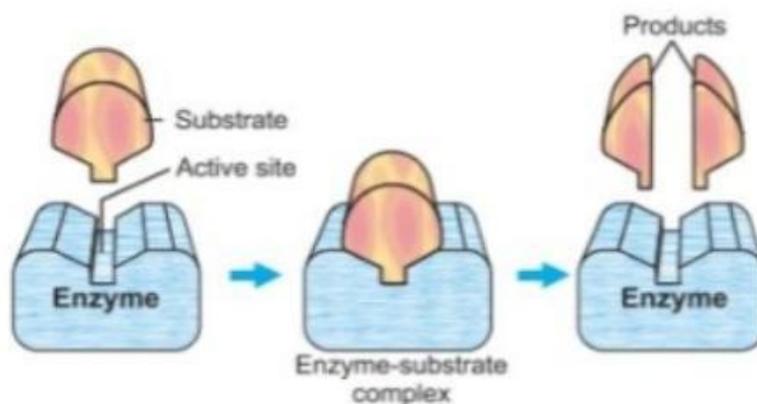
Every enzyme has its specific optimum pH value. For example pepsin (working in stomach) is active in acidic medium (low pH) while trypsin (working in small intestine) shows its activity in alkaline medium (high pH). Change in pH can affect the ionization of the amino acids at the active site.



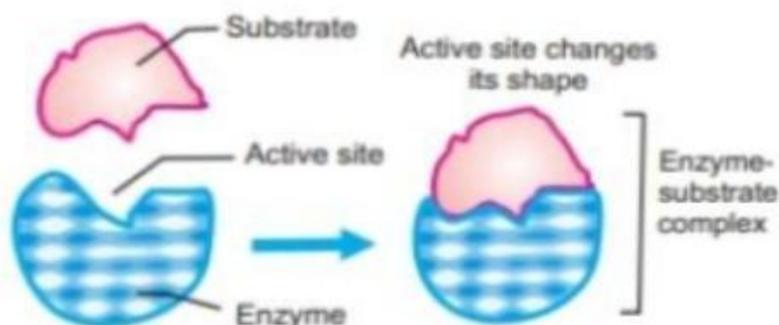
**Q :4 explain lock and key model and induced fit model of enzyme action.**

**Lock and key model of enzyme action:**

In order to explain the mechanism of enzyme action a German chemist Emil Fischer, in 1894, proposed lock and key model. According to this model, both enzyme and substrate possess specific shapes that fit exactly into one another. This model explains enzyme specificity .

**Induced fit model of enzyme action:**

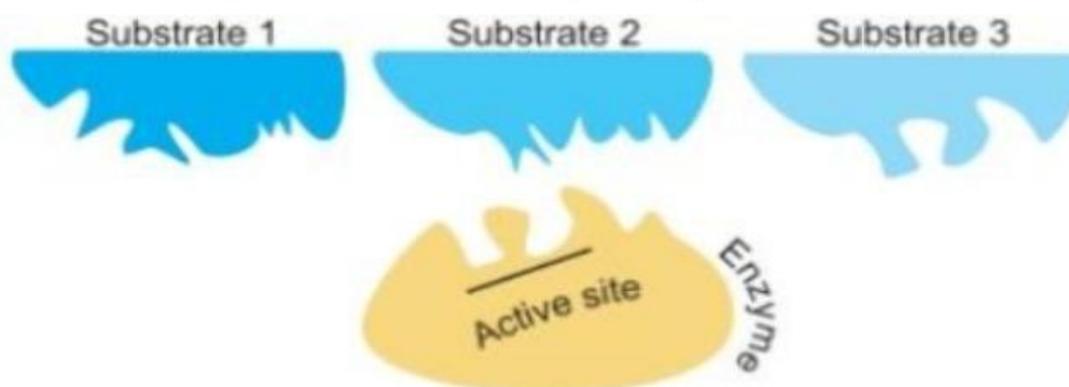
In 1958, an American biologist Daniel Koshland suggested a modification to lock and key model and proposed induced-fit model. According to this model, active site is not a rigid structure rather it is molded into the required shape to perform its function. Induced fit model is more acceptable than "lock and key model of enzyme action.



**Q:5 explain specificity of enzymes.**

There are over 2000 known enzymes, each of which is involved in one specific chemical reaction.

Enzymes are also substrate specific. The enzyme protease (which breaks peptide bonds in proteins) will not work on starch (which is broken down by an enzyme amylase). Similarly lipase enzyme acts only on lipids and digests them into fatty acids and glycerol. Specificity of different enzymes is determined by the shapes of their active sites. Active sites possess specific geometric shapes that fit with specific substrate. the geometric shape of active site of enzyme determines its specificity for substrate.



**Self Assessment for the month of July 2020****Subject: Biology****Student name: \_\_\_\_\_****Class:9<sup>th</sup>****Section: \_\_\_\_\_****Marks:60****Objective paper****(i) In 1911 \_\_\_ observed crossing over in fruit fly.**

- 1 Morgan
- 2 Weisman
- 3 Mendel
- 4 Lamark

**(ii) During apoptosis, cell membrane make a irregular buds**

- 1 Apoptotic bodies
- 2 Blebs
- 3 Tumor
- 4 Pus

**(iii) At which stage of cell cycle stop dividing?**

- 1 G1
- 2 G0
- 3 G2

## 4 S

(iv) Complete set of spindle fibre is known as

- 1 Centrosome
- 2 Mitotic spindle
- 3 Centromere
- 4 Chromatids

(v) Mitosis is divided into \_\_\_\_\_ major phases

- 1 Two
- 2 Three
- 3 Four
- 4 Five

(vi) Chiasmata is formed during

- 1 Prophase
- 2 Metaphase
- 3 Anaphase
- 4 Telophase

(vii) The term metabolism is derived from which language?

- 1 Greek
- 2 Latin
- 3 German
- 4 English

(viii) Enzymes are made of

- 1 Fats
- 2 Minerals
- 3 Proteins
- 4 Vitamins

(ix) Enzyme Lipase act only on

- 1 Protein
- 2 Lipids
- 3 Carbohydrates
- 4 Hormones

(x) When did Emil Fisher introduced lock and key model?

- 1 1894
- 2 1958
- 3 1968
- 4 1985

(xi) The catalytic region of the enzyme is

- 1 Coenzyme
- 2 Inhibitor
- 3 Cofactor
- 4 Active site

(xii) One important coenzyme is

- 1 Amylase
- 2 Sodium
- 3 Glucose
- 4 Folic acid

Subjective paper

Q:2 Give short answers .(Any five). 2×5=10

- 1 What is Phragmoplast?
- 2 Define cell cycle.
- 3 Write four stages of karyokinesis.

- 4 By whom and when was mitosis discovered.
- 5 Define somatic cell.
- 6 How cytokinesis takes in plant cells.
- 7 What is tumor? Give its example.
- 8 Define chiasmata.

**Q:3 Give short answer.(Any five)  $2 \times 5 = 10$**

- 1 Define Anabolism.
- 2 What is enzyme?
- 3 What is substrate?
- 4 What is activation energy?
- 5 Define active site.
- 6 What is cofactor?
- 7 Name some vitamins which are cofactor also?
- 8 How soya sauce is made?

**Q:4 Write short answers ( Any five). $2 \times 5 = 10$**

- 1 What is alternation of generation?
- 2 What is necrosis? Give its two causes.
- 3 Define Metastasis.
- 4 What is synapsis.
- 5 Write two uses of enzyme in biological detergents.
- 6 Differentiate between intracellular and extracellular enzyme.
- 7 Describe metabolic pathway.
- 8 Define prosthetic group.

**Part II**

**Long questions. ( Any Two)  $2 \times 9 = 18$**

Q:5 (a) Define mitosis. Explain prophase in detail. (5)

(b) Write about the significance of meiosis. (4)

Q:6 (a) Write down the characteristics of enzyme. (5)

(b) Explain lock and key model of enzyme (4)

Q:7 (a) what is cell cycle? Describe its phases (5)

(b) Describe the effect of temperature on enzyme action. (4)

## Chapter #4 By: (Abd ur Rasheed SS Chemistry SKKPHSS/ Muzaffargarh)

# Structure of Molecules

Lecture # 1

DATE: 06-07-2020(Monday)

### Q.1 Why atoms combine to form chemical bonds?

It is a universal rule that everything in this world tends to become more stable.

Atoms achieve this stability in the following two ways;

**By attaining electronic configuration of inert gases  $ns^2, np^6$**

Atoms achieve stability by attaining electronic configuration of noble gases (He, Ne or Ar, etc.) i.e.  $ns^2, np^6$ . Having 2 or 8 electrons in the valence shell is sign of stability. Attaining two electrons in the valence shell is called duplet rule while attaining eight electrons in the valence shell is called octet rule. The noble gases do have 2 or 8 electrons in their valence shells. It means all the noble gases have their valence shells completely filled. Their atoms do not have vacant space in their valence shell to accommodate extra electrons. Therefore, noble gases do not gain, lose or share electrons. That is why they are non-reactive. The importance of the noble gas electronic configuration lies in the fact that all other atoms try their best to have the noble gas electronic configuration. For this purpose, atoms combine with one another, which is called chemical bonding. In other words, atoms form chemical bonds to achieve stability by acquiring inert gas electron configuration. An atom can accommodate 8 electrons in its valence shell in three ways:

- i. By giving valence shell electrons (if they are less than three) to other atoms.
- ii. By gaining electrons from other atoms (if the valence shell has five or more electrons in it).
- iii. By sharing valence electrons with other atoms

#### **Lowest energy concept;**

Every atom tries to attain minimum energy. When two atoms come in close contact with each other, two types of forces come into play

1. Attractive forces between electrons of one atom and nucleus of the other.
2. Repulsive forces due to inter-electronic and inter-nuclear repulsions. When there is increase in the attractive force the two atoms combine, otherwise they do not combine. The attractive force results in lower energy

Lecture # 2

DATE: 07-07-2020 (Tuesday)

### Q.2 State the following rules duplet rule, octet rule.

#### **duplet rule**

Attaining two electrons in valence shell is called duplet rule.

#### **octet rule**

Attaining 8 electrons in valence shell is called octet rule.

**Q.3 What is a bond?**

"the attractive force by means of which atoms are held together in a stable arrangement is called a bond"

**Q.4 Define the following terms;**

1. **Valence electrons;**  
The electrons in the outermost shell of an atom are called valence electrons.
2. **Bonding electrons;**  
The valence electrons which take part in a chemical reaction are called bonding electrons.
3. **Non-bonding electrons;**  
The valence electrons which do not in forming covalent bonds are called Non-bonding electrons.
4. **Bond pair;**  
A pair of electrons shared between two atoms is called a bonding pair.
5. **Lone pairs**

Pairs of valence electrons not involved in bonding are called lone pairs

**Q.5 Name the types of chemical bonds;**

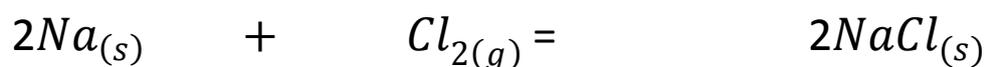
1. Ionic bond
2. Covalent bond
3. Dative covalent bond
4. Metallic bond

**Lecture # 3**

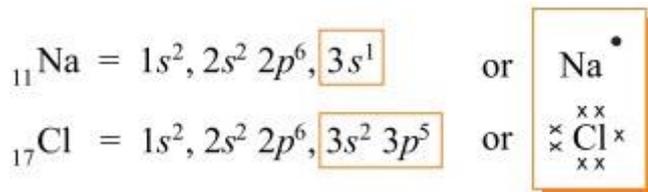
**DATE: 08-07-2020 (Wednesday)**

**Q.6 Discuss an ionic bond?**

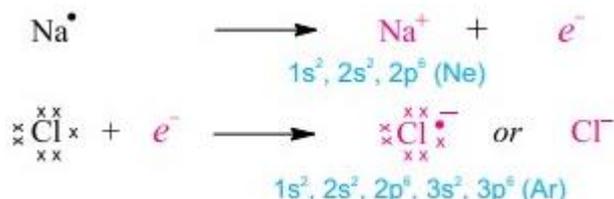
The elements of Group-1 and Group-2 being metals have the tendency to lose their valence electrons forming positively charged ions. Whereas non-metals of Group 15 to Group-17 have the tendency to gain or accept electrons. They are electronegative elements with high electron affinities. If atoms belonging to these two different groups, metals and non-metals, are allowed to react, chemical bond is formed. *This type of chemical bond, which is formed due to complete transfer of electron from one atom to another atom, is called ionic bond.*



Sodium chloride is a simple compound formed by sodium (Z =11) and chlorine (Z=17) atoms. The ground state electronic configuration of these elements is shown below:



The frames indicate electrons in the valence shells of these elements; sodium has only one electron and chlorine has seven electrons. Sodium being electropositive element has the tendency to lose electron and chlorine being an electronegative element has the tendency to gain electron. Therefore, they form positive and negative ions by losing and gaining electrons, respectively. They attain electronic configuration to the nearest noble gases.



By losing one electron from the outermost shell, sodium becomes Na ion and it is left with 8 electrons in the second shell which will now become the valence shell. By gaining one electron, chlorine atom now also has eight electrons in its outermost shell – and becomes Cl ion. Both of these atoms are now changed into oppositely charged ions. They stabilize themselves by combining with each other due to electrostatic force of attraction between them such as:



It is to be noted that only valence shell electrons take part in this type of bonding, while other electrons are not involved. In such type of reaction heat is usually given out. **The compounds formed due to this type of bonding are called ionic compounds.**

#### Lecture # 4

DATE: 09-07-2020 (Thursday)



- i. Why does sodium form a chemical bond with chlorine?
- ii. Why does sodium lose an electron and attains +1 charge?
- iii. How do atoms follow octet rule?
- iv. Which electrons are involved in chemical bonding?
- v. Why does group 1 elements prefer to combine with group 17 elements.
- vi. Why chlorine can accept only 1 electron?
- vi. Why and how elements are arranged in a period?

#### Test yourself 4.1

i. Why does sodium form a chemical bond with chlorine?

Ans: i. Both sodium and chlorine form a chemical bond to require 8 electrons in their outer shells.

Sodium loses 1 electron from its outermost shell and becomes  $\text{Na}^+$  similarly Chlorine loses an electron and becomes  $\text{Cl}^-$ . both are now oppositely charged ions they stabilize themselves and bond with each other due to electrostatic force of attraction between them and a low energy state.



ii. Why does sodium lose an electron and attains +1 charge?

Ans: ii. sodium loss an electron in order to acquire 8 electrons in its outermost shell and becomes  $\text{Na}^+$

### iii. How do atoms follow octet rule?

**Ans:** iii. atoms follow octet rule in the following three ways;

- i. By giving valence electrons to other atoms
- ii. By gaining electrons from other atoms
- iii. By sharing valence electrons with other atoms

### iv. Which electrons are involved in chemical bonding?

**Ans:** iv. The electrons of the valence shell are involved in bonding

### v. Why does group 1 elements prefer to combine with group 17 elements.

**Ans:** v. Group 1 atoms have 1 electron in their valence shells and group 17 atoms have 7 electrons in their valence shells. Group 17 atoms having 7 electrons in their valence shell can gain 1 electron very easily. Hence, group 1 atoms prefer to bond with group 17 atoms

### vi. Why chlorine can accept only 1 electron?

**Ans:** vi. Chlorine has 7 electrons in its valence shell. It can accept only one electron to complete its valence shell.

Lecture # 5

DATE: 10-07-2020 (Friday)

### Q.7 Discuss a covalent bond.

The elements of Group-13 to Group-17 when allowed to react with each other, they form a chemical bond by mutual sharing of their valence shell electrons. This type of bond, which is formed due to mutual sharing of electrons, is called a covalent bond. The energy changes during the covalent bond formation are of considerable value. When two atoms approach each other attractive forces develop between electrons of one atom and nucleus of the other atom. Simultaneously, repulsive forces between electrons of the two atoms as well as between their nuclei are also created. When the attractive forces dominate due to decrease in distance between those two atoms, a chemical bond is formed between them. See following Fig 1.1. The formation of hydrogen, chlorine, nitrogen and oxygen gases are few examples of this type of bonding.

Where

$a$  = attractive forces between nuclei and electrons in bonded H- atoms  
 $r$  = repulsive forces between  $p^+$  &  $p^+$  and between  $e^-$  &  $e^-$  in  $H_2$  molecule.

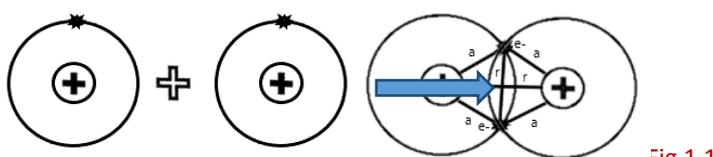


Fig 1.1

$H$  atom +  $H$  atom

$H_2$  molecule.

$a$  = attractive force  $r$  = repulsive force

$4a = 4$  attractive forces dominant than  
 $2r = 2$  repulsive forces

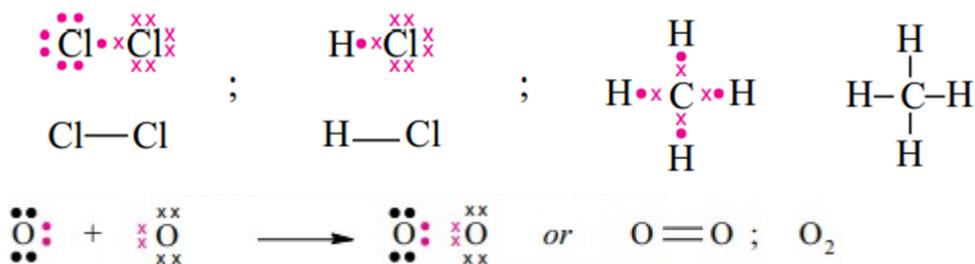
Lecture # 6

DATE: 11-07-2020 (Saturday)

### Q.8 Explain the types of covalent bonds.

Single covalent bond; ( — )

When one electron is contributed by each bonded atom, one bond pair is formed and it forms a single covalent bond. While drawing the structure of such molecules the single bond pair is indicated by a line between those two atoms.



### Double covalent bond; (=)

When each bonded atom contributes two electrons, two bond pairs are shared and a double covalent bond is formed. These bond pairs are indicated as double line between those atoms in the structure of such molecules. The molecules like oxygen (O<sub>2</sub>) gas and ethene (C<sub>2</sub>H<sub>4</sub>) show such type of double covalent bonds.

(double covalent bond)



### Triple covalent bond; (≡)

When each bonded atom contributes three electrons, three bond pairs are involved in bond formation. This type is called **triple covalent bond**. Three small lines are used to indicate these pair of electrons between those atoms in the molecules of such compounds. The examples of molecules having triple covalent bonds are nitrogen (N<sub>2</sub>) and ethyne (C<sub>2</sub>H<sub>2</sub>).



(triple covalent bond)



By this mutual sharing of valence shell electrons, each of the contributing atom attains the 'Octet' or nearest noble gas electronic configuration.



The electronic configuration of the valence shells of atoms is shown in small 'dots' or 'crosses' around the symbol of the element. Each dot or cross represents an electron. This is a standard method of Lewis to describe the electronic configuration of valence shell of an atom. It is called **Lewis Structure Diagram**.

### Q.9 Discuss dative Covalent or Coordinate Covalent Bond.

Coordinate covalent or dative covalent bonding is a type of covalent bonding in which the bond pair of electrons is donated by one bonded atom only. The atom which donates the electron pair is called donor and the atom which accepts the electron pair is called acceptor. A small arrow is usually used to indicate the atom and pair of electron being donated. The head of arrow is towards the acceptor atom. The non-bonded electron pair available on an atom, like the one available on + nitrogen in ammonia, (NH) is called a lone pair. When a proton (H) approaches a 3 molecule with a lone pair of electrons, that lone pair is donated + to H and a coordinate covalent bond is formed, e.g. formation of + ammonium radical (NH).

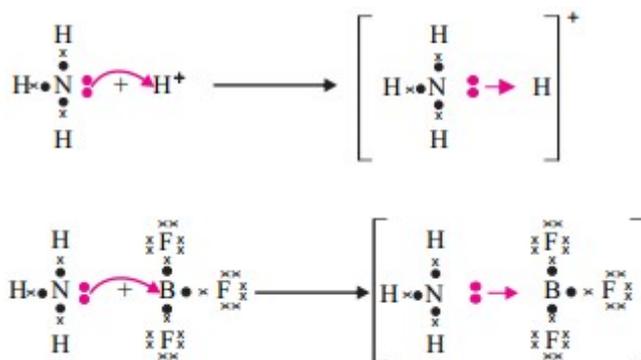


Fig. 4.1 dative covalent bond (red arrow)

In the formation of BF<sub>3</sub> (boron trifluoride) molecule, three valence electrons of boron atom (Z= 5) pair up with three electrons, one from each three fluorine atoms. The boron atom even after this sharing of electrons (covalent bond formation), remains short or deficit of two electrons in its outermost shell. Now if a molecule with a lone pair approaches this molecule, it accepts lone pair from that donor and forms a coordinate covalent bond. The lone pair on nitrogen of ammonia molecule makes it a good donor molecule to form a coordinate covalent bond as shown in figure 4.1.

#### Lecture # 8

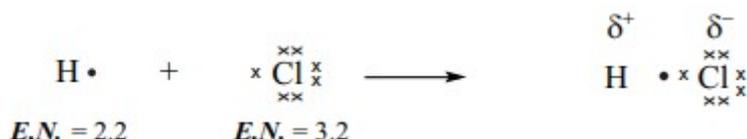
DATE: 14-07-2020 (Tuesday)

### Q.11 Explain the difference between Polar and Non - polar Covalent Bond.

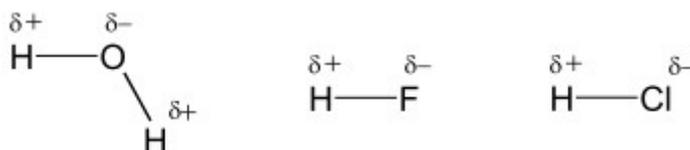
#### Polar and Non - polar Covalent Bond

If a covalent bond is formed between two similar atoms (homo-atoms), the shared pair of electrons is attracted by both the atoms equally. Such type of bond is called non-polar covalent bond. These bonds are formed by equal sharing of electron pair between the two bonding atoms. This type of bond is called a pure covalent bond. For example, bond formation in H<sub>2</sub> and Cl<sub>2</sub>. If the covalent bond is formed between two different types of atoms (heteroatoms) then the bond

pair of electrons will not be attracted equally by the bonded atoms. One of the atoms will attract the bond pair of electrons more strongly than the other one. This atom(element) will be called as more electronegative. When there is difference of electronegativity between two covalently bonded atoms, there will be unequal attraction for the bond pair of electrons between such atoms. It will result in the formation of polar covalent bond. The difference between electronegativities of hydrogen and chlorine is 1.0. As the electronegativity of chlorine is more, it attracts the shared pair of electron towards itself with a greater force. A partial negative charge is therefore created on chlorine and in turn a partial positive charge on hydrogen due to electronegativity difference. It creates polarity in the bond and is called polar covalent bond.



The delta ( $\delta$ ) sign indicates partial positive or partial negative charge that is developed due to unequal sharing of shared pair or bonded pair of electrons. The compounds resulting from polar covalent bonds are called polar compounds. For example: water, hydrogen fluoride and hydrogen chloride.



By using electronegativity values, it is possible to predict whether a chemical bond will be ionic or covalent in nature. A bond formed between elements of high electronegativity (halogen group) and elements of low electronegativity (alkali metals) are ionic in nature. There is complete transfer of electrons between them. The bond between elements of comparable electronegativities will be covalent in nature as the bond between carbon and hydrogen in methane, or nitrogen and hydrogen in ammonia. If the difference of electronegativities between two elements is more than 1.7 the bond between them will be predominantly ionic bond and if it is less than 1.7, the bond between two atoms will be predominantly covalent.



- i. Give the electronic configuration of carbon atom.
- ii. What type of elements have tendency of sharing of electrons?
- iii. If repulsive forces dominate to attractive forces will a covalent bond form?
- iv. Considering the electronic configuration of nitrogen atom, how many electrons are involved in bond formation and what type of covalent bond is formed.
- v. Point out the type of covalent bonds in the following molecules  
 $CH_4$ ,  $C_2H_2$ ,  $H_2$ ,  $N_2$ , and  $O_2$
- vi. What is a lone pair? How many lone pairs of electrons are present on nitrogen in ammonia?
- vii. Why is the  $BF_3$  electron deficient?
- viii. What types of electron pairs make a molecule good donor?
- ix. What is difference between bonded and lone pair of electron and how many bonded pair of electrons are present in  $NH_3$  molecule?
- x. What do you mean by delta sign and why it develops?
- xi. Why does oxygen molecule not form a polar covalent bond?
- xii. Why has water polar covalent bonds?

### Test yourself 4.2;

i. Give the electronic configuration of carbon atom.

Ans: i. Atomic number of carbon; = 6

number of electrons in carbon = 6

electronic configuration =  $1s^2, 2s^2, 2p^6$

ii. What type of elements have tendency of sharing of electrons?

Ans: ii. Non-metals have the tendency of sharing electrons

iii. If repulsive forces dominate to attractive forces will a covalent bond form?

Ans: iii. If repulsive forces dominate to attractive forces; covalent bond will not form.

iv. Considering the electronic configuration of nitrogen atom, how many electrons are involved in bond formation and what type of covalent bond is formed

Ans: iv. Electronic configuration of N atom =  $1s^2, 2s^2, 2p^3$  nitrogen atom has 5 electrons in its valence shell, only 3 electrons are involved in bond formation. A triple covalent bond will be formed between the nitrogen atoms.

v. Point out the type of covalent bonds in the following molecules  $CH_4$ ,  $C_2H_2$ ,  $H_2$ ,  $N_2$ , and  $O_2$

Ans: v.

molecule	Structure of molecule	Type of covalent bond
$CH_4$	$\begin{array}{c} H \\   \\ H-C-H \\   \\ H \end{array}$	Single covalent bonds between c and h atoms.
$C_2H_4$	$\begin{array}{c} H \quad \quad H \\ \diagdown \quad \diagup \\ C = C \\ \diagup \quad \diagdown \\ H \quad \quad H \end{array}$	4 single covalent bonds between c and h atoms and one double covalent bond between C and C atoms.
$H_2$	$H-H$	A single covalent bond between H and H atoms.
$N_2$	$:\text{N} \equiv \text{N}:$	A triple covalent bond between N and N
$O_2$	$:\text{O} = \text{O}:$	A double covalent bond between O and O

vi. What is a lone pair? How many lone pairs of electrons are present on nitrogen in ammonia?

Ans: vi. **Lone pair of electrons**

A pair of valence electrons on an atom which is shared with any other atom is called a lone pair.

There is one lone pair of electrons present on nitrogen in ammonia.  $\cdot\text{NH}_3$

vii. Why is the  $\text{BF}_3$  electron deficient?

Ans: vii. In the formation of boron trifluoride,  $\text{BF}_3$  molecule three electrons of boron ( $Z=5$ ) are shared with three electrons of F atoms, one each from three F atoms. The boron atom after forming three covalent bonds has three electrons in its outermost shell. It is still short or deficient of two electrons (a pair of electrons) in its outermost shell

viii. What types of electron pairs make a molecule good donor?

Ans: viii. A molecule becomes good electron pair donor when it has at least one lone pair of electrons in an atom.

ix. What is difference between bonded and lone pair of electron and how many bonded pair of electrons are present in NH molecule?

Ans: ix. **Lone pair of electrons**

A pair of valence electrons on an atom which is not shared with any other atom is called lone pair of electrons.

### **Bonded pair of electrons**

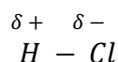
A pair of electrons shared between two atoms is called bonded pair of electrons.

### **Difference:**

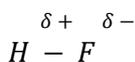
A lone pair of electrons belong to a single whereas a bonded pair of electrons belongs two atoms in a molecule.

x. What do you mean by delta sign and why it develops?

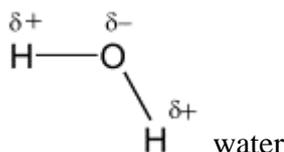
Ans: x. The delta ( $\delta$ ) sign indicates partial negative charge. It developed due to unequal sharing of shared pair or bonded pair of electrons.



hydrogen chloride



hydrogen fluoride

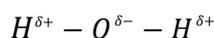


xi. Why does oxygen molecule not form a polar covalent bond?

Ans: xi. There are two similar oxygen atoms in an oxygen molecule. The shared pair of electrons is attracted by both atoms equally hence oxygen molecule is not form a polar covalent bond  $\text{O}=\text{O}$ .

xii. Why has water polar covalent bonds?

Ans: xii. Water has polar covalent bond because there is difference between electronegativity between H and O atoms. There will be unequal attraction for the bond pair of electrons between H and O atoms. It will result in the formation of polar covalent bond.



Lecture # 10

DATE: 16-07-2020 (Thursday)

### **Q.12 What is a metallic bond?**

### **Metallic Bond**

The metallic bond is defined as a bond formed between metal atoms (positively charged ions) due to mobile or free electrons. The different properties shown by metals such as high melting and boiling points, good conduction of heat and electricity, hard and heavy nature, suggest existence of different type of chemical bond between atoms of metals. In case of metals, the hold of nucleus over the outermost electrons is weak because of large sized atoms and greater number of shells in between nucleus and valence electrons. Furthermore, because of low ionization potentials, metals have the tendency to lose their outermost electrons easily. Resultantly, these loose or free electrons of all metal atoms move freely in the spaces between atoms of a metal. None of these electrons is attached to any particular atom. Either they belong to a common pool, or belong to all the atoms of that metal. Nuclei of metal atoms appear submerged in sea of these free mobile electrons. These mobile electrons are responsible for holding the atoms of metals together forming a metallic bond. A simple metallic bond is shown in figure 4.2.

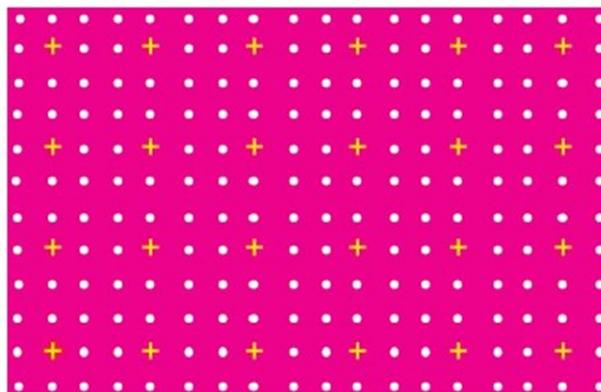
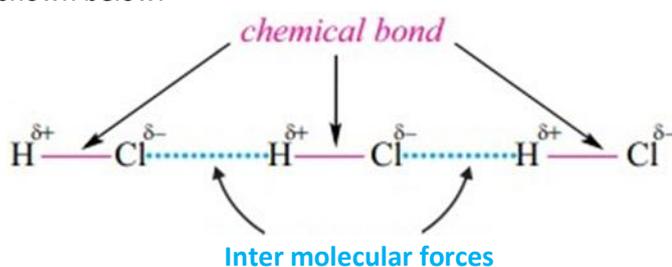


Fig. 4.2 A schematic diagram of Copper wire showing its positive nuclei (+) embedded in sea of free electrons (o) making 'Metallic Bonding'

**Q.13 What are intermolecular forces? Show these forces among HCl molecules.**

#### INTERMOLECULAR FORCES

As discussed earlier, the forces that hold atoms in a compound are chemical bonds. In addition to these strong bonding forces, relatively weak forces also exist in between the molecules, which are called intermolecular forces. The bonding and intermolecular forces of hydrochloric acid are shown below:



It requires about 17 kJ energy to break these intermolecular forces between one mole of liquid hydrogen chloride molecules to convert it into gas. Whereas, about 430 kJ energy's required to break the chemical bond between hydrogen and chlorine atoms in 1 mole of hydrogen chloride.

**Q.14 Describe dipole-dipole interactions with suitable example.**

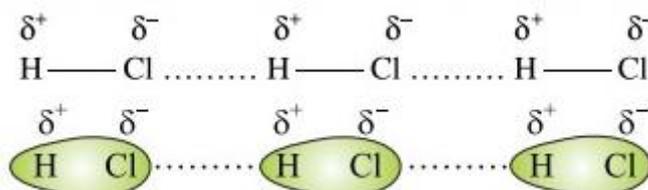
#### Dipole - Dipole Interaction

All intermolecular forces, which are collectively called van der Waals forces, are electrical in nature. They result from the attractions of opposite charges which may be temporary or permanent. The unequal sharing of electrons between two different types of atoms

make one end of molecule slightly positive and other end slightly negatively charged. As shared pair of electron is drawn towards more electro negative atom, it is partially negatively charged, as chlorine in hydrogen chloride. The other end automatically becomes partially positively charged.



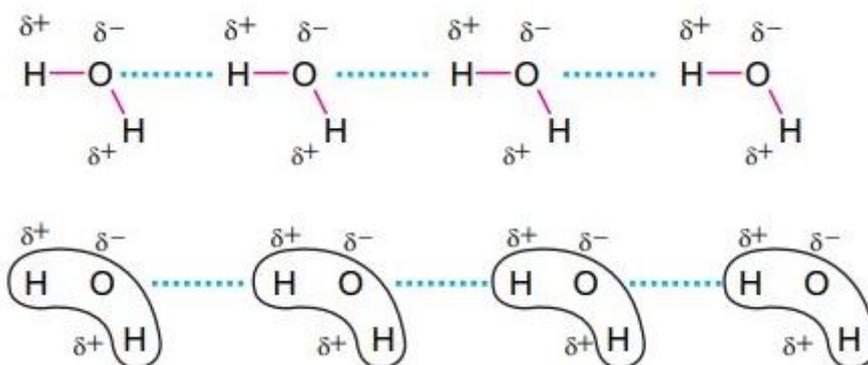
When partial positive and partial negative charges exist at different positions in a molecule, the adjacent molecules will arrange themselves in such a way that negative end of that molecule comes near to positive end of other molecule. It results in a net forces of attraction between oppositely charged ends of two adjacent molecules. These attractive forces are called dipole – dipole interactions as represented in HCl:



**Q.15 What is hydrogen bonding? Also discuss its effects on physical properties of compounds.**

#### Hydrogen Bonding

Hydrogen bonding is a special type of intermolecular forces present in the permanently polar molecules. This bonding can be considered unique dipole-dipole attraction. This force of attraction develops between molecules that have a hydrogen atom bonded to a small, highly electronegative atom with lone pairs of electrons such as nitrogen, oxygen and fluorine. The covalent bond between hydrogen atom and other atom becomes polar enough to create a partial positive charge on hydrogen atom and a partial negative charge on the other atom. The small size and high partial positive charge on the hydrogen atom enables it to attract highly electronegative (N, O or F) atom of the other molecule. So, partially positively charged hydrogen atom of one molecule attracts and forms a bond with the partially negatively charged atom of the other molecule, the bonding is called hydrogen bonding. This force of attraction is represented by a dotted line between the molecules as shown below:



Hydrogen bonding affects the physical properties of the molecules. Due to this boiling points of the compounds are affected greatly. For example, boiling point of water (100 °C) is higher than that of alcohol (78 °C) because of more and stronger hydrogen bonding in water. The important phenomenon of floating of ice over water is because of hydrogen bonding. The density of ice at 0 °C (0.917 gm ) is less than that of liquid water at 0 °C (1.00 gm ). In the liquid state water molecules move randomly. However, when

water freezes, the molecules arrange themselves in an ordered form, that gives them open structure. This process expands the molecules, that results in ice being less dense as compared to water.

## Lecture # 12

DATE: 18-07-2020 (Saturday)



- i. What type of elements form metallic bonds?
- ii. Why is the hold of nucleus over the outermost electrons in metals weak?
- iii. Why the electrons move freely in metals?
- iv. Which types of electrons are responsible for holding the atoms together in metals.
- v. Why a dipole develops in a molecule?
- vi. What do you mean by induced dipole?
- vii. Why are dipole forces of attraction not found in halogen molecules?
- viii. What types of attractive forces exist between HCl molecules?
- ix. Define intermolecular forces; show these forces among HCl molecule.

**Test yourself 4.3;**

i. What type of elements form metallic bonds?

Ans: i. Metals form metallic bonds.

ii. Why is the hold of nucleus over the outermost electrons in metals weak?

Ans: ii. This is because outer or valence electrons move freely in metals they do not belong to any individual atom they move freely from one atom to another. They are not localized. They leave one atom and enter the influence of another atom there is a weak force between the nucleus and the free electrons. Thus the hold of the nucleus to the outermost electrons is weak.

iii. Why the electrons move freely in metals?

Ans: iii. This is because the valence electrons are loosely held by the nucleus of the atom. They do not belong to any individual atoms. These electrons are not localized. There is a weak force of attraction between the nucleus and the mobile electrons. Hence valence electrons move freely in metals.

iv. Which types of electrons are responsible for holding the atoms together in metals.

Ans: iv. The metal atoms are held together by valence electrons which forms an electron sea.

v. Why a dipole develops in a molecule?

Ans: v. A dipole develops in a molecule due to electronegativity difference between the two bonded atoms. For example, the molecule of hydrogen chloride becomes a dipole.

vi. What do you mean by induced dipole?

Ans: vii. A dipole which is produced artificially due to its electron distortion by the other nearby dipole is called induced dipole.

vii. Why are dipole forces of attraction not found in halogen molecules?

Ans: viii. Dipole forces of attraction are not found in halogen molecules because they are nonpolar molecules.

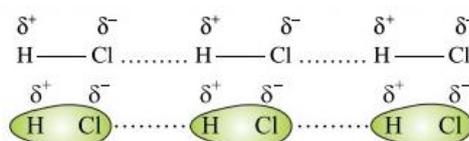
viii. What types of attractive forces exist between HCl molecules?

Ans: viii. Dipole-dipole attractive forces exist between HCl molecules.

ix. Define intermolecular forces; show these forces among HCl molecule.

Ans: xi. **Intermolecular forces;**

The attractive forces that exist between molecules of a substance are called intermolecular forces.



**Q.16 Discuss the effects of nature of bonding on the properties of compounds.**

**NATURE OF BONDING AND PROPERTIES**

Properties of the compounds depend upon the nature of bonding present in them. Let us discuss the effects of nature of bonding on the properties of compounds.

**Nature bonding and properties of Ionic Compounds**

Ionic compounds are made up of positively and negatively charged ions. Thus they consist of ions and not the molecules. These positively and negatively charged ions are held together in a solid or crystal form with strong electrostatic attractive forces. The orderly arrangement of  $\text{Na}^+$  and  $\text{Cl}^-$  ions in a solid crystal of sodium chloride is shown in figure 4.3.

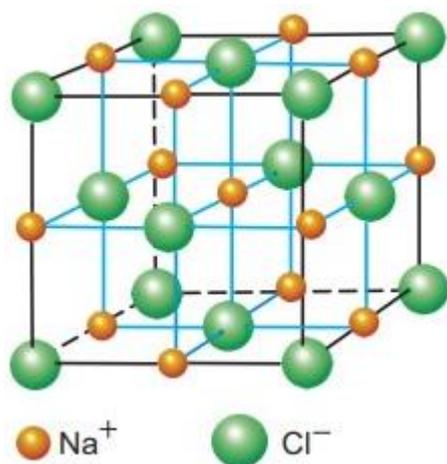


Figure 4.3 Regular arrangement of Na and Cl ions in solid crystal of NaCl

The ionic compounds have following properties: i. Ionic compounds are mostly crystalline solids. ii. Ionic compounds in solid state have negligible electrical conductance but they are good conductors in solution and in the molten form. It is due to presence of free ions in them. iii. Ionic compounds have high melting and boiling points. For example, sodium chloride has melting point  $800\text{ }^\circ\text{C}$  and a boiling point  $1413\text{ }^\circ\text{C}$ . As ionic compounds are made up of positive and negative ions, there exist strong electrostatic forces of attraction between oppositely charged ions. So, a great amount of energy is required to break these forces. iv. They dissolve easily in polar solvents like water. Water has high dielectric constant that weakens the attraction between ions.

**Nature bonding and properties of Covalent Compounds**

The covalent compounds are made up of molecules that are formed by mutual sharing of electrons between their atoms i.e. covalent bonds. A covalent bond is generally regarded as weaker than an ionic bond.

Covalent compounds are made up of two or more non-metals, e.g.  $\text{H}_2$ ,  $\text{CH}_4$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{C}_6\text{H}_{12}\text{O}_6$ . Lower molecular mass covalent compounds are gases or low boiling liquids. Contrary to it, higher molecular mass covalent compounds are solids.

General properties shown by covalent compound are as follows:

- i. They have usually low melting and boiling points.
- ii. They are usually bad conductors of electricity. The compounds having polar character in their bonding are conductor of electricity when they dissolve in polar solvents.

- iii. They are usually insoluble in water but are soluble in non-aqueous solvents like benzene, ether, alcohol and acetone.
- iv. Large molecules with three dimensional bonding form covalent crystals which are very stable and hard. They have very high melting and boiling points.

**Q.16 What are polar and non-polar compounds? Also discuss their properties.**

Polar and Non-Polar Compounds as discussed earlier the polarity in a chemical bond is due to difference in electronegativities of the bonding atoms. On the Pauling Scale, fluorine has been given an electronegativity value of 4.0. The values for other elements are calculated relative to it.

**Polar compounds;**

A compound having polar covalent bonds in its molecules is called polar compounds.

For examples,  $\text{H}_2\text{O}$ ,  $\text{HCl}$ ,  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ ,  $\text{C}_6\text{H}_{12}\text{O}_6$ ,  $\text{H}_2\text{SO}_4$  etc.

**Non-Polar compounds;**

A compound having non-polar covalent bonds in its molecules is called non-polar compounds.

For examples,  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{CCl}_4$ ,  $\text{C}_6\text{H}_6$  etc.

**Properties of polar and non-polar compounds;**

Properties of non-polar and polar covalent compounds differ to some extent.

- i. Non-polar covalent compounds usually do not dissolve in water while polar covalent compounds usually dissolve in water.
- ii. Similarly, non-polar compounds do not conduct electricity but an aqueous solution of a polar compound usually conduct electricity due to the formation of ions as a result of its reaction with water.

**Nature bonding and properties of Coordinate Covalent Compounds;**

Their properties are mostly similar to those of covalent compounds. As the nuclei in these compounds are held by shared pair of electrons, therefore, they do not form ions in water.

- i. Due to their covalent nature they form solutions in organic solvents and are very less soluble in water.
- ii. Usually they are rigid compounds with a dipole

**Nature bonding and properties of Metals**

Metals have common property of conducting heat and electricity. It gives them prime role in many industries. Major properties shown by the metals are as follows:

- i. They show metallic luster.
- ii. They are usually malleable and ductile. Malleability is the property by virtue of which a metal can be rolled into sheets, while ductility is the property by virtue of which a metal can be drawn into wires.
- iii. They have usually high melting and boiling points.
- iv. Being greater in size they have low ionization energies and form cations (M) very easily.

- v. They are good conductors of heat and electricity in solid and liquid state due to mobile electrons.

Lecture # 15

DATE: 22-07-2020 (Wednesday)



- i. Why the ionic compounds have high melting and boiling points?
- ii. What do you mean by malleability?
- iii. Why are ionic compounds easily soluble in water?
- iv. What type of bond exists in sodium chloride?
- v. Why the covalent compounds of bigger size molecules have high melting points?
- vi. (a): What is the electronegativity difference between the following pair of elements (atoms). Predict the nature of the bond between them?  
(a) H and Cl (b) H and Na (c) Na and I (d) K and Cl  
(b): Comparing the electronegativity differences, arrange these compounds in increasing ionic strength.

### Test yourself 4.4

- i. Why the ionic compounds have high melting and boiling points?

**Ans:** i. Ionic compounds have high melting and boiling points. This is due to the strong electrostatic forces between oppositely charged ions in an ionic compound.

- ii. What do you mean by malleability?

**Ans:** ii. **Malleability;** The ability of metal by virtue of which it can be converted by into different shapes without breaking is called malleability.

- iii. Why are ionic compounds easily soluble in water?

**Ans:** iii. i. Like dissolves like. Similar solvents dissolved in similar solutes. Ionic substances are polar and are soluble in polar solvents like water.  
ii. In ionic compound oppositely charged ions are held together by ionic bonds.

- iv. What type of bond exists in sodium chloride?

**Ans:** iv. Ionic bond exists in sodium chloride

- v. Why the covalent compounds of bigger size molecules have high melting points?

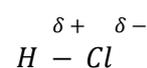
**Ans:** v. This is because these molecules are linked together by a network of covalent bonds extending in all three dimensions. Therefore, covalent crystals are very stable and hard. For example silicon dioxide  $(SiO_2)_n$  and silicon carbide  $(SiC)_n$  where 'n' represent large number for bigger sized molecules.

- vi. (a): What is the electronegativity difference between the following pair of elements (atoms). Predict the nature of the bond between them? (a) H and Cl (b) H and Na (c) Na and I (d) K and Cl

- (b): Comparing the electronegativity differences, arrange these compounds in increasing ionic strength.

**Ans:**(a) H and Cl

Electronegativity difference,  $\Delta EN = 3.2 - 2.2 = 1.0$



hydrogen chlorid

The bond between H and Cl will be polar covalent bond,

**Ans:(b)H and Na;**

Electronegativity difference,  $\Delta E. N = 2.2 - 0.9 = 1.3$

The bond between H and Na will be ionic bond, NaH this is because Na is a metal whereas H is a non-metal

**Ans:(c) Na and I;**

Electronegativity difference,  $\Delta E. N = 2.5 - 0.9 = 1.6$

The bond between I and Na will be ionic bond, NaI this is because Na is a metal whereas I is a non-metal

**Ans:(d) K and Cl;**

Electronegativity difference,  $\Delta E. N = 3.2 - 0.8 = 2.4$

The bond between K and Cl will be ionic bond, KCl

(b) Arrangement of compounds in increasing ionic strength is  $KCl > NaI > NaH > HCl$

### Synthetic Adhesives



Although natural adhesives are less expensive to produce, but most important adhesives used now a days are synthetic. Adhesives based on synthetic resins and rubbers excel in versatility and performance. Synthetic adhesives can be produced in a sufficient supply with uniform properties and they can be modified in many ways. The polymers or resins used in synthetic adhesives fall into two general categories—thermoplastics and thermosetting. One form of polymer used industrially is epoxy adhesive.

### AIR CRAFTS, CARS, TRUCKS AND BOATS ARE PARTIALLY HELD TOGETHER WITH EPOXY ADHESIVES

Epoxy is polymer that is formed from two different chemicals. These are referred to as resin and the hardener. Epoxy adhesives are called structural adhesives. These highperformance adhesives are used in the construction of aircraft, automobiles, bicycles, boats, golf clubs, where high strength bonds are required. Epoxy adhesives can be developed to suit almost any application. They can be made flexible or rigid, transparent or opaque even colored as well as fast or slow setting. Epoxy adhesives are good heat and chemical resistant. Because of these properties, they are given the name of engineering adhesives.

Lecture # 16

DATE: 23-07-2020 (Thursday)

### Multiple Choice Questions

Put a (✓) on the correct answer

1. Atoms react with each other because:

(a) they are attracted to each other (b) they are short of electrons

✓(c) **they want to attain stability**(d) they want to disperse

2. An atom having six electrons in its valence shell will achieve noble gas electronic configuration by:

(a) gaining one electron(b) losing all electrons ✓(c) **gaining two electrons**(d) losing two electrons

3. Considering the electronic configuration of atoms which atom with the given atomic number will be the most stable one? (a) 6 (b) 8 ✓(c) **10** (d) 12

4. Octet rule is:

(a) description of eight electrons (b) picture of electronic configuration

(c) pattern of electronic configuration ✓(d) **attaining of eight electrons**



1. Why do atoms react?

**Ans:** A stable substance is that which has maximum energy and maximum stability

Every atom tries to attain minimum energy and maximum stability. Atoms achieve stability by attaining electronic configuration of inert gases (He; Ne, Ar, etc.) helium has 2 electrons in its valence shell while other inert gases have 8 electrons in their valence shells these elements are chemically inert. Therefore, it was concluded that the inert gas configuration is highly stable and has no tendency to lose or gain electrons they get their stability by losing gaining or sharing electrons as to complete their octets.

2. Why is the bond between an electropositive and an electronegative atom ionic in nature?

**Ans:** An electropositive atom forms a positive by losing an electron these two oppositely charged ions are held together by electrostatic forces of attraction and form ionic bond.

3. Ionic compounds are solids. Justify

**Ans:** In ionic compounds, oppositely charged ions are held together by the strong electrostatic forces their electrons do not have the freedom to movement. They occupy fixed positions. Hence ionic compounds form crystalline solids.

4. More electronegative elements can form bonds between themselves. Justify.

**Ans:** More electronegative elements have equal or nearly equal electron affinities and electronegativities. They have high ionization energies, high nuclear charges and small atomic sizes of atoms. They do not allow the transfer of electron (s) from one atom to another. The combining atoms of electronegative elements favour the formation of covalent bond by sharing electrons, in this way they get stability by releasing energy through the process of sharing electrons.

5. Metals are good conductor of electricity. Why?

**Ans:** The reason is that when an electric field is applied between two ends of a metal, the free mobile electrons in the metal start moving towards positive pole. The new electrons from the negative pole take their place. The negative pole from the field is the battery compels the free electrons of the metal to move and become responsible for carrying current. The flow of electrons occurs from negative to positive pole. Free mobile

Electrons in metals are responsible for the flow of electricity in metals.

6. Ionic compounds conduct electricity in solution or molten form. Why?

**Ans:** Ionic salts conduct electricity in solution or molten form.

Ionic compounds (salts) are good conductors of electricity in aqueous solution and in molten form. In both cases ions become free or mobile. These mobile (free) ions act as charged carriers. The positive ions (cations) are attracted to the cathode and negative ions (anions) are attracted to the anode. At the electrodes, they lose their charge and become neutral by gaining or losing electrons.

7. What type of covalent bond is formed in nitrogen molecule?

**Ans:** A nonpolar triple covalent bond is formed in nitrogen molecule  $\text{N} \equiv \text{N}$

8. Differentiate between lone pair and bond pair of electrons.

**Ans:** A pair of valence electrons on an atom which is not shared with any other atom is called a lone pair of electrons.

A pair of electrons shared between two atoms is called bond pair of electrons.

9. Describe at least two necessary conditions for the formation of a covalent bond.

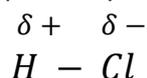
**Ans:** Necessary Conditions for the Formation of a covalent bond.

(i) the electro negativity of elements must be high.

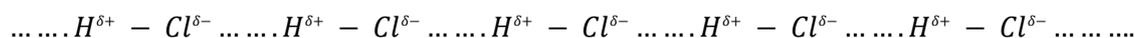
(ii) the ionization energy of elements must be high.

10. Why HCl has dipole-dipole forces of attraction?

**Ans:** Due to unequal sharing of electrons between H and Cl atoms becomes partially negatively charged whereas H-atom becomes partially positively charged.



When partial positive and partial negative charges exist at different positions in a molecule, The adjacent molecules will arrange themselves in such way that negative portion of one molecule comes near to positive portion of other molecules. It results in net forces of attraction between oppositely charged portions of two adjacent molecules. These attractive forces are called dipole-dipole forces of attraction.



Lecture # 17

DATE: 24-07-2020 (Friday)

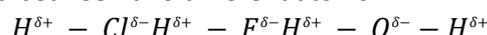
11. What is a triple covalent bond, explain with an example?

**Ans:** a covalent bond formed by sharing of three pairs of electrons between two atoms is called triple covalent bond.

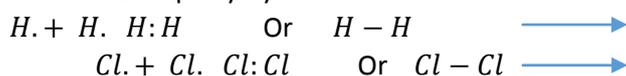
It is represented by three small lines ( $\equiv$ ) drawn between the two atoms.  $N \equiv N$

12. What is difference between polar and non-polar covalent bonds, explain with one example of each?

**Ans: Polar covalent bond;** A covalent bond between two atoms in which the shared pair of electrons is attracted un equally by both the atoms is called a polar covalent bond.  
It is the covalent bond formed between two different atoms.



**Non polar covalent bond;** A covalent bond between two atoms in which the shared pair of electrons is attracted equally by both the atoms is called a nonpolar covalent bond.



13. Why a covalent bond becomes polar?

**Ans:** A covalent bond becomes polar due to unequal electron attracting ability of the two bonded atom.

The atom having higher electronegativity has greater electrons attracting ability than the atom having lower electro negativity. Thus one end (atom)of covalent bond has a partial positive charge while other end (atom) has a partial negative charge. Due to this covalent bond become polar.

14. What is relationship between electronegativity and polarity?

**Ans:** The polarity of the covalent bond depends upon the electronegativity difference between the bonded atoms. Greater the electronegativity difference more polar is the bond.

15. Why the metals can conduct electricity?

**Ans:** The metals can conduct electricity because of the mobile (free) electrons

**Why does ice float on water?**

**Ans:** Ice floats on water. This is because ice has lower density than water. The density of ice at  $0^{\circ}C = 0.917g \text{ cm}^{-3}$  is less than of liquid water at  $0^{\circ}C = 1.00g \text{ cm}^{-3}$ . In the liquid state liquid particles move randomly. However when water freezes the molecules arrange themselves in an ordered form . that gives them an open structure. So ice occupies more volume than the same mass of water as a result of density of ice is less than that of water. hence ice floats on water.

16. Give the characteristic properties of ionic compounds.

**Ans: i.** All ionic compounds are crystalline solids at room temperature.

**ii.** Ionic compounds not conduct electricity in the solid state. This is because ions are not free in the solid state. In both cases ions become free or mobile.

**iii.** Ionic compounds have high melting and boiling points. For example, NaCl has melting 801 degrees Celsius and boiling point 1413 degrees Celsius.

**iv.** Most ionic compounds soluble in polar solvents like H<sub>2</sub>O.

**17. What characteristic properties do the covalent compound have?**

**Ans: i.** Covalent compounds usually have low melting and boiling points.

**ii.** They are usually bad conductors of electricity.

**iii.** They are insoluble in polar solvents like water. they are insoluble in nonpolar solvents like water.

They are soluble in nonpolar solvents like benzene, ether, alcohol and acetone.

**iv.** Covalent compounds having giant molecules with three dimensional covalent bonding are very stable and hard. They have high melting and boiling points.

Lecture # 18

DATE: 25-07-2020 (Saturday)

### Assignments

#### Extensive answer questions.(Solve the following questions from Text Book)

1. What is an ionic bond? Discuss the formation of ionic bond between sodium and chlorine atoms?
2. How can you justify that bond strength in polar covalent compounds is comparable to that of ionic compound?
3. What type of covalent bonds are formed between hydrogen, oxygen and nitrogen? Explain their bonding with dot and cross model.
4. How a covalent bond develops ionic character in it? Explain.
5. Explain the types of covalent bonds with at least one example of each type.
6. How a coordinate covalent bond is formed? Explain with examples?
7. What is metallic bond? Explain the metallic bonding with the help of a diagram.
8. Define hydrogen bonding. Explain that how these forces affect the physical properties of compounds.
9. What are intermolecular forces? Compare these forces with chemical bond forces with reference to HCl molecule?
10. What is a chemical bond and why do atoms form a chemical bond?
11. What is octet rule? Why do atoms always struggle to attain the nearest noble gas electronic configuration?



## Unit 4 –Turning Effect Of Forces

### LECTURE NO.1

01-07- 20

#### PARALLEL FORCES:

Such forces which are parallel to each other are called parallel forces.

In the figure given below  $F_1$ ,  $F_2$ ,  $F_3$ ,  $F_4$ ,  $F_5$  AND  $R$  are all parallel forces.

#### LIKE PARALLEL FORCES:

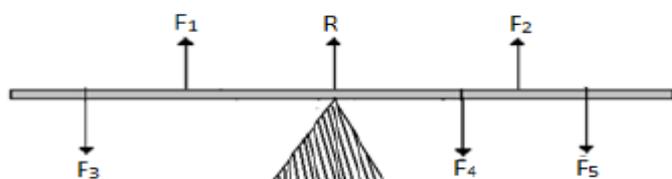
Like parallel forces are the forces that are parallel to each other and have the same direction.

In the figure given below  $F_1$ ,  $F_2$ ,  $R$  are like parallel forces. Similarly,  $F_3$ ,  $F_4$ ,  $F_5$  are also like parallel forces.

#### UNLIKE PARALLEL FORCES:

Unlike parallel forces are the forces that are parallel but have directions opposite to each other.

In the figure given below  $F_1$ ,  $F_2$ , AND  $R$  are in opposite direction to  $F_3$ ,  $F_4$ ,  $F_5$ . Thus they are called unlike parallel forces.



#### ADDITION OF FORCES:

Force is a vector quantity. It has both magnitude and direction; therefore, forces are not added by ordinary arithmetical rules. When forces are added, we get a resultant force.

**A resultant force is a single force that has the same effect as the combined effect of all the forces to be added.**

Forces are added by the Graphical method of vector addition. In this method Forces are added by using Head to tail rule.

**Head to tail rule** is the graphical method of vector addition. According to this method. "Two or more vectors can be added by drawing the vector lines in such a way that the **head** of one vector coincide with the **tail** of the other and so on. The resultant vector is obtained by joining the tail of first vector with head of last vector.

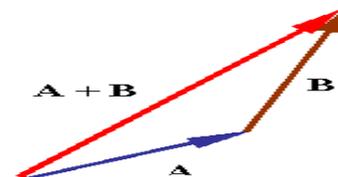
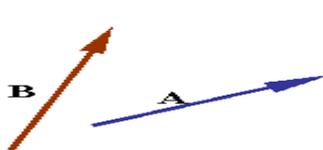
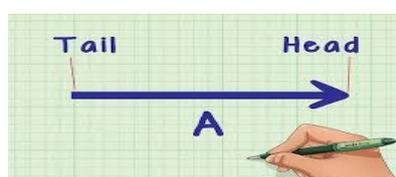


Figure shows a graphical method of vector addition. First select a suitable scale. Then draw the vectors of all the forces according to the scale; such as vectors **A** and **B**. Take any one of the vectors as first vector e.g., vector **A**. Then draw next vector **B** such that its tail coincides with the head of the first vector **A**. Similarly draw the next vector for the third force (if any) with its tail coinciding with the head of the previous vector and so on. Now draw a vector **R** such that its tail is at the tail of vector **A**, the first vector, while its head is at the head of vector **B**, the last vector as shown in figure. Vector  $\mathbf{R}=\mathbf{A}+\mathbf{B}$  represents the resultant vector completely in magnitude and direction.

### EXAMPLE 4.1

Find the resultant of three forces 12N along x-axis, 8 N making an angle of  $45^\circ$  with x-axis and 8 N along y-axis.

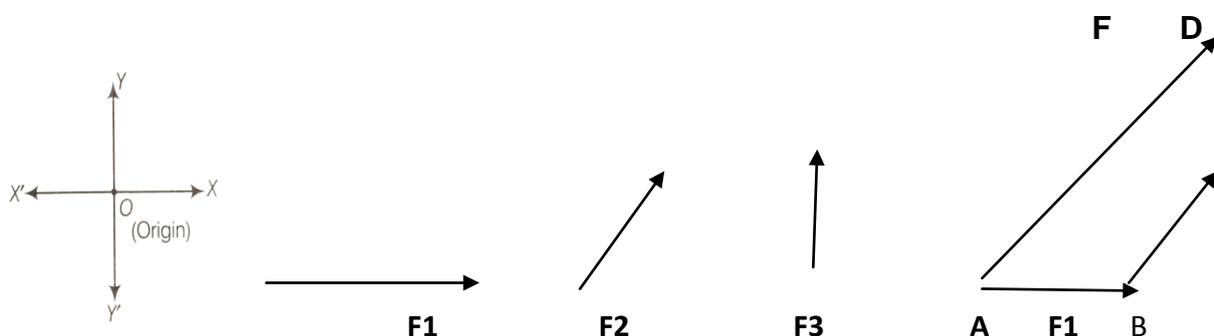
### SOLUTION

Here  $\mathbf{F}_1 = 12 \text{ N}$  along x-axis 1     $\mathbf{F}_2 = 8 \text{ N}$  along  $45^\circ$  with x-axis 2     $\mathbf{F}_3 = 8 \text{ N}$  along y-axis 3

**Scale:** 1 cm = 2 N

- (i) Represent the forces by vectors **F<sub>1</sub>** , **F<sub>2</sub>** and **F<sub>3</sub>** according to the scale in the given direction.
- (ii) Arrange these forces **F<sub>1</sub>** , **F<sub>2</sub>** and **F<sub>3</sub>** . The tail of force **F<sub>2</sub>** coincides with the head of force **F<sub>1</sub>** at point B as shown in figure . similarly the tail of force **F<sub>3</sub>** coincides with the head of force **F<sub>2</sub>** at point C.
- (iii) Join point A the tail of the force **F<sub>1</sub>** and point D the head of force **F<sub>3</sub>** . Let AD represents force **F**.

According to head to tail rule, force **F** represents the resultant force.



- (iv) Measure AD and multiply it by 2 N = 1 cm , the scale to find the magnitude of the resultant force **F**.

- (v) Measure the angle  $\angle DAB$  using a protractor Which the force **F** makes with x-axis. This gives the direction of the resultant force.



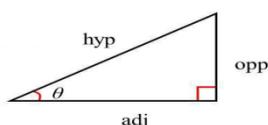
## Unit 4 –Turning Effect Of Forces

### LECTURE NO.2

### 02 -07- 20

#### Some Trigonometric Ratios

The ratios between any of its two sides of a right angled triangle are given certain names such as sine, cosine, tangent etc. Consider a right angled triangle ABC having angle  $\theta$  at A



$\sin \theta = \frac{\text{opp}}{\text{hyp}}$	$\cos \theta = \frac{\text{adj}}{\text{hyp}}$	$\tan \theta = \frac{\text{opp}}{\text{adj}}$
---	---	---

opp  $\rightarrow$  opposite side

hyp  $\rightarrow$  hypotenuse

adj  $\rightarrow$  adjacent side

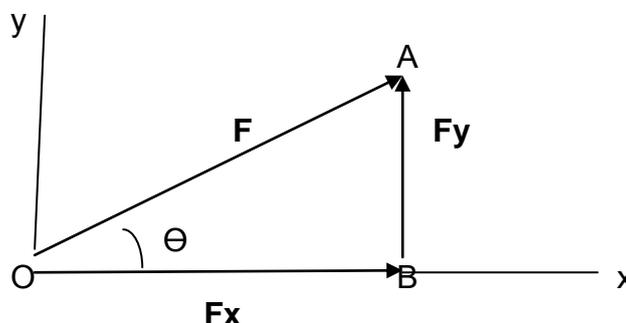
#### RESOLUTION OF FORCES

The process of splitting up vectors (forces) into their component forces is called resolution of forces. If a force

is formed from two mutually perpendicular components then such components are called its **perpendicular components**.

**Splitting up of a force into two mutually perpendicular components is called the resolution of that force.**

Consider a force  $F$  represented by line  $OA$  making an angle  $\theta$  with x-axis as shown in figure .



Draw a perpendicular  $AB$  on x-axis from  $A$ . According to head to tail rule,  $OA$  is the resultant of vectors represented by  $OB$  and  $BA$ .

Thus

$$OA = OB + BA \dots\dots\dots(1)$$

The components **OB** and **BA** are perpendicular to each other. They are called the perpendicular components of **OA** representing force **F**. Hence **OB** represents its x-component **F<sub>x</sub>** and **BA** represents its y-component **F<sub>y</sub>**. Therefore, equation 1 can be written as

$$\mathbf{F = F_x + F_y \dots\dots\dots(2)}$$

The magnitudes *F<sub>x</sub>* and *F<sub>y</sub>* of forces **F<sub>x</sub>** and **F<sub>y</sub>** can be found using the trigonometric ratios. In right angled triangle OBA

$$F_x / F = OB/OA = \cos \Theta$$

$$F_x = F \cos\Theta \dots\dots\dots(3)$$

Similarly

$$F_y / F = BA/OA = \sin\Theta$$

$$F_y = F \sin\Theta \dots\dots\dots(4)$$

Equations .3 and .4 give the perpendicular components *F<sub>x</sub>* and *F<sub>y</sub>* of the force *F* respectively.

**Problem 4.2:**

Find the perpendicular components of a force of 50 N making an angle of 30° with x axis. (43.3 N, 25 N)

**Solution:**

$$F=50\text{N}$$

$$\Theta = 30^\circ$$

$$F_x=?$$

$$F_y=?$$

$$F_x = F \cos\Theta$$

$$F_x = 50 \times \cos 30^\circ$$

$$F_x = 50 \times 0.866\text{N}$$

$$\mathbf{F_x = 43.3\text{N}}$$

$$F_y = F \sin\Theta$$

$$F_y = 50 \times \sin 30^\circ$$

$$= 50 \times 0.5\text{N}$$

$$\mathbf{F_y = 25\text{N}}$$

**Problem 4.5:**

A force is acting on a body making an angle of 30° with the horizontal .The horizontal component of the force is 20 N. Find the force. (23.1 N)

**Solution:**

$$F=?$$

$$\Theta = 30^\circ$$

$$F_x = 20\text{N}$$

$$F_x = F \cos\Theta$$

$$20 = F \times \cos 30^\circ$$

$$20 = F \times 0.866 \quad , \quad 20/0.866 = F, \quad \mathbf{F = 23.1\text{N}}$$



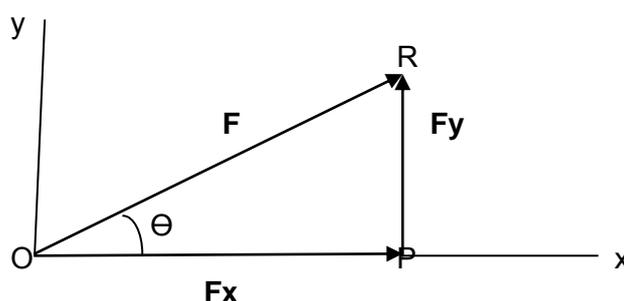
## Unit 4 –Turning Effect Of Forces

### LECTURE NO.3

03 -07- 20

#### DETERMINATION OF A FORCE FROM ITS PERPENDICULAR COMPONENTS:

Since a force can be resolved into two perpendicular components. Its reverse is to determine the force knowing its perpendicular components.



Consider  $F_x$  and  $F_y$  as the perpendicular components of a force  $F$ . These perpendicular components  $F_x$  and  $F_y$  are represented by lines  $OP$  and  $PR$  respectively as shown in above figure .

According to head to tail rule:

$$OR = OP + PR$$

Thus  $OR$  will completely represent the force  $F$  whose x and y-components are  $F_x$  and  $F_y$  respectively.

That is

$$F = F_x + F_y$$

The magnitude of the force  $F$  can be determined using the right angled triangle OPR

$$(OR)^2 = (OP)^2 + (PR)^2$$

$$F^2 = F_x^2 + F_y^2$$

$$F = \sqrt{F_x^2 + F_y^2}$$

The direction of force  $F$  with x-axis is given by

$$\tan \theta = PR/OP = F_y/F_x$$

$$\theta = \tan^{-1}(F_y/F_x)$$

**Problem 4.3 :** Find the magnitude and direction of a force, if its x-component is 12 N and y- component is 5 N.

**Solution:**

$$F = ? \quad , \quad \theta = ?$$

$$F_x = 12N \quad , \quad F_y = 5N$$

$$F^2 = F_x^2 + F_y^2 \quad , \quad F^2 = (12)^2 + (5)^2$$

$$F^2 = 144 + 25 \quad , \quad F^2 = 169$$

Taking square root on both sides

$$F = 13 \text{ N}$$

The direction of force  $F$  with x-axis is given by  $\theta = \tan^{-1}(F_y/F_x)$  ,

$$\theta = \tan^{-1}(5/12) \quad , \quad \theta = 22.6^\circ \text{ Ans}$$



## Unit 4 –Turning Effect Of Forces

### LECTURE NO.4

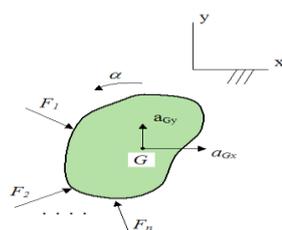
04-07- 20

#### RIGID BODY:

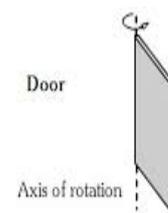
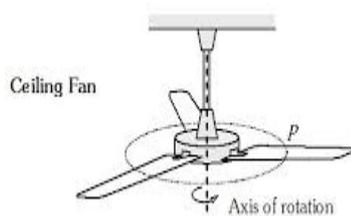
A body is composed of large number of small particles. If the distances between all pairs of particles of the body do not change by applying a force then it is called a rigid body. In other words, a rigid body is the one that is not deformed by force or forces acting on it.

#### AXIS OF ROTATION:

Consider a rigid body rotating about a line. The particles of the body move in circles with their centres all lying on this line. This line is called the axis of rotation of the body.



RIGID BODY



AXIS OF ROTATION

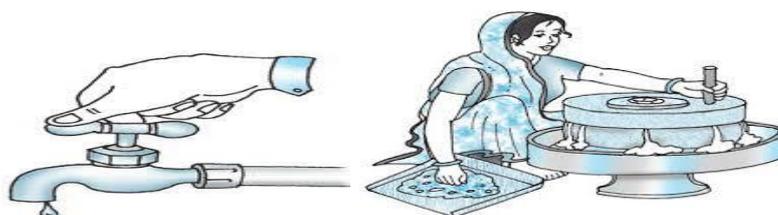
#### TORQUE:

The turning effect of a force is called torque or moment of the force.

Forces that produce turning effect are very common. Turning pencil in a sharpener, turning stopcock of a water tap, turning doorknob and so on are some of the examples where a force produces turning effect



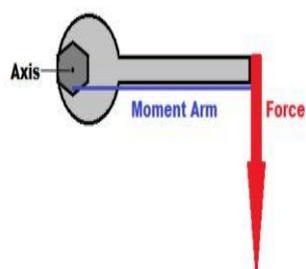
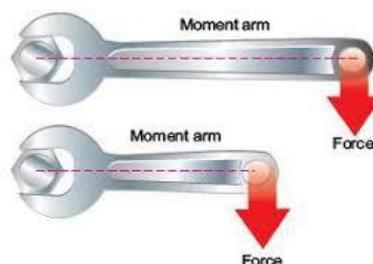
TORQUE EXAMPLES



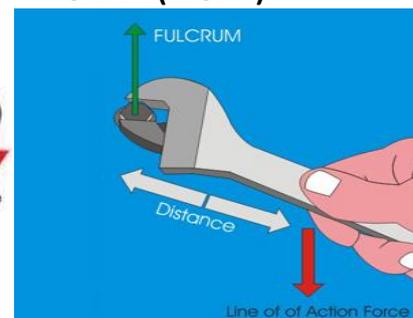
#### Explanation:

Let us study the factors on which torque or moment of a force depends. You might have seen that a mechanic uses a spanner as shown in figure to loosen or tighten a nut or a bolt. A spanner having long arm helps him to do it with greater ease than the one with short arm Figure. It is easy to tighten a nut using a spanner of longer arm than a spanner of shorter arm. It is because the turning effect of the force is different in the two cases. The moment or torque produced by a force using a spanner of longer arm is greater than the torque produced by the same force but using a spanner of shorter arm.

## PHYSICS

CLASS :9<sup>TH</sup>

## UNIT-4(LECT-4)

**LINE OF ACTION OF A FORCE**

The line along which a force acts is called the line of action of the force

**MOMENT ARM:**

The perpendicular distance between the axis of rotation and the line of action of the force is called the moment arm of the force. The torque or moment of a force depends upon the force  $F$  and the moment arm  $L$  of the force. Greater is a force, greater is the moment of the force. Similarly, longer is the moment arm greater is the moment of the force. Thus the moment of the force or torque is determined by the product of force  $F$  and its moment arm  $L$ . Mathematically,

$$\text{Torque} = \text{Force} \times \text{Length of moment arm}$$

$$\tau = F \times L$$

Torque is a vector quantity .SI unit of torque is newton-metre (Nm). A torque of 1 N m is caused by a force of 1 N acting perpendicular to the moment arm 1 m long.

**Problem 4.4:**

A force of 100 N is applied perpendicularly on a spanner at a distance of 10 cm from a nut. Find the torque produced by the force. (10 Nm).

**Solution:**

$$F = 100\text{N} ,$$

$$L = 10\text{cm} = 0.1\text{m}$$

$$\tau = ?$$

$$\tau = F \times L$$

$$= 100 \times 0.1\text{Nm}$$

$$\tau = 10\text{ Nm}$$

**Ans.**



## Unit 4 –Turning Effect Of Forces

### LECTURE NO.5

06-07- 2020

#### PRINCIPAL OF MOMENTS:

A body is balanced if the sum of clockwise moments acting on the body is equal to the sum of anticlockwise moments acting on it.

A force that turns a spanner in the clockwise direction is generally used to tighten a nut as shown in figure .The torque or moment of the force so produced is called clockwise moment.

On the other hand, to loosen a nut, the force is applied such that it turns the nut in the anticlockwise direction as shown in figure . The torque or moment of the force so produced is called anticlockwise moment. A body initially at rest does not rotate if sum of all the clockwise moments acting on it is balanced by the sum of all the anticlockwise moments acting on it. This is known as the principle of moments.

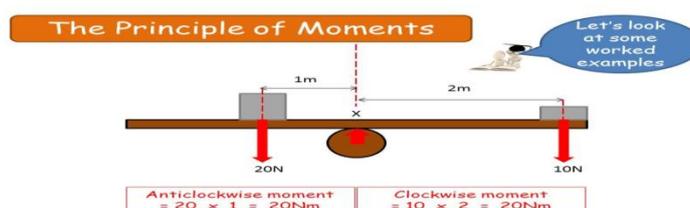
#### Experiment -Testing the principle of moments



- What did you notice about the anticlockwise moment and the clockwise moment?

- When forces act in a different direction, yet still balance, the total turning effect in each direction will be the same:

$$\text{sum of clockwise moments} = \text{sum of anticlockwise moments}$$



#### Mini Exercise

A force of 150 N can loosen a nut when applied at the end of a spanner 10 cm long.

$$F = 100 \text{ N}$$

$$L = 10\text{cm} = 0.1\text{m}$$

$$\tau = F \times L$$

$$= 150 \times 0.1\text{Nm}$$

$$\tau = 15 \text{ Nm}$$

- What should be the length of the spanner to loosen the same nut with a 60 N force?

$$\tau = F \times L$$

$$15 = 60 \times L$$

$$L = 15/60$$

$$L = 0.25 \text{ m}$$

$$L = 25 \text{ cm}$$

- How much force would be sufficient to loosen it with a 6 cm long spanner?

$$\tau = F \times L$$

$$15 = F \times 0.06$$

$$F = 15/0.06$$

$$F = 150 \text{ N}$$



## Unit 4 –Turning Effect Of Forces

### LECTURE NO.6

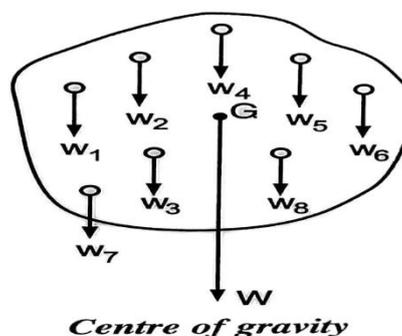
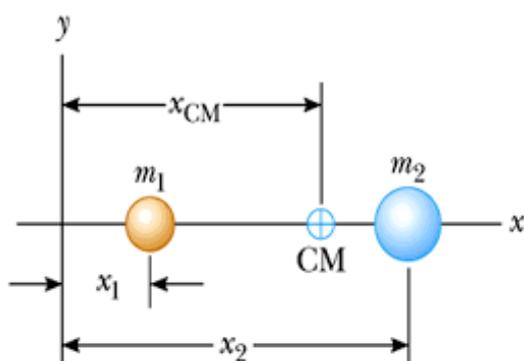
07-07- 2020

#### CENTRE OF MASS:

Centre of mass of a system is such a point where an applied force causes the system to move without rotation.

It is observed that the centre of mass of a system moves as if its entire mass is confined at that point.

A force applied at such a point in the body does not produce any torque in it i.e. the body moves in the direction of net force without rotation.



#### CENTRE OF GRAVITY:

A point where the whole weight of the body appears to act vertically downward is called centre of gravity of a body.

A body is made up of a large number of particles as illustrated in figure . Earth attracts each of these particles vertically downward towards its centre. The pull of the Earth acting on a particle is equal to its weight. These forces acting on the particles of a body are almost parallel. The resultant of all these parallel forces is a single force equal to the weight of the body. A point where this resultant force acts vertically towards the centre of the Earth is called the centre of gravity G of the body

**4.9 A nut has been tightened by a force of 200 N using 10 cm long spanner. What length of a spanner is required to loosen the same nut with 150 N force? (13.3 cm)**

**Solution:**

$$F_1 = 200\text{N}, \quad L_1 = 10\text{cm} = 0.1\text{m}$$

$$\tau = ?$$

$$\tau = F_1 \times L_1$$

$$= 200 \times 0.1 \text{Nm} = 20 \text{Nm}$$

$$F_2 = 150\text{N} \quad L_2 = ?$$

$$\tau = F_2 \times L_2$$

$$20 = 150 \times L_2$$

$$L_2 = 20/150 = 0.133 \text{m}$$

$$L_2 = 0.133 \times 100\text{cm}$$

$$L_2 = 13.3\text{cm}$$

Ans



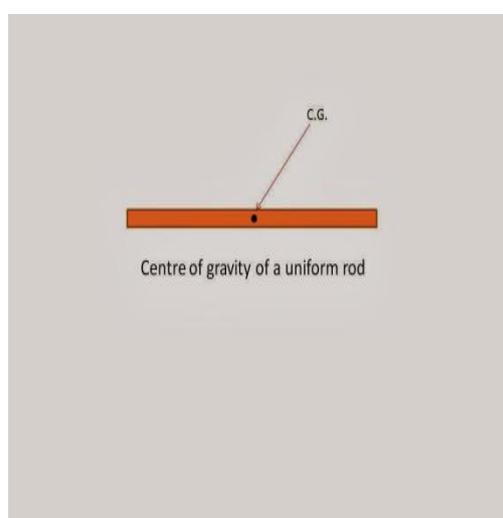
# Unit 4 –Turning Effect Of Forces

## LECTURE NO.7

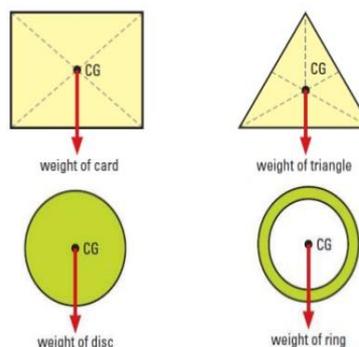
08-07- 2020

### CENTRE OF GRAVITY OF SOME SYMMETRICAL OBJECTS:

The centre of gravity of objects which have symmetrical shapes can be found from their geometry. For example, the centre of gravity of a uniform rod lies at a point where it is balanced. This balance point is its middle point C. G as shown in figure



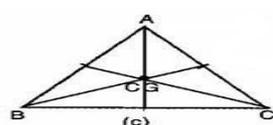
### EXAMPLES OF CENTER OF GRAVITY FOR REGULAR-SHAPED OBJECTS



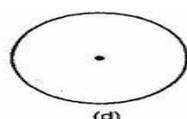
The

centre of a gravity of a **uniform square or a rectangular sheet** is the point of intersection of its diagonals as shown in figure .The centre of gravity of a **uniform circular disc** is its centre as shown in figure .

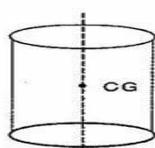
Similarly, the centre of gravity of a **solid sphere or hollow sphere** is the centre of the spheres as shown in figure . The centre of gravity of a **uniform triangular sheet** is the point of intersection of its medians as shown in figure . The centre of gravity of a **uniform circular ring** is the centre of the ring as shown in figure . The centre of gravity of a **uniform solid or hollow cylinder** is the middle point on its axis as shown in figure .



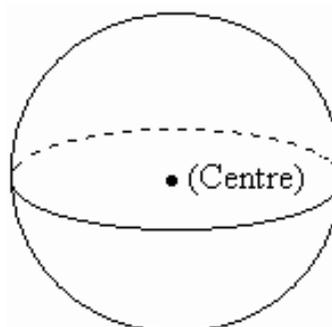
CG lies at the point of intersection of medians.



(Thin disc)  
CG lies at the centre of the circular disc.



(e)  
A Cylinder  
Mid point of the axis of the cylinder.



**Sphere**



## Unit 4 –Turning Effect Of Forces

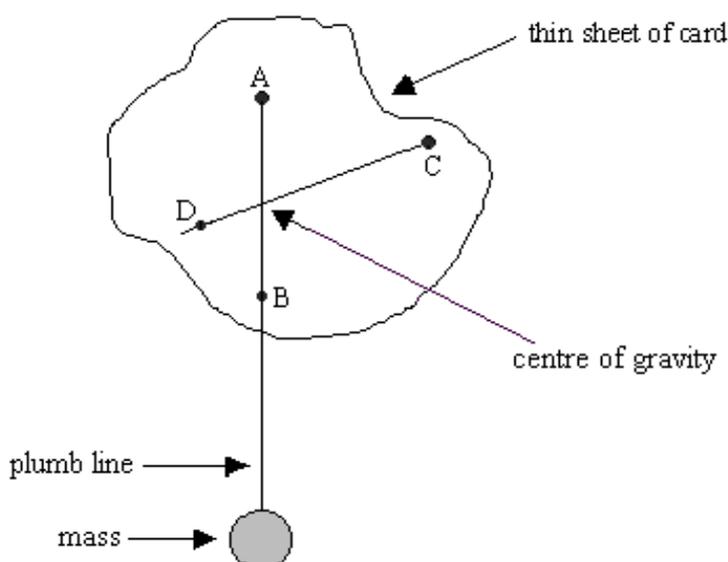
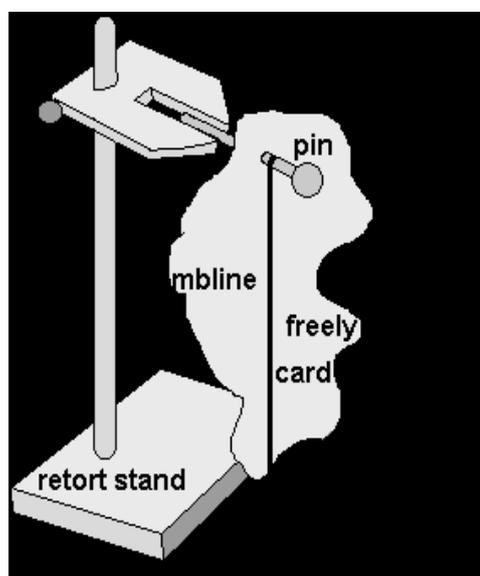
### LECTURE NO.8

09-07- 2020

#### CENTRE OF GRAVITY OF AN IRREGULAR SHAPED THIN LAMINA

A simple method to find the centre of gravity of a body is by the use of a plumb line.

A **plumb line** consists of a small metal bob (lead or brass) supported by a string. When the bob is suspended freely by the string, it rests along the vertical direction due to its weight acting vertically downward as shown in figure. In this state, centre of gravity of the bob is exactly below its point of suspension.



#### EXPERIMENT

Take an irregular piece of cardboard. Make holes A, B and C as shown in figure near its edge. Fix a nail on a wall or in a retort stand. Support the cardboard on the nail through one of the holes (let it be A), so that the cardboard can swing freely about A. The cardboard will come to rest with its centre of gravity just vertically below the nail. Vertical line from A can be located using a plumb line hung from the nail. Mark the line on the cardboard behind the plumb line. Repeat it by supporting the cardboard from hole B. The line from B will intersect at a point G. Similarly, draw another line from the hole C. Note that this line also passes through G. It will be found that all the vertical lines from holes A B and C have a common point G. This Common point G is the **centre of gravity** of the cardboard.



## Unit 4 –Turning Effect Of Forces

### LECTURE NO.9

10-07- 2020

#### COUPLE:

A couple is formed by two unlike parallel forces of the same magnitude but not along the same line.

When a driver turns a vehicle, he applies forces that produce a torque. This torque turns the steering wheel. These forces act on opposite sides of the steering wheel as shown in figure and are equal in magnitude but opposite in direction. These two forces form a couple. A double arm spanner is used to open a nut.

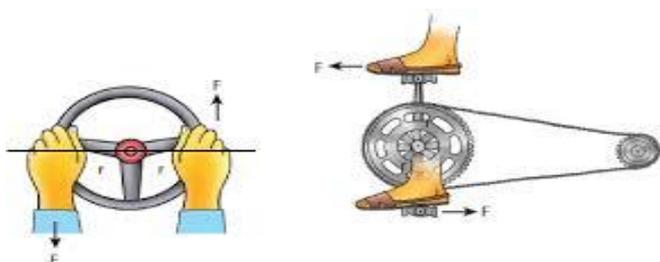
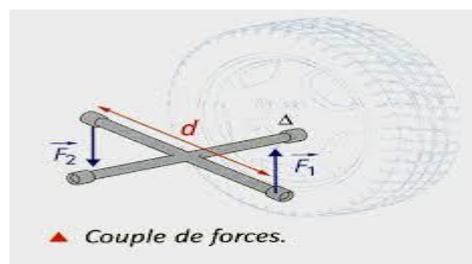


Figure 5.14. Turning effect of Couple



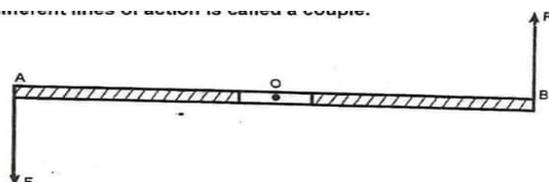
Equal forces each of magnitude  $F$  are applied on ends A and B of a spanner in opposite direction as shown in figure . These forces form a couple that turns the spanner about point O. The torques produced by both the forces of a couple have the same direction. Thus, the total torque produced by the couple will be

$$\begin{aligned} \text{Total torque of the couple} &= F \times OA + F \times OB \\ &= F(OA + OB) \end{aligned}$$

$$\text{Torque of the couple} = F \times (AB)$$

Above Eqn. gives the torque produced by a couple of forces  $F$  and  $F$  separated by distance  $AB$ .

When the lines of action is called a couple.



The torque of a couple is given by the product of one of the two forces and the perpendicular distance between them.

**4.6 The steering of a car has a radius 16 cm. Find the torque produced by a couple of 50 N.**

**Solution:**

$$F = 50 \text{ N}, \quad L = R = 16 \text{ cm} = 0.16 \text{ m}$$

$$\text{Torque produced by couple} = ?$$

$$\text{Torque produced by couple} = 2 F \times L$$

$$\text{Torque produced by couple} = 2 \times 50 \times 0.16$$

$$\text{Torque produced by couple} = 16 \text{ Nm. Ans}$$



## Unit 4 –Turning Effect Of Forces

### LECTURE NO.10

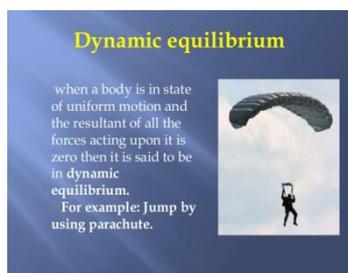
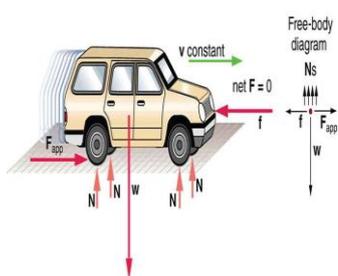
11-07- 2020

**EQUILIBRIUM:** A body is said to be in equilibrium if no net force acts on it.

Newton's first law of motion tells us that a body continues its state of rest or of uniform motion in a straight line if no resultant or net force acts on it. For example, a book lying on a table or a picture hanging on a wall, are at rest. The weight of the book acting downward is balanced by the upward reaction of the table. A book lying on the table and a picture hanging on wall are at rest, so they are said to be in equilibrium. Such equilibrium is called **Static equilibrium**.

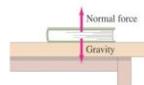
A car moving with uniform velocity on a levelled road and an aeroplane flying in the air with uniform velocity are the examples of bodies in equilibrium. Such equilibrium is called **Dynamic equilibrium**.

**A body in equilibrium thus remains at rest or moves with uniform velocity.**



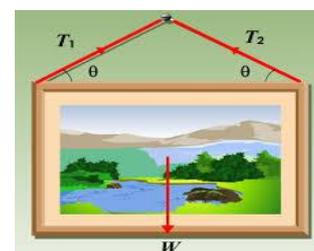
#### The Conditions for Equilibrium

An object with forces acting on it, but with zero net force, is said to be in equilibrium.



The first condition for equilibrium:

$$\Sigma F_x = 0, \quad \Sigma F_y = 0, \quad \Sigma F_z = 0.$$



### CONDITIONS FOR EQUILIBRIUM

A body at rest or in uniform motion is in equilibrium if the resultant force acting on it is zero. For a body in equilibrium, it must satisfy certain conditions. There are two conditions for a body to be in equilibrium.

#### FIRST CONDITION FOR EQUILIBRIUM

**A body is said to satisfy first condition for equilibrium if the resultant of all the forces acting on it is zero.**

Let n number of forces  $F_1, F_2, F_3, \dots, F_n$  are acting on a body such that

$$F_1 + F_2 + F_3 + \dots + F_n = 0$$

$$\text{or } \Sigma F = 0$$

The symbol  $\Sigma$  is a Greek letter called sigma used for summation. Above Equation is called the first condition for equilibrium. The first condition for equilibrium can also be stated in terms of x and y-components of the forces acting on the body as:

$$F_{1x} + F_{2x} + F_{3x} + \dots + F_{nx} = 0$$

$$\text{or } \Sigma F_x = 0$$

Similarly ,

$$F_{1y} + F_{2y} + F_{3y} + \dots + F_{ny} = 0$$

$$\text{or } \sum F_y = 0$$

A book lying on a table or a picture hanging on a wall, are at rest and thus satisfy first condition for equilibrium. A paratrooper coming down with terminal velocity (constant velocity) also satisfies first condition for equilibrium and is thus in equilibrium.

**Problem:4.7: A picture frame is hanging by two vertical strings. The tensions in the strings are 3.8 N and 4.4 N.**

**Find the weight of the picture frame. (8.2 N)**

**Solution:**

$$T_1 = 3.8 \text{ N} ,$$

$$T_2 = 4.4 \text{ N}$$

$$w = ?$$

According to first condition of equilibrium

$$\sum F = 0$$

$$T_1 + T_2 - w = 0$$

$$3.8 + 4.4 - w = 0$$

$$8.2 = w$$

$$w = 8.2 \text{ N} \quad \text{Ans.}$$

**Problem 4.8:**

**Two blocks of masses 5 kg and 3 kg are suspended by the two strings as shown. Find the tension in each string. (80 N, 30 N)**

**Solution:**

$$m_1 = 5 \text{ kg}$$

$$m_2 = 3 \text{ kg}$$

$$T_1 = ?$$

$$T_2 = ?$$

$$g = 10 \text{ ms}^{-2}$$

$$w_1 = m_1 g$$

$$w_1 = 5 \times 10 ,$$

$$w_1 = 50 \text{ N}$$

$$w_2 = m_2 g$$

$$w_2 = 3 \times 10 , \quad w_2 = 30 \text{ N}$$

According to first condition of equilibrium

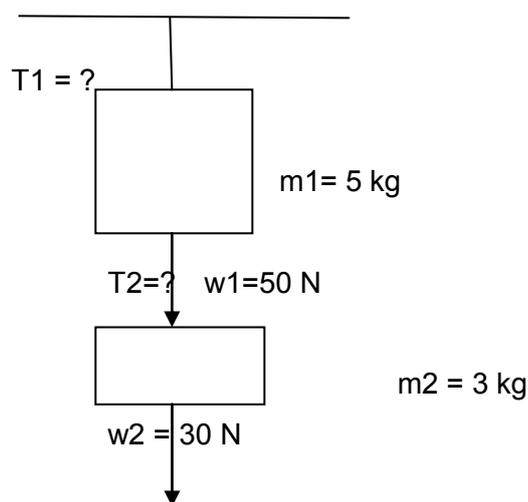
$$\sum F = 0$$

$$T_1 = w_1 + w_2$$

$$T_1 = 50 + 30 , \quad T_1 = 80 \text{ N}$$

similarly

$$T_2 = w_2 , \quad T_2 = 30 \text{ N}$$





## Unit 4 –Turning Effect Of Forces

### LECTURE NO.11

13-07- 2020

#### SECOND CONDITION FOR EQUILIBRIUM:

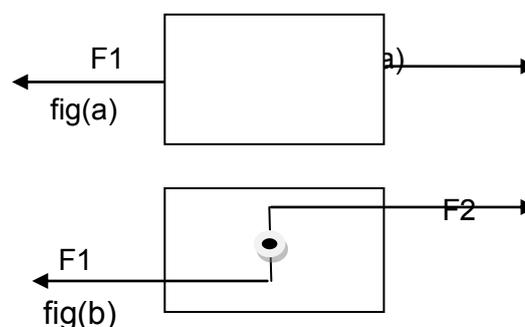
According to second condition of equilibrium , a body satisfies second condition for equilibrium when the resultant torque acting on it is zero.

First condition for equilibrium does not ensure that a body is in equilibrium. This is clear from the following example. Consider a body pulled by the forces  $F_1$  and  $F_2$  as shown in figure( a) The two forces are equal but opposite to each other. Both are acting along the same line, hence their resultant will be zero.

According to the first condition, the body will be in equilibrium. Now shift the location of the forces as shown in figure (b). In this situation, the body is not in equilibrium although the first condition for equilibrium is still satisfied. It is because the body has the tendency to

rotate. This situation demands another condition for equilibrium in addition to the first condition for equilibrium. This is called **second condition for equilibrium**.

According to this, a body satisfies second condition for equilibrium when the resultant torque acting on it is zero. **Mathematically**  $\sum \tau = 0$



**Problem: 4.10** A block of mass 10 kg is suspended at a distance of 20 cm from the centre of a uniform bar 1 m long. What force is required to balance it at its centre of gravity by applying the force at the other end of the bar? (40 N

**Solution:** mass suspended at point C of the bar of the bar  $m = 10 \text{ kg}$

weight of the mass suspended  $w = mg = 100\text{N}$

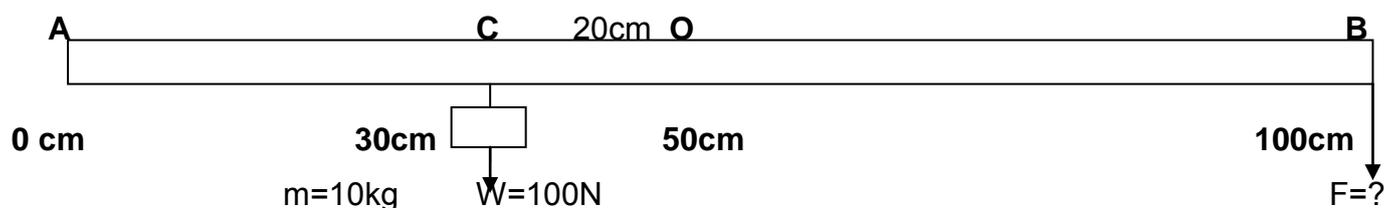
moment arm of the weight  $OC = 20 \text{ cm}$

length of the bar  $AB = 1\text{m} = 100\text{cm}$

distance of the mass from the centre O of the bar  $OC = 20 \text{ cm}$

force exerted at the other end B to balance the rod=  $F = ?$

moment arm of force applied at the end B of the bar  $OB = 50 \text{ cm}$



According to second condition of equilibrium:  $\sum \tau = 0$

Clock wise torque produced by the force  $F =$  Anti clock wise torque produced by the force of weight  $w$

$$F \times OB = w \times OC$$

$$F \times 50 = 100 \times 20$$

$$F = 2000/50, \quad F = 40 \text{ N} \quad \text{Ans.}$$



# Unit 4 –Turning Effect Of Forces

## LECTURE NO.12

14-07- 2020

### STATES OF EQUILIBRIUM:

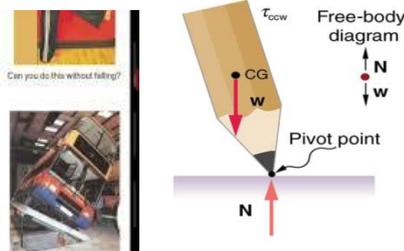
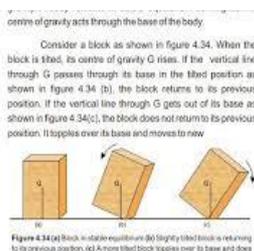
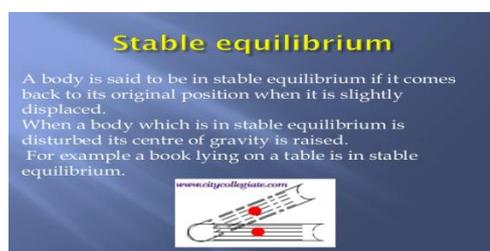
There are three states of equilibrium; stable equilibrium, unstable equilibrium and neutral equilibrium.

A body may be in one of these three states of equilibrium.

### STABLE EQUILIBRIUM :

Consider a book lying on the table. Tilt the book slightly about its one edge by lifting it from the opposite side as shown in figure . It returns to its previous position when sets free. Such a state of the body is called **stable equilibrium**. Thus **A body is said to be in stable equilibrium if after a slight tilt it returns to its previous position.**

When a body is in stable equilibrium, its centre of gravity is at the lowest position. When it is tilted, its centre of gravity rises. It returns to its stable state by lowering its centre of gravity. A body remains in stable equilibrium as long as the centre of gravity acts through the base of the body. Consider a block as shown in figure . When the block is tilted, its centre of gravity  $G$  rises. If the vertical line through  $G$  passes through its base in the tilted position as shown in figure (b), the block returns to its previous position. If the vertical line through  $G$  gets out of its base as shown in figure (c), the block does not return to its previous position. It topples over its base and moves to new stable equilibrium position. That is why a vehicle is made heavy at its bottom to keep its centre of gravity as low as possible. A lower centre of gravity keeps it stable. Moreover, the base of a vehicle is made wide so that the vertical line passing through its centre of gravity should not get out of its base during a turn.



### UNSTABLE EQUILIBRIUM:

**If a body does not return to its previous position when sets free after a slightest tilt is said to be in unstable equilibrium.**

Take a pencil and try to keep it in the vertical position on its tip as shown in figure . Whenever you leave it, the pencil topples over about its tip and falls down. This is called the **unstable equilibrium**. The centre of gravity of the body is at its highest position in the state of unstable equilibrium. As the body topples over about its base (tip), its centre of gravity moves towards its lower position and does not return to its previous position.



# Unit 4 –Turning Effect Of Forces

## LECTURE NO.13

15-07- 2020

### NEUTRAL EQUILIBRIUM:

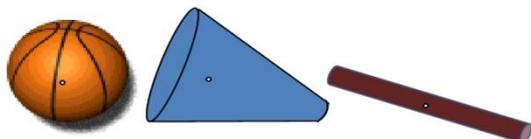
If a body remains in its new position when disturbed from its previous position, it is said to be in a state of neutral equilibrium.

Take a ball and place it on a horizontal surface as shown in figure. Roll the ball over the surface and leave it after displacing from its previous position. It remains in its new position and does not return to its previous position. This is called neutral equilibrium. In neutral equilibrium, all the new states in which a body is moved, are the stable states and the body, remains in its new state. In neutral equilibrium, the centre of gravity of the body remains at the same height, irrespective to its new position. There are various objects which have neutral equilibrium such as a ball, a sphere, a roller, a pencil lying horizontally, an egg lying horizontally.

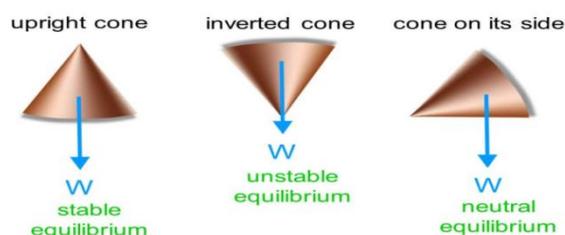
### NEUTRAL EQUILIBRIUM

For objects with neutral equilibrium:

- the C.G. is neither lowered nor raised when the object is toppled.
- they roll from one side to another.



An object is stable provided its weight does not produce a moment that causes it to topple ...



### STABILITY AND POSITION OF CENTRE OF MASS:

The position of centre of mass of an object plays an important role in their stability. To make them stable, their centre of mass must be kept as low as possible. It is due to this reason, racing cars are made heavy at the bottom and their height is kept to be minimum. Circus artists such as tight rope walkers use long poles to lower their centre of mass. In this way they are prevented from topple over.

### REAL LIFE APPLICATIONS



- Racing cars are built low and broad for stability
- Bunsen burners, table lamps and fans are designed with large, heavy bases to make them stable.
- The legs of a baby's highchair are set wide apart so that the chair is stable.



## UNIT-4 (LECT-13)

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PHYSICS

CLASS :9TH

- Figure shows a sewing needle fixed in a cork. The cork is balanced on the tip of the needle by hanging forks. The forks lower the centre of mass of the system.



Figure 4.38: A needle is made to balance at its tip.

- Figure shows a perched parrot which is made heavy at its tail. Figure shows a toy that keeps itself upright when tilted. It has heavy semi spherical base. When it is tilted, its centre of mass rises. It returns to the upright position at which its centre of mass is at the lowest.



Figure 4.39 (a) A perched parrot (b) A self righting toy

Figure (1) shows a sewing needle fixed in a cork. The cork is balanced on the tip of the needle by hanging forks. The forks lower the centre of mass of the system. Figure shows a perched parrot which is made heavy at its tail. Figure (2) shows a toy that keeps itself upright when tilted. It has a heavy semispherical base. When it is tilted, its centre of mass rises. It returns to its upright position at which its centre of mass is at the lowest.

is vertically below their point of equilibrium stable.

is a sewing needle fixed in a cork on the tip of the needle by hanging forks to lower the centre of mass of the system. Figure 4.39(a) shows a perched parrot which is made heavy at its tail. Figure 4.39(b) shows a toy that keeps itself upright when tilted. It has a heavy semispherical base. When it is tilted, its centre of mass rises. It returns to its upright position at which its centre of mass is at the lowest.



Figure 4.39 (a) A perched parrot (b) A self righting toy



# Unit 5 Gravitation

## LECTURE NO.1

16-7-20

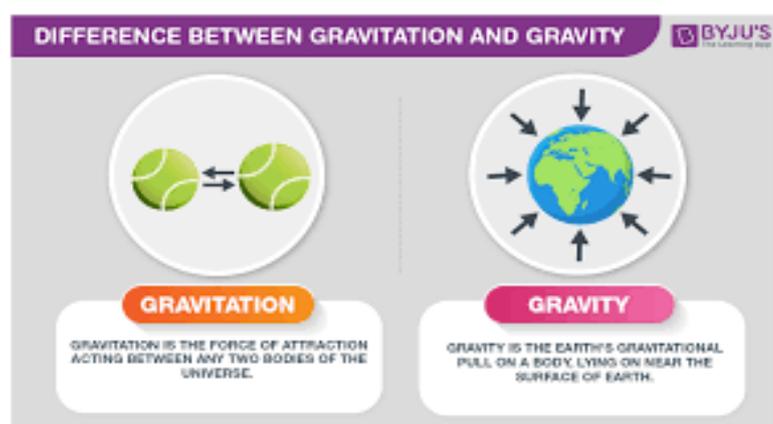
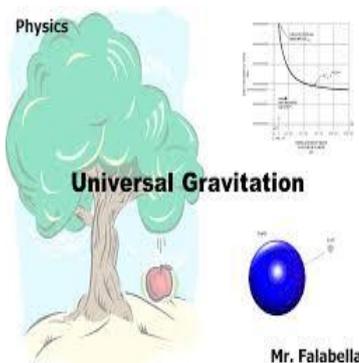
**THE GRAVITATION:** The first man who came up with the idea of gravity was Isaac Newton. It was an evening of 1665 when he was trying to solve the mystery why planets revolve around the Sun. Suddenly an apple fell from the tree under which he was sitting. The idea of gravity flashed in his mind. He discovered not only the cause of falling apple but also the cause that makes the planets to revolve around the Sun and the moon around the Earth.

**Gravity, or gravitation, is a natural phenomenon by which all things with mass or energy—including planets, stars, galaxies, and even light—are brought toward one another. On Earth, gravity gives weight to physical objects, and the Moon's gravity causes the ocean tides.**

### **FORCE OF GRAVITATION:**

On the basis of his observations, Newton concluded that the force which causes an apple to fall on the Earth and the force which keeps the moon in its orbit are of the same nature. He further concluded that there exists a force due to which everybody of the universe attracts every other body.

He named this force the **force of gravitation**.



**NEWTON,S LAW OF GRAVITATION:**

According to Newton's law of universal gravitation:

**Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.**

Consider two bodies of masses  $m_1$  and  $m_2$  . The distance between the centers of masses is  $d$  as shown in figure .

$$F_g = \frac{G m_1 m_2}{d^2}$$

$G = 6.67 \times 10^{-11}$

According to the law of gravitation, the gravitational force of attraction  $F$  with which the two masses  $m_1$  and  $m_2$  separated by a distance  $d$  attract each other is given by:

$$F \propto m_1 m_2$$

$$F \propto 1/d^2$$

$$F \propto m_1 m_2 / d^2$$

$$F = G m_1 m_2 / d^2$$

Here **G** is the proportionality constant. It is called the universal constant of gravitation. Its value is same everywhere. In SI units its value is  $6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$  . Due to small value of  $G$ , the gravitational force of attraction between objects around us is very small and we do not feel it. Since the mass of Earth is very large, it attracts nearby objects with a significant force. The weight of an object on the Earth is the result of gravitational force of attraction between the Earth and the object.

**LAW OF GRAVITATION AND NEWTON'S THIRD LAW OF MOTION:**

It is to be noted that mass  $m_1$  attracts  $m_2$  towards it with a force  $F$  while mass  $m_2$  attracts  $m_1$  towards it with a force of the same magnitude  $F$  but in opposite direction. If the force acting on  $m_1$  is considered as action then the force acting on  $m_2$  will be the reaction. The action and reaction due to force of gravitation are equal in magnitude but opposite in direction. This is consistent with **Newton's third law of motion which states, to every action there is always an equal but opposite reaction.**



## Unit 5 Gravitation

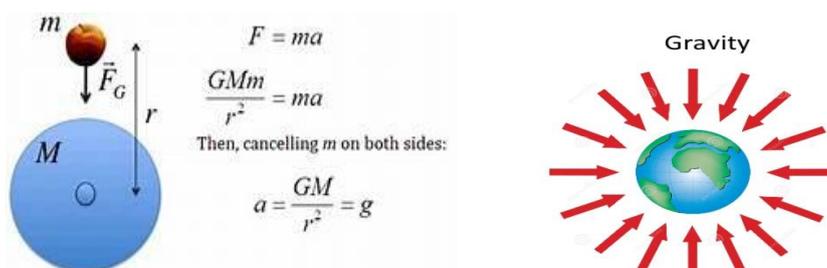
### LECTURE NO.2

17-7-20

#### GRAVITATIONAL FIELD:

*The region of space surrounding a body in which another body experiences a force of gravitational attraction is called gravitational field . According to the Newton's law of gravitation, the gravitational force between a body of mass m and the Earth is given by*

$$F = G m M / r^2$$



where  $M$  is the mass of the Earth and  $r$  is the distance of the body from the centre of the Earth. **The weight of a body is due to the gravitational force with which the Earth attracts a body.** Gravitational force is a non-contact force. For example, the velocity of a body, thrown up, goes on decreasing while on return its velocity goes on increasing. This is due to **the gravitational pull of the Earth acting on the body whether the body is in contact with the Earth or not. Such a force is called the field force.** It is assumed that a gravitational field exists all around the Earth. This field is directed towards the centre of the Earth as shown by arrows in figure . The gravitational field becomes weaker and weaker as we go farther and farther away from the Earth. In the gravitational field of the Earth, the gravitational force per unit mass is called the **gravitational field strength** of the Earth. At any place its value is equal to the value of  $g$  at that point. Near the surface of the Earth, the gravitational field strength is **10 N kg<sup>-1</sup>.**

#### **Problem:5.1:**

Find the gravitational force of attraction between two spheres each of mass 1000 kg. The distance between the centres of the spheres is 0.5 m. ( $2.67 \times 10^{-4} \text{N}$ )

#### **Solution:**

$$\begin{aligned}
 F &= ? \\
 m_1 &= 1000\text{kg} \\
 m_2 &= 1000\text{kg}
 \end{aligned}$$

**(UNIT-5)****LECT-2****PHYSICS****CLASS :9<sup>TH</sup>**

$$d = 0.5\text{m}$$

$$G = 6.673 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$$

$$F = Gm_1m_2/d^2$$

$$F = 6.673 \times 10^{-11} \times 1000 \times 1000 / (0.5)^2$$

$$F = 2.67 \times 10^{-4} \text{ N} \quad \text{Ans.}$$

**Problem5.2:**

The gravitational force between two identical lead spheres kept at 1 m apart is 0.006673 N. Find their masses. (10,000 kg each).

**Solution:**

$$F = 0.006673 \text{ N}$$

$$d = 1\text{m}$$

$$m_1 = m_2 = m = ?$$

$$G = 6.673 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$$

$$F = Gm_1m_2/d^2$$

$$F = Gm^2/d^2$$

$$m^2 = Fd^2/G$$

$$m^2 = 0.006673 \times 1^2 / 6.673 \times 10^{-11}$$

$$m^2 = 1 \times 10^8$$

$$m = 10^4 \text{ kg}$$

$$m = 10000 \text{ kg. Ans}$$

**Mini Exercise**

1. Does an apple attract the Earth towards it?

**Ans: Yes an apple attract the Earth.**

2. With what force an apple weighing 1N attracts the Earth?

**Ans: An apple weighing 1N attracts the Earth with a force of 1N.**

3. Does the weight of an apple increase, decrease or remain constant when taken to the top of a mountain?

**Ans: The weight of an apple will decrease when taken to the top of a mountain due to less value of g on mountains.**

**DO YOU KNOW?**

Value of  $g$  on the surface of a celestial object depends on its mass and its radius. The value of  $g$  on some of the objects is given below:

OBJECT:	SUN	MERCURY	VENUS	MOON	MARS	JUPITOR
VALUE OF $g$ ( $\text{ms}^{-2}$ )	274.2	3.7	8.87	1.62	3.73	26.94

PHYSICS



CLASS :9TH

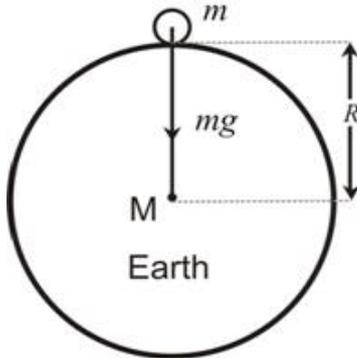
# Unit 5 Gravitation

## LECTURE NO.3

18-7-20

### MASS OF THE EARTH:

Consider a body of mass  $m$  on the surface of the Earth as shown in figure



. Let the mass of the Earth be  $M_e$  and radius of the Earth be  $R$ . The distance of the body from the centre of the Earth will also be equal to the radius  $R$  of the Earth. According to the law of gravitation, the gravitational force  $F$  of the Earth acting on a body is given by

$$F = Gm M_e/R^2 \dots\dots\dots(1)$$

But the force with which Earth attracts a body towards its centre is equal to its weight  $w$ .

Therefore,  $F = w = mg \dots\dots\dots(2)$

or

$$mg = Gm M_e/R^2$$

$$g = G M_e/R^2$$

$$M_e = g R^2/G$$

Mass  $M_e$  of the Earth can be determined on putting the values of  $g$ ,  $R$  and  $G$  in above equation

$$R = 6400\text{km} = 6400000\text{m} = 6.4 \times 10^6\text{m}$$

$$G = 6.673 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$$

$$g = 10\text{ms}^{-2}$$

$$M_e = 10 \times (6.4 \times 10^6)^2 / 6.673 \times 10^{-11}$$

$$M_e = 10 \times (6.4)^2 \times 10^{12} / 6.673 \times 10^{-11}$$

$$M_e = 10 \times (6.4)^2 \times 10^{12} \times 10^{11} / 6.673 \text{ kg}$$

$$M_e = (6.4)^2 \times 10^{24} / 6.673 \text{ kg}$$

$$M_e = 6.0 \times 10^{24} \text{ kg}$$

PHYSICS



CLASS :9TH

# Unit 5 Gravitation

## LECTURE NO.4

20-7-20

Problem5.3:

Find the acceleration due to gravity on the surface of the Mars. The mass of Mars is  $6.42 \times 10^{23}$  kg and its radius is 3370 km. ( $3.77 \text{ ms}^{-2}$ ).

Solution:

$$\begin{aligned}
 M &= 6.0 \times 10^{23} \text{ kg} \\
 R &= 3370 \text{ km} = 3370000 \text{ m} = 3.37 \times 10^6 \text{ m} \\
 G &= 6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2} \\
 g &= ? \\
 g &= GM/R^2 \\
 g &= 6.673 \times 10^{-11} \times 6.0 \times 10^{23} / (3.37 \times 10^6)^2 \\
 \\ \\
 g &= 3.77 \text{ ms}^{-2}
 \end{aligned}$$

Problem:5.4

The acceleration due to gravity on the surface of moon is  $1.62 \text{ ms}^{-2}$ . The radius of moon is 1740 km. Find the mass of moon. ( $7.35 \times 10^{22}$  kg)

Solution:

$$\begin{aligned}
 g &= 1.62 \text{ ms}^{-2} \\
 R &= 1740 \text{ km} = 1740000 \text{ m} = 1.74 \times 10^6 \text{ m} \\
 G &= 6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2} \\
 M &=? \\
 M &= g R^2 / G \\
 M &= 1.62 \times (1.74 \times 10^6)^2 / 6.673 \times 10^{-11}
 \end{aligned}$$

$$M = 7.35 \times 10^{22} \text{ kg}$$

PHYSICS



CLASS :9TH

## Unit 5 Gravitation

### LECTURE NO.5

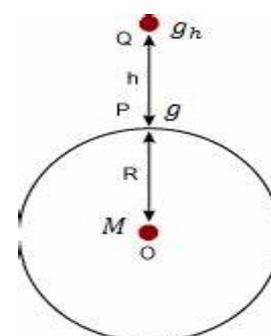
21-7-20

#### VARIATION OF $g$ WITH ALTITUDE:

The value of  $g$  at the surface of Earth is given by

$$g = G M_e / R^2$$

Above equation shows that the value of acceleration due to gravity  $g$  depends on the radius of the Earth at its surface. The value of  $g$  is inversely proportional to the square of the radius of the Earth. But it does not remain constant. It decreases with **altitude**. Altitude is the height of an object or place above sea level.



The value of  $g$  is greater at sea level than at the hills.

Consider a body of mass  $m$  at an altitude  $h$  as shown in figure. The distance of the body from the centre of the Earth becomes  $R + h$ . Therefore, using above equation, we get

$$g_h = G M_e / (R + h)^2$$

According to the above equation, we come to know that at a height equal to one Earth radius above the surface of the Earth,  $g$  becomes one fourth of its value on the Earth. Similarly at a distance of two Earths radius above the Earth's surface, the value of  $g$  becomes one ninth of its value on the Earth.

**Problem: 5.5** Calculate the value of  $g$  at a height of 3600 km above the surface of the Earth. (4.0  $ms^{-2}$ )

**Solution:**

$M_e$	=	$6.0 \times 10^{24} \text{ kg}$	
$h$	=	$3600 \text{ km}$	= $3600000 \text{ m} = 3.6 \times 10^6 \text{ m}$
$R$	=	$6400 \text{ km}$	= $6400000 \text{ m} = 6.4 \times 10^6 \text{ m}$
$R + h$	=	$6.4 \times 10^6 \text{ m}$	+ $3.6 \times 10^6 \text{ m}$
$R + h$	=	$10.0 \times 10^6 \text{ m}$	= $1.0 \times 10^7 \text{ m}$
$G$	=	$6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$	
$g_h$	= ?		
$g_h$	=	$G M_e / (R + h)^2$	
$g_h$	=	$6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2} \times 6.0 \times 10^{24} \text{ kg} / (1.0 \times 10^7 \text{ m})^2$	
$g_h$	=	$6.673 \times 6.0 \times 10^{13} \times 10^{-14} \text{ ms}^{-2}$	
$g_h$	=	$40 \times 10^{-1} \text{ ms}^{-2}$	
	=	$4.0 \text{ ms}^{-2}$	Ans.



PHYSICS

CLASS :9TH

# Unit 5 Gravitation

## LECTURE NO.6

22-7-20

**Problem :5.6** Find the value of g due to the Earth at geostationary satellite .The radius of the geostationary orbit is 48700 km.

**Solution:**

$$M_e = 6.0 \times 10^{24} \text{kg}$$

$$R+h = 48700 \text{km} = 48700000 \text{m} = 4.87 \times 10^7 \text{m}$$

$$G = 6.673 \times 10^{-11} \text{ Nm}^2 \text{kg}^{-2}$$

$$g_h = ?$$

$$g_h = \frac{G M_e}{(R+h)^2}$$

$$g_h = \frac{6.673 \times 10^{-11} \text{ Nm}^2 \text{kg}^{-2} \times 6.0 \times 10^{24} \text{kg}}{(4.87 \times 10^7 \text{m})^2}$$

$$g_h = \frac{(6.673 \times 6.0)}{(4.87)^2} \times 10^{13} \times 10^{-14} \text{ms}^{-2}$$

$$g_h = 40/23.72 \times 10^{-1} \text{ ms}^{-2}$$

$$g_h = 0.17 \text{ ms}^{-2} \text{ Ans.}$$

**Problem 5.7:** The value of g is 4.0 ms<sup>-2</sup> at a distance of 10000 km from the centre of the Earth. Find the mass of the Earth.

**Solution:**

$$R+h = 10000 \text{km} = 10000000 \text{m} = 1.0 \times 10^7 \text{m}$$

$$G = 6.673 \times 10^{-11} \text{ Nm}^2 \text{kg}^{-2}$$

$$g_h = 4.0 \text{ ms}^{-2}$$

$$g_h = \frac{G M_e}{(R+h)^2}$$

$$M_e = \frac{g_h (R+h)^2}{G}$$

$$M_e = \frac{4.0(1.0 \times 10^7)^2}{6.673 \times 10^{-11}}$$

$$M_e = (4.0/6.673) \times 10^{14} \times 10^{11}$$

$$M_e = 0.599 \times 10 \times 10^{24} \text{kg}, M_e = 5.99 \times 10^{24} \text{kg} \text{ Ans.}$$

**Problem 5.8:** At what altitude the value of g would become one fourth than on the surface of the Earth?

**Solution:**

$$g_h = (1/4)g \dots\dots\dots(1)$$

$$\text{Altitude} = h = ?$$

The value of g at the surface of Earth is given by  $g = G M_e/R^2 \dots\dots\dots(2)$

The value of g at a height h above the surface of Earth is given by  $g_h = G M_e/(R+h)^2 \dots\dots(3)$

putting values of g and g<sub>h</sub> in eqn. no(1) we get

$$\frac{G M_e}{(R+h)^2} = \frac{1}{4} \left( \frac{G M_e}{R^2} \right)$$

$$\frac{1}{(R+h)^2} = \frac{1}{4} (R^2)$$

$$(R+h)^2 = 4 R^2$$

$$R+h = 2R$$

$$h = 2R - R, h = R \text{ At an altitude of one Earth's}$$

radius the value of g would become one fourth than on the surface of Earth.



## Unit 5 Gravitation

### LECTURE NO.7

23-7-20

#### ARTIFICIAL SATELLITES :

An object that revolves around a planet is called a satellite. The moon revolves around the Earth so moon is a natural satellite of the Earth. Scientists have sent many objects into space. Some of these objects revolve around the Earth. These are called artificial satellites. Most of the artificial satellites, orbiting around the Earth are used for communication purposes. Artificial satellites carry instruments or passengers to perform experiments in space.

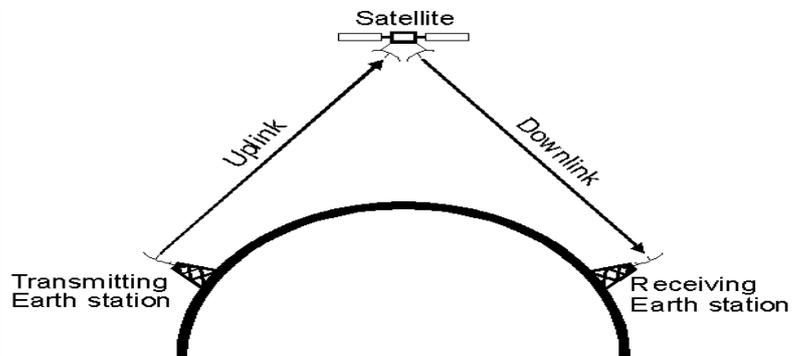
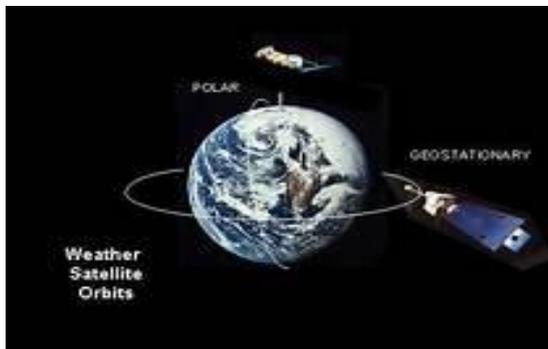


Figure : A satellite is orbiting around the Earth at a height  $h$  above the surface of the Earth.

Large number of artificial satellites have been launched in different orbits around the Earth. They take different time to complete their one revolution around the Earth depending upon their distance  $h$  from the Earth.

Communication satellites take 24 hours to complete their one revolution around the Earth. As Earth also completes its one rotation about its axis in 24 hours, hence, these communication satellites appear to be stationary with respect to Earth. It is due to this reason that the orbit of such a satellite is called geostationary orbit. Dish antennas sending and receiving the signals from them have fixed direction depending upon their location on the Earth.



**MOTION OF ARTIFICIAL SATELLITES:**

A satellite requires centripetal force that keeps it to move around the Earth. The gravitational force of attraction between the satellite and the Earth provides the necessary centripetal force. Consider a satellite of mass  $m$  revolving round the Earth at an altitude  $h$  in an orbit of radius  $r_0$  with orbital velocity  $v_0$ . The necessary centripetal force required is given by equation

$$F_c = mv_0^2/r_0 \dots \dots \dots (1)$$

This force is provided by the gravitational force of attraction between the Earth and the satellite and is equal to the weight of the satellite  $w$  ( $mg_h$ ). Thus

$$F = w = mg_h \dots \dots \dots (2)$$

Comparing eqn.1 and eqn. 2 we get

$$mv_0^2/r_0 = m g_h$$

$$v_0^2 = g_h r_0$$

$$v_0 = \sqrt{g_h r_0}$$

since

$$r_0 = R + h$$

So

$$v_0^2 = g_h (R + h)$$

$$v_0 = \sqrt{g_h (R + h)}$$

above equation gives the velocity, which a satellite must possess when launched in an orbit of radius  $r_0 = (R + h)$  around the Earth. An approximation can be made for a satellite revolving close to the Earth such that  $R \gg h$ .

$$R + h \approx R$$

$$g_h \approx g$$

$$v_0 \approx \sqrt{g R}$$

A satellite revolving around very close to the Earth, has speed  $v$  nearly 8 kms-1 or 29000 kmh-1

**Global Positioning System (GPS)** is a satellites navigation system. It helps us to find the exact position of an object anywhere on the land, on the sea or in the air. GPS consists of 24 Earth satellites. These satellites revolve around the Earth twice a day with a speed of 3.87 km s<sup>-1</sup>.

**Geostationary Satellites:** The height of a geostationary satellite is about 42,300 km from the surface of the Earth. Its velocity with respect to Earth is zero

***Important Information:***

Moon is nearly 3,80,000 km way from the Earth. It completes its one revolution around the Earth in 27.3 days

PHYSICS



CLASS :9TH

## Unit 5 Gravitation

### LECTURE NO.8

24-7-20

**Problem:5.9** A polar satellite is launched at 850 km above Earth. Find its orbital speed.

**Solution:**

$$\begin{aligned} M_e &= 6.0 \times 10^{24} \text{ kg} \\ h &= 850 \text{ km} \\ R &= 6400 \text{ km} \\ R+h &= 6400 \text{ km} + 850 \text{ km} = 7250 \text{ km} = 7250000 = 7.25 \times 10^6 \text{ m} \\ G &= 6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2} \\ v_0 &=? \\ v_0^2 &= g_h (R+h) \\ g_h &= G M_e / (R+h)^2 \\ v_0^2 &= G M_e / (R+h)^2 \times (R+h) \\ v_0^2 &= G M_e / (R+h) \\ &= (6.673 \times 10^{-11} \times 6.0 \times 10^{24}) / 7.25 \times 10^6 \\ &= 5.5224828 \times 10^7 = 55224828 \end{aligned}$$

Taking square root we get  $v_0 = 7431 \text{ ms}^{-1}$  Ans.

**Problem:5.10:** A communication satellite is launched at 42000 km above Earth. Find its orbital speed

**Solution:**

$$\begin{aligned} M_e &= 6.0 \times 10^{24} \text{ kg} \\ h &= 42000 \text{ km} \\ R &= 6400 \text{ km} \\ R+h &= 6400 \text{ km} + 42000 \text{ km} = 48400 \text{ km} = 48400000 \text{ m} = 4.84 \times 10^7 \text{ m} \\ G &= 6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2} \\ v_0 &=? \\ v_0^2 &= g_h (R+h) \\ g_h &= G M_e / (R+h)^2 \\ v_0^2 &= G M_e / (R+h)^2 \times (R+h) \\ v_0^2 &= G M_e / (R+h) \\ &= (6.673 \times 10^{-11} \times 6.0 \times 10^{24}) / 4.84 \times 10^7 \\ &= 8.272314 \times 10^6 \\ &= 8272314 \end{aligned}$$

Taking square root we get  $v_0 = 2876 \text{ ms}^{-1}$  Ans.

## Unit 5

# Factorization

## Exercise 5.1

### Q1. Factorize

(i)  $2abc - 4abx + 2abd$

$$= 2ab(c - 2x + d)$$

(ii)  $9xy - 12x^2y + 18y^2$

$$= 3y(3x - 4x^2 + 6y)$$

(iii)  $-3x^2y - 3x + 9xy^2$

$$= -3x(xy + 1 - 3y^2)$$

(iv)  $5ab^2c^3 - 10a^2b^3c - 20a^3bc^2$

$$= 5abc(bc^2 - 2b^2 - 4a^2c)$$

(v)  $3x^3y(x-3y) - (7x^2y^2(x-3y))$

$$= (x-3y)(3x^3y - 7x^2y^2)$$

$$= (x-3y)x^2y(3x-7y)$$

$$= x^2y(x-3y)x^2y(3x-7y)$$

$$\begin{aligned}
 \text{(vi)} \quad & 2xy^3(x^2+5)+8xy^2(x^2+5) \\
 &= (x^2+5)(2xy^3+8xy^2) \\
 &= (x^2+5)(2xy^2)(y+4) \\
 &= 2xy^2(x^2+5)(y+4)
 \end{aligned}$$

**Q.2**

$$\begin{aligned}
 \text{(i)} \quad & 5ax-3ay-5bx+3by \\
 &= 5ax-5bx-3ay+3by \\
 &= 5x(a-b)(5x-3y)
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & 3xy+2y-12x-8 \\
 &= 3xy-12x+2y-8 \\
 &= 3x(y-4)+2(y-4) \\
 &= (y-4)(3x+2)
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & x^3+3xy^2-2x^2-6y^3 \\
 &= x(x^2+3y^2)-2y(x^2+3y^2) \\
 &= (x^2+3y^2)(x-2y)
 \end{aligned}$$

$$\text{(iv)} \quad (x^2-y^2)z+(y^2-z^2)x$$

$$\begin{aligned}
 &= x^2z - y^2z + y^2x - z^2x \\
 &= x^2z - z^2x + y^2x - y^2z \\
 &= xz(x - z) + y^2x - y^2z \\
 &= (x - z)(xz + y^2)
 \end{aligned}$$

**Q.3**

$$(i) 144a^2 + 24a + 1$$

$$\begin{aligned}
 &= 144a^2 + 12a + 12a + 1 \\
 &= 12a(12a + 1) + 1(12a + 1) \\
 &= (12a + 1)(12a + 1) = (12a + 1)^2
 \end{aligned}$$

$$(ii) \frac{a^2}{b^2} - 2 + \frac{b^2}{a^2}$$

$$\begin{aligned}
 &= \left(\frac{a}{b}\right)^2 - 2\left(\frac{a}{b}\right)\frac{b}{a} + \left(\frac{b}{a}\right)^2 \\
 &= \left(\frac{a}{b} - \frac{b}{a}\right)^2
 \end{aligned}$$

$$(iii) (x + y)^2 - 14z(x + y) + 49z^2$$

$$\begin{aligned}
 &= (x + y)^2 - 2(x + y)(7z) + (7z)^2 \\
 &= (x + y - 7z)^2
 \end{aligned}$$

$$(iv) 12x^2 - 36x + 27$$

$$\begin{aligned}
 &= 3(4x^2 - 12x + 9) \\
 &= 3[(2x)^2 - 2(2x)(3) + (3)^2] \\
 &= 3(2x - 3)^3
 \end{aligned}$$

**Q4.**

**(i)**  $3x^2 - 75y^2$

$$\begin{aligned}
 &= 3(x^2 - 25y^2) \\
 &= 3[(x^2) - (5y)^2] \\
 &= 3(x + 5y)(x - 5y)
 \end{aligned}$$

**(ii)**  $x(x-1) - y(y-1)$

$$\begin{aligned}
 &= x^2 - x - y^2 + y \\
 &= x^2 - y^2 - x + y \\
 &= (x + y)(x - y) - 1(x - y) \\
 &= (x - y)(x + y - 1)
 \end{aligned}$$

**(iii)**  $128am^2 - 242an^2$

$$\begin{aligned}
 &= 2a(64m^2 - 121n^2) \\
 &= 2a\{(8m^2) - (11n^2)\} \\
 &= 21(8m + 11n)(8m - 11n)
 \end{aligned}$$

**(iv)**  $3x - 243x^3$

$$\begin{aligned}
 &= 3x(1 - 81x^2) \\
 &= 3x((1)^2 - (9x^2)) \\
 &= 3x(1 + 9x)(1 - 9x)
 \end{aligned}$$

**Q.5**

**(i)**  $x^2 - y^2 - 6y - 9$

$$\begin{aligned} &= x^2 - (y^2 + 6y + 9) \\ &= x^2 - ((y^2) + 2(y)(3) + (3)^2) \\ &= x^2 - (y+3)^2 \\ &= (x+(y+3))(x-(y+3)) \\ &= (x+y+3)(x-y-3) \end{aligned}$$

**(ii)**  $x^2 - a^2 + 2a - 1$

$$\begin{aligned} &= x^2 - (a^2 - 2a + 1) \\ &= x^2 - ((a)^2 - 2(a)(1) + (1)^2) \\ &= x^2 - (a-1)^2 \\ &= (x)^2 - (a-1)^2 \\ &= (x+(a-1))(x-(a+1)) \\ &= (x+a-1)(x-a+1) \end{aligned}$$

**(iii)**  $4x^2 - y^2 - 4x - 2y + 3$

$$\begin{aligned} &= 4x^2 - (y^2 + 2y + 1) \\ &= (2x)^2 - (y+1)^2 \\ &= [2x+(y+1)][2x-(y+1)] \\ &= (2x+y-1)(2x-y-1) \end{aligned}$$

$$\text{(iv)} x^2 - y^2 - 4x - 2y + 3$$

$$= x^2 - 4x - y^2 - 2y + 3$$

$$= x^2 - 4x - y^2 - 2y + 3$$

$$= x^2 - 4x + 4 - y^2 - 2y - 1$$

$$= x^2 - 4x + 4 - (y + 1)^2$$

$$= ((x - 2) + (y + 1))(x - 2 - y - 1)$$

$$= (x + y - 1)(x - y - 3)$$

$$\text{(v)} 25x^2 - 10x + 1 - 36z^2$$

$$= (5x)^2 - 2(5x)(1) + (1)^2 - 36z^2$$

$$= (5x - 1)^2 - (6z)^2$$

$$= ((5x - 1) + 6z)((5x - 1) - 6z)$$

$$= (5x - 1 + 6z)(5x - 1 - 6z)$$

$$\text{(vi)} x^2 - y^2 - 4xz + 4z^2$$

$$= x^2 - 4xz + 4z^2 - y^2$$

$$= (x)^2 - 2(x)(2z) + (2z)^2 - y^2$$

$$= (x - 2z)^2 - (y)^2$$

$$= ((x - 2z) + y)((x - 2z) - y)$$

$$= (x - 2z + y)(x - y - 2z)$$

$$= (x + y - 2z)(x - y - 2z)$$

## Exercise 5.2

### Q.1 Factorize

$$(i) x^4 + \frac{1}{x^4} - 3$$

$$= x^4 + 1/x^4 - 2 - 1$$

$$= x^4 - 2 + 1/x^4 - 1$$

$$= (x^2 - 1/x^2)^2 - 1^2$$

$$= ((x^2 - 1/x^2) + 1)((x^2 - 1/x^2) - 1)$$

$$= (x^2 - 1/x^2 + 1)(x^2 - 1/x^2 - 1)$$

$$(ii) 3x^4 + 12y^4$$

$$= 3(x^4 + 4y^4)$$

$$= 3(x^4 + 4x^2y^2 + 4y^4 - 4x^2y^2)$$

$$= 3(x^2 + 2y^2)^2 - 4x^2y^2$$

$$= 3((x^2 + 2y^2) + (2xy))^2$$

$$= 3((x^2 + 2y^2) + 2xy)((x^2 + 2y^2) - 2xy)$$

$$= 3(x^2 + 2xy + 2y^2)(x^2 - 2xy + 2y^2)$$

$$(iii) a^4 + 3a^2b^2 + ab^4$$

$$= a^4 + 4a^2b^2 + 4b^2 - a^2b^2$$

$$= (a^2 + 2b^2)^2 - (ab)^2$$

$$= (a^2 + 2b^2 + ab)(a^2 + 2b^2 - ab)$$

$$= (a^2 + ab + 2b^2)(a^2 - ab + 2b^2)$$

$$(iv) 4x^4 + 81$$

$$= (2x^2)^2 + (9)^2 + 36x - 36x^2$$

$$\begin{aligned}
 &= (2x^2 + 9)^2 - (6x)^2 \\
 &= (2x^2 + 9 + 6x)(2x^2 + 9 - 6x) \\
 &= (2x^2 + 6x + 9)(2x^2 - 6x + 9)
 \end{aligned}$$

**(v)**  $x^4 + x^2 + 25$

$$\begin{aligned}
 &= x^4 + 10x^2 + 25 - 9x^2 \\
 &= (x^2)^2 + 2(x^2)5 - 9x^2 \\
 &= (x^2 + 5)^2 - (3x)^2 \\
 &= (x^2 + 5 + 3x)(x^2 + 5 - 3x) \\
 &= (x^2 + 2x + 4)(x^2 - 2x + 4)
 \end{aligned}$$

**(vi)**  $x^4 + 4x^2 + 16$

$$\begin{aligned}
 &= x^4 + 8x^2 + 16 - 4x^2 \\
 &= (x^2 + 4)^2 - (2x)^2 \\
 &= (x^2 + 4 + 2x)(x^2 + 4 - 2x) \\
 &= (x^2 + 2x + 4)(x^2 + 2x - 4)
 \end{aligned}$$

## Q.2

**(i)**  $x^2 + 14x + 48$

$$\begin{aligned}
 &= x^2 + 8x + 6x + 48 \\
 &= x(x + 8) + 6(x + 8) \\
 &= (x + 8)(x + 6)
 \end{aligned}$$

**(ii)**  $x^2 - 21x + 108$

$$\begin{aligned}
 &= x^2 - 12x - 9x + 108 \\
 &= x(x - 12) - 9(x - 12) \\
 &= (x - 12)(x - 9)
 \end{aligned}$$

$$\text{(iii)} x^2 - 11x - 42$$

$$\begin{aligned} &= x^2 - 14x + 3x - 42 \\ &= x(x-14) + 3(x-14) \\ &= (x-14)(x+3) \end{aligned}$$

$$\text{(iv)} x^2 + x - 132$$

$$\begin{aligned} &= x^2 - 12x - 11x - 132 \\ &= x(x+12)(x-11) \\ &= (x+12)(2x+1) \end{aligned}$$

### Q.3

$$\text{(i)} 4x^2 + 12x + 5$$

$$\begin{aligned} &= 4x^2 + 10x + 2x + 5 \\ &= 2x(2x+5) + 1(2x+5) \\ &= (2x+1)(2x+5) \end{aligned}$$

$$\text{(ii)} 30x^2 + 7x - 15$$

$$\begin{aligned} &= 30x^2 + 25x - 18x - 15 \\ &= 5x(6x+5) - 3(6x+5) \\ &= (6x+5)(5x-3) \end{aligned}$$

$$\text{(iii)} 24x^2 - 65x + 21$$

$$\begin{aligned} &= 24x^2 - 56x - 9x + 21 \\ &= 8x(3x-7) - 3(3x-7) \\ &= (3x-7)(8x-3) \end{aligned}$$

$$\text{(iv)} 5x^2 - 16x - 21$$

$$\begin{aligned} &= 5x^2 - 21x + 5x - 21 \\ &= x(5x - 21) + 1(5x - 21) \\ &= (5x - 21)(x + 1) \end{aligned}$$

$$\text{(v)} 4x^2 - 17xy + 4y^2$$

$$\begin{aligned} &= 4x^2 - 16xy - y + 4y^2 \\ &= 4x(x - 4y) - y(x - 4y) \\ &= (x - 4y)(4x - y) \end{aligned}$$

$$\text{(vi)} 3x^2 - 38xy + 13y^2$$

$$\begin{aligned} &= 3x^2 - 39xy + xy - 13y^2 \\ &= 3x(x - 13y) + y(x - 13y) \\ &= (x - 13y)(3x + y) \end{aligned}$$

$$\text{(vii)} 5x^2 + 33xy - 14y^2$$

$$\begin{aligned} &= 5x^2 + 35xy - 2xy - 14y^2 \\ &= 5x(x + 7y) + y(x + 7y) \\ &= (x + 7y)(5x + y) \end{aligned}$$

$$\text{(viii)} (5x - 1/x)^2 + 4(5x - 1/x) + 4$$

$$\text{let } 5x - \frac{1}{x} = y$$

$$= y^2 + 4y + 4$$

$$(y + 2)^2 = (y + 2)(y + 2)$$

$$\begin{aligned} & \text{by putting value of } y = 5x - \frac{1}{x} \\ & = (5x - 1/x + 2)(5x - 1/x + 2) \end{aligned}$$

**Q.4**

$$(i) (x^2 + 5x + 4)(x^2 + 5x + 6) - 3$$

$$\begin{aligned} & \text{let } x^2 + 5x = y \\ & (y + 4)(y + 6) - 3 \\ & = y^2 + 6y + 4y + 24 - 3 \\ & = y^2 + 10y + 21 \\ & = y^2 + 7y + 3y + 21 \\ & = y(y + 7) + 3(y + 7) \\ & = (y + 7)(y + 3) \end{aligned}$$

$$\begin{aligned} & \text{by putting value of } y = x^2 + 5x \\ & = (x^2 + 5x + 7)(x^2 + 5x + 3) \end{aligned}$$

$$(ii) (x^2 - 4x)(x^2 - 4x - 1) - 20$$

$$\begin{aligned} & \text{let } x^2 - 4x = y \\ & = y(y - 1) - 20 \\ & = y^2 - y - 20 \\ & = y^2 - 5y + 4y - 20 \\ & = y(y - 5) + 4(y - 5) \\ & = (y - 5)(y + 5) \end{aligned}$$

$$\begin{aligned} & \text{by putting value of } y = x^2 - 4x \\ & = (x^2 - 4x - 5)(x^2 - 4x + 4) \\ & = (x^2 - 5x + x - 5)(x^2 - 2(x)2 + 4) \\ & = ((x(x - 5) + 1(x - 5)))(x - 2)^2 \\ & = (x - 5)(x + 1)(x - 2)^2 \end{aligned}$$

$$\text{(iii)} (x+2)(x+3)(x+4)(x+5) - 15$$

By using commutative property of addition

$$\text{As } 2+5 = 3+4$$

$$= (x^2 + 7x + 10)(x^2 + 7x + 12) - 15$$

$$\text{let } x^2 + 7x = y$$

$$= (y+10)(y+12) - 15$$

$$= y^2 + 22y + 120 - 15$$

$$= y^2 + 22y + 105$$

$$= y^2 + 15y + 7y + 105$$

$$= y(y+15) + 7(y+15)$$

$$= (y+15)(y+7)$$

By putting value of  $y = x^2 + 7x$

$$= (x^2 + 7x + 15)(x^2 + 7x + 7)$$

$$\text{(iv)} (x+4)(x-5)(x+6)(x-7) - 504$$

By using commutative property of subtraction

$$\text{As } 4-5 = 6-7$$

$$= (x^2 - x - 20)(x^2 - x - 42) - 504$$

$$\text{let } x^2 - x = y$$

$$= (y-20)(y-42) - 504$$

$$= y^2 - 42y - 20y + 840 - 504$$

$$= y^2 - 62y + 336$$

$$= y(y-56)(y-6)$$

= by putting value of  $y = x^2 - x$

$$= (x^2 - x - 56)(x^2 - x - 6)$$

$$= (x^2 - 8x + 7x - 56)(x^2 - 3x + 2x - 6)$$

$$= (x(x-8) + 7(x-8))(x(x-3) + 2(x-3))$$

$$= (x-8)(x+7)(x-3)(x+2)$$

$$\text{(v)} (x+1)(x+2)(x+3)(x+6) - 3x^2$$

By using commutative property of multiplication

$$\begin{aligned} \text{As } (1)(6) &= (2)(3) \\ &= (x^2 + 7x + 6)(x^2 + 5x + 6) - 3x^2 \\ &= (x^2 + 6 + 7x)(x^2 + 6 + 5x) - 3x^2 \end{aligned}$$

$$\begin{aligned} \text{let } x^2 + 6 &= y \\ &= (y + 7x)(y + 5x) - 3x^2 \\ &= y^2 + 5xy + 7xy + 35x^2 - 3x^2 \\ &= y^2 + 12xy + 32x^2 \\ &= y^2 + 8xy + 4xy + 32x^2 \\ &= y(y + 8x) + 4x(y + 8x) \\ &= (y + 8x)(y + 4x) \end{aligned}$$

By putting value of  $y = x^2 + 6$

$$\begin{aligned} &= (x^2 + 6 + 8x)(x^2 + 6 + 4x) \\ &= \left(x + 8 + \frac{6}{x}\right) \cdot x \left(x + 4 + \frac{6}{x}\right) \\ &= x^2 \left(x + \frac{6}{x} + 8\right) \left(x + \frac{6}{x} + 4\right) \end{aligned}$$

### Q.5

$$\begin{aligned} \text{(i)} \quad x^3 + 48x - 12x^2 - 64 \\ &= x^3 - 12x^2 + 48x - 64 \\ &= x^3 - 3 \cdot x^2 \cdot 4 + 3 \cdot x \cdot 4^2 - 4^3 \\ &= (x - 4)^3 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad 8x^3 + 60x^2 + 150x + 125 \\ &= (2x)^3 + 3 \cdot (2x)^2 \cdot 5 + 3 \cdot (2x) \cdot 5^2 + 5^3 \\ &= (2x + 5)^3 \end{aligned}$$

$$\text{(iii)} \quad x^3 - 18x^2 + 108x - 216$$

$$= x^{23} - 3x^2 \cdot 6 + 3 \cdot x \cdot 6^2 - 6^3$$

$$= (x - 6)^3$$

**(iv)**  $8x^3 - 125y^3 - 60x^2y + 150xy^2$

$$= 8x^3 - 60x^2y + 150xy^2 - 125y^3$$

$$= (2x)^3 - 3 \cdot (2x)^2 \cdot 5y + 3 \cdot (2x) \cdot (5y)^2 - (5y)^3$$

$$= (2x - 5y)^3$$

**Q.6**

**(i)**  $27 + 8x^3$

$$= (3)^3 + (2x)^3$$

$$= (3 + 2x)(3^2 - 3 \cdot 2x + 2(x)^2)$$

$$= (3 + 2x)(9 - 6x + 4x^2)$$

**(ii)**  $125x^3 - 216y^3$

$$= (5x)^3 - (6y)^3$$

$$= (5x - 6y)((5x)^2 + 5x \cdot 6y + (6y)^2)$$

$$= (5x - 6y)(25x^2 + 30xy + 36y^2)$$

**(iii)**  $64x^3 + 27y^3$

$$= (4x)^3 + (3y)^3$$

$$= (4x + 3y)((4x)^2 - 4x \cdot 3y + (3y)^2)$$

$$= (4x + 3y)(16x^2 - 12xy + 9y^2)$$

**(iv)**  $8x^3 + 125y^3$

$$\begin{aligned} &= (2x)^3 + (5y)^3 \\ &= (2x + 5y)((4x)^2 - 4x \cdot 4y + (3y)^2) \\ &= (2x + 5y)(4x^2 - 10xy + 25y^2) \end{aligned}$$

ClassNotes

## Exercise 5.3

**Q.1 Use Remainder theorem to find the remainder when**

(i)  $3x^3 - 10x^2 + 13x - 6$  is divided by  $(x - 2)$

**Solution**

$$\text{Let } p(x) = 3x^3 - 10x^2 + 13x - 6$$

When  $p(x)$  is divided by  $x - 2$

The remainder  $R = p(2)$

$$p(2) = 3(2)^3 - 10(2)^2 + 13(2) - 6$$

$$p(2) = 24 - 40 + 26 - 6 = 4$$

Therefore remainder = 4

(ii)  $4x^3 - 4x + 3$  is divided by  $(2x - 1)$

**Solution**

$$\text{Let } p(x) = 4x^3 - 4x + 3$$

When  $p(x)$  is divided by  $2x - 1$

The remainder  $R = p\left(\frac{1}{2}\right)$

$$\begin{aligned} p\left(\frac{1}{2}\right) &= 4\left(\frac{1}{2}\right)^3 - 4\left(\frac{1}{2}\right) + 3 \\ &= 4\left(\frac{1}{8}\right) - 4\left(\frac{1}{2}\right) + 3 = \frac{1}{2} - \frac{4}{2} + 3 = \frac{1 - 4 + 6}{2} = \frac{3}{2} \end{aligned}$$

(ii)  $6x^4 + 2x^3 - x + 2$  is divided by  $(x + 2)$

**Solution:**

$$\text{Let } p(x) = 6x^4 + 2x^3 - x + 2$$

when  $p(x)$  is divided by  $x + 2$  the remainder  $R = p(-2)$

$$p(-2) = 6(-2)^4 + 2(-2)^3 - 2 + 2$$

$$96 - 16 + 2 + 2 = 84$$

Therefore remainder = 84

**(iii)  $p(x) = (2x+1)^3 + 6(3+4x)^2 - 10$  is divided by  $(2x+1)$**

**Solution:**

$$\text{Let } p(x) = (2x+1)^3 + 6(3+4x)^2 - 10$$

When  $p(x)$  is divided by  $2x+1$  the remainder  $R = p\left(\frac{-1}{2}\right)$

$$\left[2\left(\frac{-1}{2}\right) - 1\right]^3 + 6\left[3 + 4\left(\frac{-1}{2}\right)\right]^2 - 10$$

$$= (-1-1)^3 + 6(3-2)^2 - 10$$

$$(-2)^3 + 6(1)^2 - 10$$

$$= -8 + 6 - 10 = -12$$

Therefore remainder = -12

**(iv)  $x^3 - 3x^2 + 4x - 14$  is divided by  $(x+2)$**

$$\text{Let } p(x) = x^3 - 3x^2 + 4x - 14$$

when  $p(x)$  is divided by  $x+2$  the remainder  $R = p(-2)$

$$= (-2)^3 - 3(-2)^2 + 4(-2) - 14$$

$$= -8 - 12 - 8 - 14 = -42$$

Therefore remainder = -42

**Q2. If  $(x+2)$  is a factor of  $x^2 - 4kx - 4k^2$  then find the value(s) of  $k$ .**

**Solution:**

$$\text{Let } p(x) = x^2 - 4kx - 4k^2$$

As  $x+2 = x - (-2)$  is a factor of  $p(x)$

$$\text{So } p(-2) = 0$$

$$3(-2)^2 - 4k(-2) - 4k^2 = 0$$

$$12 + 8k - 4k^2 = 0$$

$$\text{or } 3 + 2k - k^2 = 0$$

$$3 + 3k - k - k^2 = 0$$

$$3(1+k) - k(1+k) = 0$$

$$(1+k)(3-k) = 0$$

$$1+k=0 : 3-k=0$$

$$k=-1 : k=3$$

$$\Rightarrow k = -1, 3$$

(ii) If  $(x-1)$  is a factor of  $x^3 - kx^2 + 11x - 6$ , then find the value(s) of  $k$ .

**Solution:**

$$\text{Let } p(x) = x^3 - kx^2 + 11x - 6$$

As  $x-1$  is a factor of  $p(x)$  we have  $p(1) = 0$

i.e.

$$(1)^3 - k(1)^2 + 11(1) - 6 = 0$$

$$1 - k + 11 - 6 = 0$$

$$-k + 6 = 0$$

$$\Rightarrow k = 6$$

**Q3. Without actual long division determine whether.**

1.  $(x-2)$  and  $(x-3)$  are factors of

$$P(x) = x^3 - 12x^2 + 44x - 48$$

**Solution:**

The remainder for  $x-2$  is

$$P(2) = (2)^3 - 12(2)^2 + 44(2) - 48$$

$$= 8 - 48 + 88 - 48$$

$$= 0$$

Since remainder = 0 therefore  $x-2$  is a factor of  $p(x)$

The remainder for  $x-3$  is

$$P(3) = (3)^3 - 12(3)^2 + 44(3) - 48$$

$$=3$$

Since remainder is not equal to zero therefore  $x-3$  is not a factor

**2.  $(x-2)$ ,  $(x+3)$  and  $(x-4)$  are factors of**

$$q(x) = x^3 + 2x^2 - 5x - 6$$

**Solution:**

$$q(x) = x^3 + 2x^2 - 5x - 6$$

The remainder for  $x-2$  is

$$p(2) = (2)^3 + 2(2)^2 - 5(2) - 6$$

$$P(2) = 8+8-10-6$$

Since remainder=0 therefore  $x-2$  is a factor of  $q(x)$

The remainder for  $x-4$  is

$$P(4) = 4^3 + 2(4)^2 - 5(4) - 6$$

$$=70$$

Not a factor as remainder is not equal to zero

**Q4. For what value of  $m$  is the polynomial  $p(x) = 4x^3 - 7x^2 + 6x - 3m$  exactly divisible by  $x+2$ :**

**Solution:**

$$P(x) = 4x^3 - 7x^2 + 6x - 3m$$

As  $p(x)$  is exactly divisible  $x+2$  therefore remainder=0

$$4(-2)^3 - 7(-2)^2 + 6(-2) - 3m = 0$$

$$-72 - 3m = 0$$

$$-24 - m = 0$$

$$m = -24$$

**Q5. Determine the value of  $k$  if  $p(x) = kx^3 + 4x^2 + 3x - 4$  And  $q(x) = x^3 - 4x + k$  leaves the same remainder when divided by  $x-3$ :**

**Solution:**

$$P(3) = k(3)^3 + 4(3)^2 + 3(3) - 4$$

$$=27k+41$$

$$Q(3) = (3)^2 - 4(3) + k$$

$$=15+k$$

According to given condition:

$$27k+41=15+k$$

$$K=-1$$

**Q6. The remainder after dividing the polynomial  $p(x) = x^3+ax^2+7$  by  $(x+1)$  is 2b. Calculate the value of a and b if this expression leaves a remainder of  $(b+5)$  on being divided by  $(x-2)$**

**Solution:**

$$P(x) = x^3 + ax^2 + 7$$

When  $p(x)$  is divided by  $x+1$ , then the remainder  $p(-1)=0$

$$P(-1) = (-1)^3 + a(-1)^2 + 7$$

$$= -1 + a + 7$$

$$= a + 6$$

As given remainder = 2b

$$A+6=2b$$

$$a-2b=-6 \quad \dots\dots(i)$$

When  $p(x)$  is divided by  $x-2$ , then the remainder  $p(2)=0$

$$p(2) = (2)^3 + a(2)^2 + 7$$

$$=4a+15$$

As given remainder = b+15

Therefore, calculated remainder = given remainder

$$4a+15=b+5$$

$$4a-b=-10 \quad \dots\dots(ii)$$

Multiply eq2 by 2 and subtract from eq1:

$$a - 2b = -6$$

$$-8a \mp 2b = \mp 20$$

$$-7a=14$$

Put  $a = -2$  in eq1, we get

$$-2-2b=-6$$

$$-2b=-4 \quad \text{or} \quad b=2$$

$$a = -2, b = -2$$

**Q7. The polynomial  $x^3+lx^2+mx+24$  has factor  $(x+4)$  and it leaves a remainder of 36 when divided by  $(x-2)$ . Find the value of  $l$  and  $m$ .**

$$\text{Let } P(x) = x^3+lx^2+mx+24$$

As  $x+4$  is a factor of  $p(x)$

$$\text{i.e. } (-4)^3+l(-4)^2+m(-4)+24=0$$

$$4l-m=10 \quad \dots\dots\dots(i)$$

When  $p(x)$  is divided by  $x-2$

When remainder is  $p(2)$

$$\text{Then } P(2)=36$$

$$x^3 + lx^2 + mx + 24 = 36$$

$$8 + 4l + 2m + 24 = 36$$

$$4l + 2m = 4$$

$$2l + 3m = 2 \quad \dots\dots\dots(ii)$$

By adding eq1 and eq2 we get:

$$6l = 12$$

$$l = 2$$

Putting  $l = 2$  in eq (i)

$$8 - m = 10$$

$$-m = 2$$

$$m = -2$$

So,  $l = 2, m = -2$

**Q8. The expression  $lx^3 + mx^2 - 4$  leaves remainder of -3 and 12 when divided by  $(x-1)$  and  $(x+2)$  respectively. Calculate the values of  $l$  and  $m$ .**

**Solution:**

When  $p(x)$  is divided by  $x-1$  the remainder

$$L(x)^3m(1)^2-4=-3$$

$$L+m-4=-3$$

$$L+m=1 \quad \dots\dots\dots(i)$$

When  $p(x)$  is divided by  $x+2$  the remainder

$$P(-2)=12$$

$$L(-2)^2+m(-2)^2-4=12$$

$$-8l+4m-4=12$$

$$-8l+4m=16$$

$$-2l+m=4 \quad \dots\dots\dots(ii)$$

Subtracting eq2 from eq1:

$$3l=-3$$

$$l=-1$$

Putting  $l = -1$  in eq1:

$$-l+m=1$$

$$m=2$$

So  $l=-1, m=2$

**Q9 The expression  $ax^3 - 9x^2 + bx + 3a$  is exactly divisible  $x^2 - 5x + 6$ . Find the values of  $a$  and  $b$ .**

**Solution:**

$$\text{Let } p(x) = ax^3 - 9x^2 + bx + 3a$$

$$q(x) = x^2 - 5x + 6$$

$$=x^2-3x-2x+6$$

$$=x(x-3)-2(x-3)$$

$$=(x-3)(x-2)$$

As  $p(x)$  is exactly divisible by  $q(x)$ . So,  $p(x)$  is exactly divisible by  $x-2$  and  $x-3$  [ $x=2$ ,  $x=3$ ]

Hence  $p(2)=0$

And  $p(3)=0$

$$P(2) = 2(2)^3 - 9(2)^2 + b(2) + 3a = 0$$

$$8a - 36 + 2b + 3a = 0$$

$$11a + 2b = 36$$

$$P(3) = 2(3)^3 - 9(3)^2 + b(3) + 3a = 0$$

$$27a - 81 + 3b + 3a = 0$$

$$30a + 3b = 81$$

$$10a + b = 27$$

By multiplying eq2 by 2 and subtracting from eq1:

$$11a + 2b = 36$$

$$\underline{\pm 20a \pm 2b = \pm 54}$$

$$-9a = -18$$

$$a = 2$$

Putting in eq2:

$$20 + b = 27$$

$$b = 7$$

So,  **$a=2$**  and  **$b=7$**

## Exercise 5.4

**Factorize each of the following cubic polynomials by factor theorem.**

**Q1.**  $x^3 - 2x^2 - x + 2$

**Solution:**

Let  $p(x) = x^3 - 2x^2 - x + 2$

Possible factors of constant zeros of  $p(x)$  are  $p = \pm 1, \pm 2$  and possible factors of leading coefficient 1 are  $q = \pm 1$  Thus the expected zeros of  $p(x)$  are

$$\frac{p}{q} = \pm 1, \pm 2$$

Now  $p(1) = 1^3 - 2(1)^2 - 1 + 2$   
 $= 1 - 2 - 1 + 2$

Hence  $x=1$  is a zero of  $p(x)$  are therefore  $x-1$  is a factor of  $p(x)$

$p(-1) = -1^3 - 2(-1)^2 - 1 + 2$   
 $= -1 - 2 + 1 + 2 = 0$

Hence  $x=-1$  is a zero of  $p(x)$  and

Therefore  $x-1$  and  $x+1$  is a factor of  $p(x)$

$p(2) = 2^3 - 2(2)^2 - 2 + 2$   
 $= 8 - 8 - 2 + 2 = 0$

Hence  $x=2$  is a zero of  $p(x)$  and therefore  $x-2$  is a factor of  $p(x)$

Hence required factors are  $(x-1)(x+1)(x-2)$

**Q2.**  $x^3 - x^2 - 22x + 40$

**Solution:**

Let  $p(x) = x^3 - x^2 - 22x + 40$

Possible factors of constant term 40 are

$$p = \pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \pm 8, \pm 10, \pm 20, \pm 40$$

And those of leading coefficient 1 are Thus the possible zeros of  $p(x)$

$$\pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \pm 8, \pm 10, \pm 20, \pm 40$$

Now  $p(1) = 1 - 1 - 22 + 44 = 18 \neq 0$

So  $x-1$  is not a factor of  $p(x)$

$$\begin{aligned} p(x) &= -1^3 - 1^2 - 22(-1) + 40 \\ &= 8 - 4 - 44 + 40 = 0 \\ &= -1 - 1 + 22 + 40 = 60 \neq 0 \end{aligned}$$

$x+1$  is not a factor of  $p(x)$

$$\begin{aligned} p(2) &= -2^3 - (-2)^2 - 22(2) + 40 \\ &= 8 - 4 - 44 + 40 = 0 \end{aligned}$$

$x-2$  is a factor of  $p(x)$

$$\begin{aligned} p(-2) &= (-2)^2 - 22(-2) + 40 \\ &= 8 - 4 + 44 + 40 = 72 \neq 0 \end{aligned}$$

$x+2$  is not a factor of  $p(x)$

$$\begin{aligned} p(4) &= p(4) = 4^3 - (4)^2 - 22(4) + 40 \\ &= 64 - 16 - 88 + 40 = 48 \neq 0 \end{aligned}$$

$x-4$  is not a factor of  $p(x)$

$$p(-4) = -4^3 - (4)^2 - 22(4) + 40$$

$x+4$  is not a factor of  $p(x)$

$$\begin{aligned} p(5) &= 5^3 - (5)^2 - 110 + 40 \\ &= 125 - 25 - 110 + 40 = 30 \neq 0 \end{aligned}$$

$x-5$  is not a factor of  $p(x)$

$$\begin{aligned} p(-5) &= -5^3 - (-5)^2 - 22(-5) + 40 \\ &= 125 - 25 + 110 + 40 = 0 \end{aligned}$$

So,  $x+5$  is a factor of  $p(x)$

Hence required factors are  $(x-2)(x-4)(x+5)$

**Q3.**  $x^3 - 6x^2 + 3x + 10$

**Solution:**

Let  $p(x) = x^3 - 6x^2 + 3x + 10$

Possible factors of constant term 10 are

$$\pm 1, \pm 2, \pm 5, \pm 10$$

$$p(-1) = -1^3 - (-1)^2 - 22(-1) + 40$$

Now  $= 8 - 4 - 44 + 40 = 0$

$$= -1 - 1 + 22 + 40 = 60 \neq 0$$

So,  $x+1$  is not a factor

$$p(2) = 2^3 - (2)^2 - 22(2) + 40$$

$$= 8 - 4 - 44 + 40 = 0$$

$x-2$  is not a factor

$$p(-2) = -2^3 - (-2)^2 - 22 + 40$$

$$= -8 - 4 - 44 + 40 = 72 \neq 0$$

$x+4$  is not a factor of  $p(x)$

$$p(5) = 5^3 - (5)^2 - 22(5) + 40$$

$$= 30 \neq 0$$

$x-5$  is not a factor of  $p(x)$

$$p(-5) = -5^3 - (5)^2 - 22(-5) + 40$$

$$= 125 - 25 + 110 + 40 = 0$$

So,  $x-5$  is a factor of  $p(x)$

Hence required factors are  $(x-2)(x-4)(x+5)$

**Q4.**  $x^3 + x^2 - 10x + 8$

**Solution:**

Let  $p(x) = x^3 + x^2 - 10x + 8$

Possible factors of constant term 8 are

$$p = \pm 1, \pm 2, \pm 4, \pm 8$$

Thus the expected zeros of  $p(x)$  are

$$\frac{p}{q} = \pm 1, \pm 2, \pm 4, \pm 8 \quad \frac{p}{q} = \pm 1, \pm 2, \pm 4, \pm 8$$

$$\begin{aligned} p(1) &= (1)^3 + (1)^2 - 10(1) + 8 \\ &= 1 + 1 - 10 + 8 = 0 \end{aligned}$$

So,  $x-1$  is a factor of  $p(x)$

$$\begin{aligned} p(-1) &= (-1)^3 + (-1)^2 - 10(-1) + 8 \\ &= -1 + 1 + 10 + 8 = 18 \neq 0 \end{aligned}$$

$x+1$  is not a factor of  $p(x)$

$$\begin{aligned} p(2) &= (2)^3 + (2)^2 - 10(2) + 8 \\ &= 8 + 4 - 20 + 8 = 0 \end{aligned}$$

$x+2$  is not a factor of  $p(x)$

$$\begin{aligned} p(-4) &= (-4)^3 + (4)^2 - 10(4) + 8 \\ &= -64 + 16 - 40 + 8 = 0 \end{aligned}$$

$x-4$  is not a factor of  $p(x)$

$$\begin{aligned} p(-4) &= (-4)^3 + (4)^2 - 10(4) + 8 \\ &= -64 + 16 - 40 + 8 = 0 \end{aligned}$$

So,  $x+4$  is a factor of  $p(x)$

Hence required factors are  $(x-1)(x-2)(x+4)$

**Q5.**  $x^3 - 2x^2 + 5x + 6$

**Solution:**

Let  $p(x) = x^3 - 2x^2 + 5x + 6$

Possible factors of constant term 6 are

$$p = \pm 1, \pm 2, \pm 3, \pm 6$$

Thus the possible zeros of  $p(x)$  are

$$\frac{p}{q} = \pm 1, \pm 2, \pm 3, \pm 6$$

$$P(1) = 1^3 - 2(1)^2 - 5(1) + 6$$

$$= -1 - 2 + 5 + 6 = 8 \neq 0$$

So,  $x-1$  is a factor of  $p(x)$

$$p(-1) = 1^3 - 2(1)^2 - 5(1) + 6$$

$$= -1 - 2 + 5 + 6 = 8 \neq 0$$

$x-2$  is not a factor of  $p(x)$

$$p(-2) = -2^3 - 2(2)^2 - 5(-2) + 6$$

$$= -8 - 8 + 10 + 6 = 0$$

$x+2$  is a factor of  $p(x)$

$$p(3) = 3^3 - 2(3)^2 - 5(3) + 6$$

$$= 27 - 18 + 15 + 6 = 0$$

So,  $x-3$  is a factor of  $p(x)$

Hence required factors are  $(x-1)(x-3)(x+2)$

**Q6.**  $x^3 + 5x^2 - 2x - 24$

**Solution:**

Let  $p(x) = x^3 - x^2 - 22x + 40$

Possible factors of constant term 40 are

$$p = \pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \pm 8, \pm 10, \pm 20, \pm 40$$

And those of leading coefficient 1 are Thus the possible zeros of  $p(x)$

$$\pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \pm 8, \pm 10, \pm 20, \pm 40$$

Now  $p(1) = 1 - 1 - 22 + 44 = 18 \neq 0$

So  $x-1$  is not a factor of  $p(x)$

$$\begin{aligned} p(x) &= -1^3 - 1^2 - 22(-1) + 40 \\ &= 8 - 4 - 44 + 40 = 0 \\ &= -1 - 1 + 22 + 40 = 60 \neq 0 \end{aligned}$$

$x+1$  is not a factor of  $p(x)$

$$\begin{aligned} p(2) &= -2^3 - (-2)^2 - 22(2) + 40 \\ &= 8 - 4 - 44 + 40 = 0 \end{aligned}$$

$x-2$  is a factor of  $p(x)$

$$\begin{aligned} p(-2) &= (-2)^2 - 22(-2) + 40 \\ &= 8 - 4 + 44 + 40 = 72 \neq 0 \end{aligned}$$

$x+2$  is not a factor of  $p(x)$

$$\begin{aligned} p(4) &= p(4) = 4^3 - (4)^2 - 22(4) + 40 \\ &= 64 - 16 - 88 + 40 = 48 \neq 0 \end{aligned}$$

$x-4$  is not a factor of  $p(x)$

$$p(-4) = -4^3 - (4)^2 - 22(4) + 40$$

$x+4$  is not a factor of  $p(x)$

$$\begin{aligned} p(5) &= 5^3 - (5)^2 - 110 + 40 \\ &= 125 - 25 - 110 + 40 = 30 \neq 0 \end{aligned}$$

$x-5$  is not a factor of  $p(x)$

$$\begin{aligned} p(-5) &= -5^3 - (-5)^2 - 22(-5) + 40 \\ &= 125 - 25 + 110 + 40 = 0 \end{aligned}$$

So,  $x+5$  is a factor of  $p(x)$

Hence required factors are  $(x-2)(x-4)(x+5)$

**Q7.**  $3x^3 - x^2 - 12x + 4$

**Solution:**

Let  $p(x) = 3x^3 - x^2 - 12x + 4$

Possible factors of the constant term 4 are

$$P = \pm 1, \pm 2, \pm 4$$

And those of the leading coefficient 3 are  $q = \pm 1, \pm 3$

Thus the possible zeros of  $p(x)$

$$\begin{aligned} p(-1) &= 3(-1)^3 - (-1)^2 - 12(-1) + 4 \\ &= 3 - 1 + 12 + 4 = 12 \neq 0 \end{aligned}$$

So,  $x-1$  is not a factor of  $p(x)$

$$\begin{aligned} p(-1) &= 3(-1)^3 - (-1)^2 - 12(-1) + 4 \\ &= 3 - 1 + 12 + 4 = 12 \neq 0 \end{aligned}$$

$x-2$  is not a zero of  $p(x)$

$$\begin{aligned} p(-2) &= 3(-2)^3 - (-2)^2 - 12(-2) - 24 \\ &= -24 - 4 + 4 + 4 = 0 \end{aligned}$$

So,  $x+2$  is a zero of  $p(x)$

$$\begin{aligned} p\left(\frac{1}{3}\right) &= 3\left(\frac{1}{3}\right)^3 - \left(\frac{1}{3}\right)^2 - 12\left(\frac{1}{3}\right) + 4 \\ &= \frac{1}{9} - \frac{1}{9} - 4 + 4 = 0 \end{aligned}$$

So  $3x-1$  is zero of  $p(x)$

Hence  $(x-2), (x+2)$  and  $(3x-1)$  are factors of  $P(x)$

Hence required functions are  $(x-2)(x+2)(3x-1)$

**Q8.**  $2x^3 + x^2 - 2x - 1$

**Solution:**

Let  $p(x) = 2x^3 + x^2 - 2x - 1$

Possible factors of the constant term  $-1$  are  $p = \pm 1$  and those of leading coefficient 2 are  $q = \pm 1, \pm 2$

Thus the possible zeros  $p(x)$  are  $\frac{p}{q} = \pm 1, \pm \frac{1}{2}$

$$\begin{aligned}p(1) &= 2(1)^3 + (1)^2 - 2(1) - 1 \\ &= 2 + 1 - 2 - 1 = 0\end{aligned}$$

So,  $x-1$  is a zero of  $p(x)$

$$\begin{aligned}p\left(\frac{1}{2}\right) &= 2\left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^2 - 2\left(\frac{1}{2}\right) - 1 \\ &= \frac{1}{4} + \frac{1}{4} - 1 - 1 = 0\end{aligned}$$

So,  $x = -\frac{1}{2}$  is a zero of  $p(x)$

Hence  $x+1$  and  $2x+1$  are factors of  $p(x)$

Hence required factors are  $(x+1)(x-1)(2x+1)$

ClassNotes

## بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

جماعت : نہم ، مضمون : اسلامیات ، ماہ : جولائی 2020 ، ایک ہفتے میں پیریڈز کی تعداد : چار  
سلیبس : سورۃ انفال : رکوع نمبر چار ، احادیث : ایک تا تین ، موضوعاتی مطالعہ : قرآن مجید (تعارف، حفاظت اور فضائل)  
پہلا ہفتہ : رکوع نمبر چار (سورہ انفال)

پہلا دن : آیات نمبر 29 تا ۳۲ (کتاب سے ترجمہ یاد کریں) ، دوسرا دن : آیات نمبر ۳۳ تا ۳۵ (کتاب سے ترجمہ یاد کریں)  
تیسرا دن : آیات نمبر ۳۶ تا ۳۷ (کتاب سے ترجمہ یاد کریں) ، چوتھا دن : مشق رکوع نمبر چار (نوٹس سے یاد کریں)  
دوسرا ہفتہ : تین احادیث :

پہلا دن : حدیث نمبر ۱ (ترجمہ و تشریح کتاب سے یاد کریں) ، دوسرا دن : حدیث نمبر ۲ ، تیسرا دن : حدیث نمبر ۳ ، چوتھا دن : تینوں احادیث کو دہرا لیں۔

تیسرا ہفتہ : موضوعاتی مطالعہ

پہلا دن : قرآن مجید کا تعارف ، دوسرا دن : قرآن مجید کی حفاظت ، تیسرا دن : قرآن مجید کے فضائل ، چوتھا دن : تینوں اسباق کو دہرا لیں  
چوتھا ہفتہ : دہرائی اور خود آزمائی (ان موضوعات کو درسی کتاب سے یاد کریں اور لکھیں۔)

### سورۃ انفال کے رکوع نمبر چار کے مختصر سوالات اور ان کے جوابات

#### الدرس الثانی (الف)

س-۱ اس سبق میں تقویٰ کے کیا انعامات بیان ہوئے ہیں؟

ج- اللہ تعالیٰ نے مومنوں کو خطاب کرتے ہوئے فرمایا ہے کہ اگر تم تقویٰ اختیار کرو گے تو وہ تمہارے لیے امر فارق پیدا کر دے گا یعنی تمہیں ممتاز کر دے گا اور واضح طور پر برتری اور غلبہ عطا کرے گا۔

س-۲ واذینکربک الذین کفرو میں کس واقعے کی طرف اشارہ ہے؟

ج- اس آیت میں کفار کی اس سازش کی طرف اشارہ ہے جو انہوں نے نبی کریم ﷺ کے خلاف کی کہ آپ ﷺ کو قید کر دیا جائے یا جلا وطن کر دیا جائے یا قتل کر دیا جائے۔ اس واقعے کے بعد اللہ تعالیٰ نے نبی کریم ﷺ کو مکہ سے مدینہ ہجرت کرنے کا حکم دیا۔

س-۳ کفار کے مطالبے کے باوجود اللہ تعالیٰ نے ان پر عذاب کیوں نازل نہ کیا؟

ج- کفار کے مطالبے کے باوجود اللہ تعالیٰ نے ان پر عذاب اس لیے نازل نہ کیا کیونکہ نبی کریم ﷺ ان میں موجود تھے۔ اس کے علاوہ اگر کسی قوم میں اللہ تعالیٰ سے بخشش مانگنے والے لوگ موجود ہوں تو پھر بھی اللہ تعالیٰ عذاب نازل نہیں کرتا۔

س-۴ مندرجہ ذیل عبارات کا مفہوم بیان کیجئے۔؟

(الف) وَمَا كَانَ اللَّهُ لِيُعَذِّبَهُمْ وَأَنْتَ فِيهِمْ وَمَا كَانَ اللَّهُ مُعَذِّبَهُمْ وَهُمْ يَسْتَغْفِرُونَ

مفہوم۔ اس آیت کا مفہوم یہ ہے کہ کفار نے اللہ تعالیٰ سے عذاب کا مطالبہ کیا لیکن ان کے مطالبے کے باوجود اللہ تعالیٰ نے ان پر عذاب اس لیے نازل نہ کیا کیونکہ نبی کریم ﷺ ان میں موجود تھے۔ اس کے علاوہ اللہ تعالیٰ سے بخشش مانگنے والے لوگ کسی قوم میں موجود ہوں تو پھر بھی اللہ تعالیٰ عذاب نازل نہیں کرتا۔

(ب) إِنَّ الَّذِينَ كَفَرُوا يُنْفِقُونَ أَمْوَالَهُمْ لِيَصُدُّوا عَنْ سَبِيلِ اللَّهِ فَسَيَفْقُرُونَ نَهَا ثُمَّ تَكُونُ عَلَيْهِمْ حَسْرَةٌ ثُمَّ يُغْلَبُونَ

مفہوم۔ غزوہ بدر کے بعد اللہ تعالیٰ نے کفار کے حق میں پیشین گوئی فرمائی کہ یہ لوگوں کو اللہ کی راہ سے روکنے کے لیے اپنا مال خرچ کریں گے لیکن ایک وقت آئے گا کہ ان کا مال خرچ کرنا ان کے لیے موجب فسوس ہوگا اور وہ مغلوب ہو جائیں گے

### من ہدی الحدیث

- س-1 حدیث کی روشنی میں بتائیں کہ سب سے فضیلت والا عمل کیا ہے؟
- ج- سب سے فضیلت والا عمل لا الہ الا اللہ ہے یعنی اللہ تعالیٰ کے سوا کسی اور کو الہ نہ ماننے کا اقرار اور اپنے عمل سے اس عقیدے کا اظہار سب سے فضیلت والا عمل ہے۔
- س-2- الہ سے کیا مراد ہے؟
- ج- الہ سے مراد ایسی ذات ہے جس کی عبادت کی جائے جس سے بے پناہ محبت اور عقیدت ہو، جس کی عظمت سے دل لبریز ہوں اور جس کی نافرمانی کا خوف سب سے بڑھ کر ہو۔
- س-3- استغفار سے کیا مراد ہے؟
- ج-3 استغفار سے مراد یہ ہے کہ انسان اپنے گناہوں اور نافرمانیوں پر شرمندہ ہو کر اللہ تعالیٰ سے معافی مانگے۔ اپنی اصلاح کرے اور دوبارہ نہ کرنے کا عہد کرے۔
- س-4- انسانی فطرت کا بنیادی تقاضا کیا ہے؟
- ج-4- انسانی فطرت کا بنیادی تقاضا یہ ہے کہ اسے اپنی ذات اور کائنات کے بارے میں ہر اچھی اور بری بات کا علم ہو۔
- س-5- علم کی فرضیت کے بارے میں ایک حدیث کا ترجمہ لکھیں۔
- ج-5- آپ ﷺ نے فرمایا "علم کی طلب ہر مسلمان (مرد و عورت) پر فرض ہے۔"
- س-5- ہمارے ملک میں لڑکوں کے مقابلے میں لڑکیوں کی تعلیم کا تناسب کیا ہے؟
- ج- ہمارے ملک میں لڑکوں کے مقابلے میں لڑکیوں کی تعلیم کا تناسب نصف ہے اور لڑکیوں کے مدارس کی تعداد بھی آدھی ہے۔
- س-6- علم حاصل کرنا کیوں ضروری ہے؟
- ج-6- علم حاصل کرنا اس لیے ضروری ہے کیوں کہ انسان علم کے بغیر اپنے مقام اور اللہ تعالیٰ کی طرف سے عائد کردہ فرائض کو نہیں جان سکتا۔ اس کے علاوہ کائنات میں موجود اشیا کے بارے میں جاننا انسان کی فطری ضرورت ہے اور علم اس ضرورت کو پورا کرتا ہے۔

### موضوعاتی مطالعہ: قرآن مجید (تعارف، حفاظت اور فضائل)

- س-1- قرآن مجید کو کچھلی کتابوں کے لیے مُصدِّق کہنے کا کیا مطلب ہے؟
- ج- قرآن مجید کو کچھلی کتابوں کے لیے مُصدِّق کہنے کا مطلب یہ ہے کہ یہ پہلی آسمانی کتابوں کی تصدیق کرتا ہے اور یہ بتاتا ہے کہ یہ کتابیں اللہ کی طرف سے نازل ہوئیں۔ اور ان میں ہدایت اور نور تھا اور اپنے زمانے کے لوگوں کے لیے ہدایت کا ذریعہ تھیں۔
- س-2- قرآن مجید کو کچھلی کتابوں کے لیے مُہین کہنے کا مطلب کیا ہے؟
- ج-2- قرآن مجید کو کچھلی کتابوں کے لیے مُہین کہنے کا مطلب یہ ہے کہ ان کتابوں میں جو تعلیمات اور عقائد اپنی اصلی حالت میں محفوظ نہ رہ سکے انہیں قرآن مجید نے اپنے اندر از سر نو بیان کر کے محفوظ کر دیا ہے۔
- س-3- قرآن مجید انسانی زندگی کے تمام پہلوؤں سے متعلق رہنمائی کرتا ہے؟
- ج- قرآن مجید انسانی زندگی کے تمام پہلوؤں سے متعلق رہنمائی کرتا ہے اس میں انسانی زندگی کی حقیقت، خیر و شر، حلال و حرام، اخلاقی تعلیمات اور آخرت کی زندگی کے متعلق رہنمائی کرتا ہے۔
- س-4- حفاظت قرآن مجید پر ایک آیت کا ترجمہ لکھیں؟
- ج- ترجمہ: بلاشبہ یہ ذکر ہم نے نازل کیا ہے اور خود ہم اس کے محافظ ہیں (الحجر-9)

س-5 حضرت ابو بکر صدیقؓ کے دور میں حفاظت قرآن پر کیا کام ہوا ہے؟-

ج- حضرت ابو بکر صدیقؓ نے نبی اکرم ﷺ کی رحلت کے بعد آپ ﷺ کی مقرر کردہ ترتیب کے مطابق قرآن مجید کے متفرق اجزا کو یک جا کر کے محفوظ کر دیا۔ آیت کی ترتیب اور سورتوں کے نام وہی تھے جو نبی کریم ﷺ نے اللہ کے حکم سے مقرر فرمائے تھے۔

س-6 حضرت عثمان غنیؓ کے دور میں حفاظت قرآن پر کیا کام ہوا؟-

ج- حضرت عثمان غنیؓ کے دور میں قرآن مجید کی قراءت میں اختلاف پیدا ہوا تو آپؓ نے ایک کمیٹی قائم کی اور حضرت ابو بکر صدیقؓ کے دور میں لکھوائے ہوئے مصحف کی قراءت قریش کے مطابق نقول تیار کر کے تمام صوبائی دارالحکومتوں میں ایک ایک نسخے کے طور پر بھجوادیں اور قاری بھی ساتھ بھجوادے تاکہ قرآن مجید کی قراءت میں کوئی اختلاف باقی نہ رہے۔

س-7 قرآن مجید کی فضیلت پر ایک حدیث کا ترجمہ تحریر کریں؟-

ج- ترجمہ: تم میں سے بہتر وہ ہے جس نے قرآن سیکھا اور اسے (دوسروں کو) سکھایا۔

س-8 مسلمان کب تک دنیا پر غالب رہے اور کب عزت و سر بلندی سے محروم ہو گئے؟-

ج- مسلمان جب تک قرآن مجید کی تعلیمات پر عمل پیرا رہے دنیا پر غالب رہے جب انھوں نے اس کی طرف سے غفلت برتی تو عزت و سر بلندی سے محروم ہو گئے۔

## خود آزمائی

جون اور جولائی 2020

جماعت: نہم پرچہ: اسلامیات کل نمبر 50 وقت: ایک گھنٹہ 45 منٹ

(حصہ معروضی)

۱۰	س۔ 1 درج ذیل میں سے درست جوابات کی نشاندہی کریں۔	دس	پانچ	بارہ	تین
	۱۔ سورۃ انفال کے کتنے رکوع ہیں؟	ستر	پچھتر	اسی	سو
	۲۔ سورۃ انفال کی کتنی آیات ہیں؟	دو ہزار	تین ہزار	ایک ہزار	پانچ ہزار
	۳۔ غزوہ بدر میں کتنے فرشتے نازل ہوئے تھے	اس نے پھینکا	تو نے پھینکا	میں نے پھینکا	ہم نے پھینکا
	۴۔ رَمِيَتْ کا معنی ہے	مدد کرنا	ڈر جاتے ہیں	لگا تار	اوگھ
	۵۔ وَجَلَّتْ کا معنی ہے	نماز	روزہ	حج	انسان
	۶۔ قرآن مجید کا موضوع ہے	حرف	لفظ	آیت	رکوع
	۷۔ قرآن مجید کے ایک۔۔۔ کی تلاوت پر دس نیکیاں ملتی ہیں	بیس سال	تیس سال	تیس سال	دس سال
	۸۔ قرآن مجید قریباً کتنے عرصے میں نازل ہوا	اس نے سیکھا	اس نے سکھایا	معافی مانگنا	ذکر کرنا
	۹۔ تَعَلَّمَ کا معنی ہے	عابد	معبود	جن	فرشتہ
	۱۰۔ اِلٰه کا معنی ہے				

س۔ 2 درج ذیل میں سے چھ سوالات کے مختصر جوابات تحریر کریں۔

۱۔ مال غنیمت کو انفال کیوں کہا جاتا ہے؟ ۲۔ کفار کے ساتھ مقابلے کی صورت میں سورۃ انفال کی آیات میں کیا ہدایت کی گئی ہیں؟

۳۔ سورۃ انفال میں تقویٰ کے کیا انعامات بیان ہوئے ہیں؟ ۴۔ واذیٰمکر بک الذین کفرو میں کس واقعے کی طرف اشارہ ہے؟

۵۔ کفار کے مطالبے کے باوجود اللہ تعالیٰ نے ان پر عذاب کیوں نازل نہ کیا؟ ۶۔ دو گروہوں سے کیا مراد ہے؟

۷۔ کفار کو خطاب کرتے ہوئے سورۃ انفال میں کیا تشبیہ کی گئی ہے؟ ۸۔ شرالدوآب سے کیا مراد ہے؟

۹۔ وَمَا رَمِيَتْ اِذْ رَمِيَتْ وَلٰكِنَّ اللّٰهَ رَمٰی کا مفہوم تحریر کریں۔

س۔ 3 درج ذیل میں سے چھ سوالات کے مختصر جوابات تحریر کریں۔

۱۔ حدیث کی روشنی میں بتائیں کہ سب سے فضیلت والا عمل کیا ہے؟ ۲۔ اللہ سے کیا مراد ہے؟ ۳۔ انسانی فطرت کا بنیادی تقاضا کیا ہے؟ ۴۔

قرآن مجید کو کچھلی کتابوں کے لیے مُصَدِّق کہنے کا کیا مطلب ہے؟ ۵۔ قرآن مجید کو کچھلی کتابوں کے لیے مہین کہنے کا مطلب کیا ہے؟ ۶۔ قرآن

مجید انسانی زندگی کے کن پہلوؤں سے متعلق رہنمائی کرتا ہے؟ ۷۔ حفاظت قرآن مجید پر ایک آیت کا ترجمہ لکھیں؟ ۸۔ حضرت عثمان غنیؓ کے

دور میں حفاظت قرآن پر کیا کام ہوا؟ ۹۔ مسلمان کب تک دنیا پر غالب رہے اور کب عزت و سر بلندی سے محروم ہو گئے؟

س-4 مندرجہ ذیل قرآنی آیات کا ترجمہ تحریر کریں۔

الف) إِنَّ الَّذِينَ كَفَرُوا يَنْفِقُونَ أَمْوَالَهُمْ لِيَصُدُّوا عَنْ سَبِيلِ اللَّهِ فَسَيَنْفِقُونَهَا ثُمَّ تَكُونُ عَلَيْهِمْ حَسْرَةً ثُمَّ يُغْلَبُونَ

ب) وَأَعْلَمُوا أَنَّمَا أَمْوَالُكُمْ وَأَوْلَادُكُمْ فِتْنَةٌ وَأَنَّ اللَّهَ عِنْدَهُ أَجْرٌ عَظِيمٌ

ج) وَلَنْ تُغْنِيَ عَنْكُمْ فِتْنَتُكُمْ شَيْئًا وَلَوْ كَثُرَتْ وَأَنَّ اللَّهَ مَعَ الْمُؤْمِنِينَ

س-5 درج ذیل حدیث کا ترجمہ اور تشریح کریں۔

طَلَبُ الْعِلْمِ فَرِيضَةٌ عَلَى كُلِّ مُسْلِمٍ.

س-6 فضائل قرآن پر نوٹ لکھیں یا حفاظت قرآن پر نوٹ لکھیں۔

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یونٹ نمبر 02

مضمون: مطالعہ پاکستان

کلاس: نہم

درج ذیل سوالات کے درست جواب پر نشان لگائیں

- 1- اورنگزیب عالمگیر نے وفات پائی؟  
(ا) 1707 میں (ب) 1708 میں (ج) 1717 میں (د) 1718 میں
- 2- 1906 میں قائم ہوئی؟  
(ا) کانگریس (ب) مسلم لیگ (ج) انجمن حمایت اسلام (د) مجلس احرار
- 3- پہلی جنگ عظیم ترکی نے ساتھ دیا  
(ا) روس (ب) امریکہ (ج) جرمنی (د) جاپان
- 4- علماء نے برصغیر کو قرار دیا  
(ا) دارالاسلام (ب) دارالحرب (ج) دارالامان (د) دارالسلطنت
- 5- نہرو رپورٹ پیش کی گئی  
(ا) 1938 (ب) 1928 (ج) 1908 (د) 1918
- 6- کرپس مشن ہندوستان آیا  
(ا) 1940 میں (ب) 1942 میں (ج) 1944 میں (د) 1946 میں
- 7- قائد اعظم نے حالات کی نزاکت کو بھانپتے ہوئے فوری طور پر دارالحکومت بنایا  
(ا) اسلام آباد کو (ب) لاہور کو (ج) کراچی (د) فیصل آباد کو
- 8- جنرل ایوب نے ملک میں مارشل لاء لگایا  
(ا) 10 اکتوبر 1956 (ب) 17 اکتوبر 1957 (ج) یکم اکتوبر 1958 (د) 27 اکتوبر 1958
- 9- 1970 کے انتخابات میں مغربی پاکستان سے پاکستان پیپلز پارٹی نے قومی اسمبلی کی نشستیں حاصل کیں  
(ا) 37 (ب) 81 (ج) 112 (د) 160
- 10- بنگلہ دیش کا قیام عمل میں آیا  
(ا) 1970 (ب) 1971 (ج) 1972 (د) 1973
- 11- قائد اعظم نے گورنر جنرل کی حیثیت سے حلف اٹھایا  
(ا) 11 اگست 1947 (ب) 15 اگست 1947 (ج) 14 اگست 1947 (د) 12 اگست 1947
- 12- حکومت برطانیہ نے رولٹ ایکٹ منظور کیا؟  
(ا) 1917 (ب) 1918 (ج) 1919 (د) 1920
- 13- شملہ وفد وائسرائے ہند و لارڈ منٹو سے ملا  
(ا) 1904 (ب) 1905 (ج) 1906 (د) 1907
- 14- مسلمانوں کے لیے جداگانہ انتخابات کا حق کب تسلیم کیا گیا  
(ا) 1906 (ب) 1907 (ج) 1908 (د) 1909
- 15- تحریک خلافت کا آغاز کیا گیا  
(ا) 1917 (ب) 1918 (ج) 1919 (د) 1920

- 16 - ہندوستان میں منٹو مارلے اصلاحات کا نفاذ ہوا؟  
 (ا) 1907 (ب) 1908 (ج) 1909 (د) 1910
- 17 - قائد اعظم نے کانگریس کو کب چھوڑا؟  
 (ا) 1913 (ب) 1917 (ج) 1920 (د) 1930
- 18 - پہلی عرب اسرائیل جنگ کب ہوئی؟  
 (ا) 1947 (ب) 1948 (ج) 1949 (د) 1950
- 19 - بنیادی جمہوریوں کا نظام پیش کیا  
 (ا) جنرل سکندر مرزا (ب) جنرل ایوب خان (ج) جنرل یحییٰ خان (د) جنرل ضیاء الحق
- 20 - ملتی بہنی کی مدد سے آزاد مملکت کا نعرہ لگایا  
 (ا) حسین شہید سہروردی (ب) مولانا بھاشانی (ج) شیخ مجیب الرحمن (د) ذالفقار بھٹو
- 21 - پاکستان انڈسٹریل ڈویلپمنٹ بینک کا قیام عمل میں لایا گیا  
 (ا) 1960 (ب) 1961 (ج) 1962 (د) 1965
- 22 - انویسٹمنٹ پرموشن بیورو (IBP) کا قیام عمل میں لایا گیا  
 (ا) 1957 (ب) 1958 (ج) 1959 (د) 1960
- 23 - لیاقت علی خان کو شہید کیا گیا  
 (ا) 1949 (ب) 1950 (ج) 1951 (د) 1952
- 24 - پاکستان کی پہلی اسمبلی توڑی گئی  
 (ا) 1950 (ب) 1952 (ج) 1954 (د) 1956
- 25 - قرارداد مقاصد کس نے پیش کی  
 (ا) فضل الحق (ب) لیاقت علی خان (ج) مولانا بھاشانی (د) شیخ مجیب الرحمن

مختصر سوالات کے جواب تحریر کریں۔

1- تحریک علی گڑھ کا بنیادی مقصد تحریر کریں۔

(i) حکومت اور مسلمانوں کے درمیان اعتماد بحال کرنا (ii) مسلمانان برصغیر کو جدید علوم اور انگریزی زبان سیکھنے کی طرف راغب کرنا

(iii) مسلمانان کو برصغیر کو سیاست سے باز رکھنا

2- مسلم لیگ کے قیام کے پس منظر میں کیا محرکات شامل تھے؟

(i) تقسیم بنگال 1905 اور ہندوؤں کا رد عمل (ii) انگریزوں کا رویہ (iii) مسلمانوں کا احساس محرومی (iii) مسلمانوں کا سیاسی طور پر نظر انداز کیا جانا

3- تحریک ہجرت کا سبب کیا تھا؟

1920 میں چند علماء کرام نے فتویٰ جاری کیا کہ برصغیر دار الحرب ہے۔ مسلمانوں کا انگریزوں کی عملداری میں رہنا جائز نہیں۔ انہیں دارالاسلام ہجرت کرنی چاہیے۔

4- ریڈ کلف ایوارڈ کا اہم ترین فیصلہ کیا تھا؟

ریڈ کلف نے گورداسپور کو بھارت میں شامل کر دیا اور اسی راستے سے بھارت نے کشمیر پر قبضہ کر لیا اس طرح آج تک کشمیر کا مسئلہ حل نہیں ہو سکا۔

5- قیام پاکستان کے بعد مسلمانوں کو جو مشکلات پیش آئیں ان میں سے صرف تین کے نام لکھیں۔

(i) 149 مہاجرین کی آباد کاری (ii) فوجی آٹاٹوں کی تقسیم (iii) معاشی مشکلات

6. قرارداد مقاصد کے حوالے سے حاکمیت اعلیٰ کس کے پاس ہے؟

اس قرارداد میں اس بات کی وضاحت کر دی گئی کہ ساری کائنات کا مالک اللہ تعالیٰ ہے اور سارا اقتدار اسی کو حاصل ہے اقتدار مسلمانوں کے پاس اللہ تعالیٰ کی امانت ہے اور اس اقتدار کو اللہ تعالیٰ کی مقرر کردہ حدود کے اندر رہ کر عوام کے منتخب نمائندے استعمال کریں گے۔

7- 1956 کے آئین کی تین خصوصیات بیان کریں۔

(i) پاکستان کو اسلامی جمہوریہ قرار دیا گیا (ii) ملک میں وفاقی پارلیمانی نظام حکومت قائم کیا گیا (iii) اس دستور میں اردو اور بنگالی کو قومی زبانیں قرار دیا گیا

8- بنیادی جمہوریتوں کا نظام 1959 کا تعارف لکھیں

1959 میں جنرل ایوب خان نے چار سطحی بنیادی جمہوریتوں کا نظام لانے کا فیصلہ کیا۔ اس چار سطحی نظام میں یونین کونسل، تحصیل کونسل، ضلع کونسل اور ڈویژن کونسل شامل

تھیں

9- 1956 کا آئین کب منسوخ ہوا؟

اکتوبر 1958 میں جنرل ایوب خان نے آئین منسوخ کر دیا۔

10- 1956 کا آئین کیوں منسوخ کیا گیا؟

پاکستان کے مخصوص حالات اور سیاست دانوں کی چپقلیش، جمہوری اداروں میں فوج اور بیوروکریسی کی بے جا مداخلت، اعلیٰ قیادت کے فقدان اور گورنر جنرل کی حکومتی

معاملات میں بے جا ممانی نے آئین کو زیادہ دیر چلنے نہیں دیا۔

11- قرارداد مقاصد کب اور کس پیش کی؟

12 مارچ 1949 کو اس وقت کے وزیر اعظم لیاقت علی خان نے قانون ساز ادارے میں قرارداد مقاصد پیش کی۔

12- قانون آزادی ہند کب منظور ہوا؟

18 جولائی 1947 کو برطانوی پارلیمنٹ میں قانون آزادی ہند منظور ہوا

13- کابینہ مشن پلان کے دو بنیادی مقاصد تحریر کریں۔

(i) ایک ہندوستان کی دستوری حیثیت اور حکومت کی شکل واضح کرنا اور دوسری مسلمانوں اور ہندوؤں میں نفرتوں کی خلیج کم کر کے ہندوستان کو متحد رکھنے کی کوشش کرنا

14- کرپس مشن کی تین تجاویز لکھیں۔

(i) جنگ کے بعد برصغیر تاج برطانیہ کے ماتحت ہوگا لیکن اندرونی اور بیرونی معاملات میں برطانوی حکومت کسی طرح دخل اندازی سے گریز کرے گی

(ii) دفاع، امور، خارجہ،

مواصلات وغیرہ سمیت تمام شعبے ہندوستانیوں کو سپرد کیے جائیں گے (iii) اقلیتوں کے حقوق کا تحفظ کیلئے مناسب اقدام اٹھائے جائیں گے۔

15-

نہرو رپورٹ نے مسلمانوں کے ساتھ ماضی میں کئے گئے معاہدہ لکھنؤ پر پانی پھیر دیا اور جداگانہ طریقہ انتخاب کے اصول کو رد کرتے ہوئے ان تمام تحفظات کو ماننے سے

انکار کر دیا

تو مسلمان اپنی ترقی اور بقاء کیلئے لازمی سمجھتے تھے۔

16- تحریک عدم تعاون 1920 کے کیا مقاصد تھے؟

(i) حکومت کے ساتھ عدم تعاون (ii) سرکاری ملازمتوں کو ترک کرنا (iii) فوج میں مسلمانوں کا بھرتی نہ ہونا (iv) انگریزی مصنوعات کا بائیکاٹ (v) عدالتی

بائیکاٹ (vi) بچوں کو سکولوں اور کالجوں میں نہ بھیجنا (vii) انگریزوں کے عطا کردہ خطابات واپس کرنا

17- میثاق لکھنؤ سے کیا مراد ہے؟

مسلم لیگ اور کانگریس کے درمیان 1916 میں ایک معاہدہ طے پایا جسے میثاق لکھنؤ کہتے ہیں اس معاہدے میں پہلی بار مسلمانوں کو الگ قوم تسلیم کیا گیا اور جداگانہ طریقہ

انتخاب کے مطالبے کو تسلیم کیا گیا۔

18- مسلم لیگ کے قیام کے اہم مقاصد کیا تھے؟

- (i) مسلمانوں اور برطانوی حکومت کے درمیان وفادارانہ جذبات پیدا کرنا اور حکومت کی کاروائیوں کے بارے میں ان کے شکوک و شبہات کو دور کرنا  
(ii) مسلمانوں کے سیاسی حقوق کی حفاظت کرنا اور ان کے مطالبات کو حکومت کو سامنے پیش کرنا (iii) برصغیر کی دوسری اقوام سے تعلقات استوار کرنا۔  
19- قرارداد مقاصد کی اہمیت بیان کریں؟

اس کی اہمیت کا اندازہ اس بات سے لگایا جاسکتا ہے کہ اس کی منظوری کے بعد ملک میں دستور بنانے کے کام کا آغاز کر دیا گیا اس مقصد کیلئے ایک بنیادی اصولوں کی کمیٹی بنائی گئی۔ (ii) قرارداد نے دستور بنانے کیلئے بنیادی اصولوں کی نشاندہی کر دی۔

20- مسلم عائلی قوانین 1961 کے اہم نکات لکھیں

(i) نکاح کا اندراج لازمی قرار دیا گیا (ii) پہلی بیوی کی اجازت کے بغیر دوسری شادی خلاف قانون قرار دی گئی (iii) شادی کے لیے لڑکے کی عمر 18 سال اور لڑکی کی عمر 16 سال مقرر کی گئی۔

(iv) طلاق کی صورت میں مدت عدت 90 روز کی گئی

21- دوسرے پنجسالہ منصوبے کے اہم مقاصد اور اہداف لکھیں۔

(i) قومی قومی آمدنی اور فی کس آمدنی میں اضافہ کرنا (ii) لوگوں کیلئے روزگار کے مواقع فراہم کرنا (iii) زرعی پیداوار اور بڑی اور اوسط درجے کی صنعتی پیداوار میں اضافہ کرنا

(iv) گھریلو اور چھوٹی صنعتوں کی پیداوار میں اضافہ اور برآمدات میں اضافہ کرنا۔

22- تیسرے پنجسالہ منصوبے کے اہم اہداف لکھیں

(i) قومی آمدنی میں اضافہ کرنا (ii) تمام افرادی قوت کو 1985 تک روزگار فراہم کرنا (iii) غیر ملکی امداد پر انحصار کم کرنا (iv) فی کس آمدنی کی تفاوت ختم کرنا  
23- لیگل فریم ورک آرڈر 1970 کے اہم نکات لکھیں کوئی سے تین لکھیں۔

(i) مغربی پاکستان سے ون یونٹ کا خاتمہ کر دیا اور چاروں صوبے بحال کر دیے گئے۔ (ii) انتخابات کیلئے عوام کو براہ راست ووٹ ڈالنے کا حق دیا گیا۔ رائے دہی کیلئے 21 سال عمر مقرر کی گئی (iii) انتخاب لڑنے کیلئے امیدوار کی عمر کم از کم 25 سال مقرر کی گئی

24- پاکستان میں پہلے عام انتخابات کب ہوئے؟

پاکستان کی تاریخ میں پہلی بار قومی اور صوبائی اسمبلیوں کے عام انتخابات 1970 میں ہوئے

25- مشرقی پاکستان کی علیحدگی کے چند اسباب لکھیں۔

(i) جغرافیائی فاصلہ (ii) معاشی پسماندگی (iii) تجارت و ملازمت پر ہندوؤں کے اثرات (iv) زبان کا مسئلہ (v) نمائندگی کی شرح کا مسئلہ

سردار کوڑے خان پبلک ہائر سیکنڈری سکول مظفر گڑھ

خود آزمائی کلاس: نہم مضمون: مطالعہ پاکستان کل نمبر 40

8

درج ذیل سوالات کے درست جواب پر نشان لگائیں

- 1- 1906 میں قائم ہوئی؟  
(ا) کانگریس (ب) مسلم لیگ (ج) انجمن حمایت اسلام (د) مجلس احرار
- 2- نہرو رپورٹ پیش کی گئی  
(ا) 1938 (ب) 1928 (ج) 1908 (د) 1918
- 3- کرپس مشن ہندوستان آیا  
(ا) 1940 میں (ب) 1942 میں (ج) 1944 میں (د) 1946 میں
- 4- شملہ وفد آسراے ہندو لارڈ منٹو سے ملا  
(ا) 1904 (ب) 1905 (ج) 1906 (د) 1907
- 5- مسلمانوں کے لیے جداگانہ انتخابات کا حق کب تسلیم کیا گیا  
(ا) 1906 (ب) 1907 (ج) 1908 (د) 1909
- 6- قیام پاکستان کا مطالبہ کرتے وقت مسلمانوں کی سوچ تھی کہ۔  
(ا) اتحاد عالم اسلام ہو (ب) مسلم قوم بہتر تعلیم حاصل کرے (ج) ملک میں معاشی ترقی ہو (د) وہ اپنے مذہب اور عقائد کے مطابق زندگی بسر کر سکیں
- 7- 1867ء میں جب بنارس میں ہندوؤں کی مسلم دشمنی کھل کر سامنے آگئی جس پر سرسید احمد نے واضح اعلان کیا کہ  
(ا) مسلمان اور ہندو الگ الگ قومیں ہیں (ب) مسلمان ریاست سے الگ رہیں (ج) ہندو ہمارے دوست نہیں (د) مسلمان انگریزی تعلیم حاصل کریں
- 8- قطب الدین ایبک نے دہلی سلطنت کی بنیاد رکھی۔  
(ا) 1106 (ب) 1206 (ج) 1306 (د) 1406

8x2=16

حصہ اول درج ذیل مختصر سوالات کے جواب تحریر کریں۔

- 1- تحریک ہجرت کا سبب کیا تھا؟  
2- ریڈ کلف ایوارڈ کا اہم ترین فیصلہ کیا تھا؟
- 3- قرارداد مقاصد کے حوالے سے حاکمیت اعلیٰ کس کے پاس ہے؟  
4- قرارداد مقاصد کب اور کس پیش کی؟
- 5- قانون آزادی ہند کب منظور ہوا؟  
6- مسلم لیگ کے قیام کے اہم مقاصد کیا تھے؟
- 7- قرارداد مقاصد کی اہمیت بیان کریں؟  
8- قیام پاکستان کے بعد مسلمانوں کو جو مشکلات پیش آئیں ان میں سے صرف تین کے نام لکھیں۔

8x2=16

حصہ دوم درج ذیل مختصر سوالات کے جواب تحریر کریں۔

- 1- قائد اعظم نے یکم جولائی 1948ء کو سٹیٹ بینک کا افتتاح کرتے ہوئے کیا فرمایا؟  
2- دو قومی نظریے سے کیا مراد ہے؟
- 3- ہندوستان میں ایسٹ انڈیا کمپنی قائم کرنے کا مقصد کیا تھی؟  
4- عدل و انصاف معاشرے کی ترقی کیوں ضروری ہے؟
- 5- چند مشہور مغل حکمرانوں کے نام تحریر کریں۔  
6- چند ہندو تحریکوں کے نام لکھیں۔ جس کا مقصد ہندو ازم کی اشاعت تھا۔
- 7- نظریہ کی اہمیت بیان کریں۔  
8- اقلیتوں کے حقوق کے تحفظ کے لیے قائد اعظم نے کیا فرمایا؟

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

برائے جماعت نہم ماہ جولائی ۲۰۲۰ء

کل ہفتے۔ 4 دن۔ 25 کل پیریڈ۔ 40

پہلا ہفتہ:- دن۔ 6

سبق ”شاعروں کے لطیفے“ (پڑھائی+ الفاظ معنی+ مشقی سوالات + تشریح)

درخواست برائے رخصت بوجہ ضروری کام

دوسرا ہفتہ:- دن۔ 6

سبق ”نصوح اور سلیم کی گفتگو“ (پڑھائی+ الفاظ معنی+ مشقی سوالات + تشریح)

والد صاحب کو اپنی کامیابی کی اطلاع دے کر کچھ رقم منگوانے کے لیے خط لکھیں۔ قواعد و انشائیں دیئے گئے تمام واحد جمع تحریر کریں

تیسرا ہفتہ:- دن۔ 6

سبق ”پنچایت“ (پڑھائی+ الفاظ معنی+ مشقی سوالات + تشریح، خلاصہ)

کہانی لکھیں جس کا نتیجہ ”لا لچ بری بلا ہے“ ہونا چاہیے۔ قواعد و انشائیں دیئے گئے تمام الفاظ مترادف تحریر کریں۔

چوتھا ہفتہ:- دن۔ 6

سبق ”آرام و سکون“ (مشقی سوالات + تشریح، خلاصہ)

قواعد و انشائیں دیئے گئے تمام الفاظ متضاد تحریر کریں۔ قواعد و انشائیں سے ضرب الامثال (پہلی دس)

”شاعروں کے لطیفے“ از محمد حسین آزاد

مشکل الفاظ کے معنی

معنی	الفاظ	معنی	الفاظ
خیریت تو ہے	خیر باشد	ایجاد کرنے والا	موجد
دلی اطمینان	خاطر جمعی	خیال پیدا کرنا	تخیل آفرینی
گستاخی کرنا/ بے ادبیاں	زبان درازیاں	بیان کرنے کا انداز	اسلوب بیان
کئی زیادہ تعداد	متعدد	مشابہت رکھنے والا	تمثیلی
تعریف چاہنا	داد خواہی	تصویریں بنانا	پیکر تراشی
ذرا	ٹک	شعر کی دل کشی	شعریت
شعرا گفتگو	کلام	بات کو بڑھا چڑھا کر پیش کرنا	مبالغہ آرائی
کلمہ افسوس	آہ	بحث	تکرار
نوکر خدمت گار/ خادم کی جمع	خدام	مجمع میں موجود	شریک گروہ

موقوف	-	ماتوی	-	طلوع ہونے کی جگہ
حقیقت آرائی	-	اصلیت کا بیان کرنا	-	غزل یا قصیدہ کا پہلا شعر
دلکش	-	خوب صورت	-	اندھیری رات
دل نشین	-	دل میں گھر کرنے والی	-	بغیر کسی تاخیر کے
شاہ کار	-	یادگار کام	-	کلمہ تحسین
قاطع برہان	-	پکی دلیل کو رد کرنے والی	-	مصحکہ خیز تشبیہ
طول دینا	-	بڑھانا	-	سوچ بچار
صاحب عالم	-	دنیا کا بادشاہ / شہزادہ	-	قصہ / واقعہ
بالیں	-	سر کی طرف	-	چھالے
طرف دار	-	حمایتی	-	شعر کی ایک سطر
گروہ عام	-	عام لوگ	-	خیریت دریافت کرنا

### کثیر الانتخابی سوالات

(D)	(C)	(B)	(A)	
لکھنو	کلکتہ	ڈھاکہ	دہلی	۱۔ کس شہر میں میر مرزا کے کلام پر دو شخصوں میں تکرار ہوئی؟
خواجہ میر درد	میر مہدی	خواجہ مفتی	خواجہ باسط	۲۔ بحث کرنے والے کس کے مرید تھے؟
جرات	انشا اللہ خان انشا	سودا	میر تقی میر	۳۔ گرمی کلام پر چونک پڑے؟
اسیر	وفا	ناصح	نیرنگ	۴۔ شیخ امام بخش کا تخلص تھا؟
حیدر آباد دکن	بہمنی	لاہور	بنارس	۵۔ خواجہ حیدر علی آتش کا شاگرد کہاں جانا چاہتا تھا؟
مصحفی	غالب	مومن	ذوق	۶۔ معمولی دربار میں کون سا شاعر موجود تھا؟
غالب	ذوق	شیفۃ	سودا	۷۔ قاطع برہان کے مصنف کا نام کیا ہے؟
در بار اکبری	قصص ہند	آب حیات	سخندان فارس	۸۔ سبق ”شاعروں کے لطیفے“ کس کتاب سے لیا گیا ہے؟
۱۸۸۸ء میں	۱۸۸۵ء میں	۱۸۸۴ء میں	۱۸۸۰ء میں	۹۔ محمد حسین آزاد کو دماغی مرض شروع ہوا؟
محکمہ صحت	محکمہ زراعت	محکمہ اوقاف	محکمہ تعلیم	۱۰۔ محمد حسین آزاد لاہور میں کس محکمے میں ملازم تھے؟
۱۶۔ ۱۷ برس	۱۴۔ ۱۵ برس	۱۲۔ ۱۳ برس	۱۰۔ ۱۱ برس	۱۱۔ مشاعرے میں کلام سنانے والے شریف زادے کی عمر تھی؟
مضمون	مصرع	فکر	خواب	۱۲۔ جرات کے خیال میں کیا آیا؟
بادشاہ	شہزادی	مرشدزادی	ملکہ	۱۳۔ دربار میں مرشدزادہ کس کی طرف سے عرض لے کر آیا تھا؟
مولوی محمد جعفر	مولوی محمد باقر	مولوی محمد علی	مولوی اختر علی	۱۴۔ محمد حسین آزاد کے والد کا نام تھا؟
غالب	میر	سودا	جرات	۱۵۔ ایک دن انشا اللہ کس کی ملاقات کو آئے؟
۱۸۵۸ء میں	۱۸۵۷ء میں	۱۸۵۵ء میں	۱۸۵۰ء میں	۱۶۔ محمد حسین آزاد کے والد کب مارے گئے؟
انجمن احیاء اسلام	انجمن پنجاب	انجمن حمایت اسلام	انجمن ترقی اردو	۱۷۔ لاہور محمد حسین آزاد لیکچرار اور سیکرٹری رہے؟

۱۸۔ محمد حسین آزاد کا سن ولادت ہے؟	۱۸۳۰ء	۱۸۳۵ء	۱۸۴۰ء	۱۸۴۵ء
۱۹۔ سید انشانے کس بات پر اصرار کیا؟	مصرع سنانے پر	گانا سنانے پر	نعت سنانے پر	قصیدہ سنانے پر
۲۰۔ دربار میں کون سے حکیم موجود تھے؟	حکیم اجمل خان	حکیم فتح اللہ خان	حکیم احسن اللہ خان	حکیم عبدالحمید

## سوالات کے مختصر جوابات

- س ۱۔ محمد حسین آزاد نے تلاش معاش کے لیے کہاں کہاں سفر کیا؟  
جواب۔ پہلے لکھنؤ اور حیدرآباد گئے، پھر لاہور پہنچ کر پندرہ روپے ماہوار پر ملازم ہو گئے۔
- س ۲۔ حکومت پنجاب نے محمد حسین آزاد سے کس قسم کی کتابیں لکھوائیں؟  
جواب۔ حکومت پنجاب نے مولانا محمد حسین آزاد سے نصابی اور درسی کتابیں لکھوائیں۔
- س ۳۔ محمد حسین آزاد نے درس و تدریس کے فرائض کہاں کہاں انجام دیئے؟  
جواب۔ محمد حسین آزاد انجمن پنجاب میں لیکچرار اور گورنمنٹ کالج لاہور میں عربی اور فارسی کے پروفیسر رہے۔
- س ۴۔ محمد حسین آزاد کا سب سے بڑا کارنامہ کیا ہے؟  
جواب۔ ان کا سب سے بڑا کارنامہ اردو میں جدید طرز کی شاعری ہے۔
- س ۵۔ خواجہ باسط نے میر اور مرزا کے کلام کے بارے میں کیا کہا؟  
جواب۔ انھوں نے کہا کہ دونوں صاحب کمال ہیں، مگر فرق اتنا ہے کہ میر کا کلام ”آہ“ اور سودا کا کلام ”واہ“ ہے۔
- س ۶۔ شریف زادے کا کلام سن کر سودا نے کیا کہا؟  
جواب۔ سودا نے تعریف کی اور کہا کہ میاں لڑکے! جوان ہوتے نظر نہیں آتے۔
- س ۷۔ خواجہ حیدر علی آتش کا شاگرد کس غرض سے سفر کرنا چاہتا تھا؟  
جواب۔ خواجہ صاحب کا شاگرد بے روزگار تھا وہ روزگار کے حصول کے لیے سفر کرنا چاہتا تھا۔
- س ۸۔ میر اور مرزا کے کلام پر کہاں تکرار ہوئی؟  
جواب۔ میر اور مرزا کے کلام پر لکھنؤ میں دو شخصوں میں تکرار ہوئی۔
- س ۹۔ انشا اللہ خان کس کی ملاقات کو آئے؟  
جواب۔ انشا اللہ خان جرات کی ملاقات کو آئے۔
- س ۱۰۔ شیخ امام بخش ناسخ کب مشاعرے میں پہنچے، اور وہاں کون موجود تھے؟  
جواب۔ مشاعرہ ختم ہو چکا تھا مگر خواجہ حیدر علی آتش اور چند دوسرے شعرا وہاں موجود تھے۔
- س ۱۱۔ دربار میں مرشد زادے کس کا پیغام لے کر آئے تھے؟  
جواب۔ وہ کسی مرشد زادی یا بیگمات میں سے کسی کا پیغام لے کر بادشاہ کے حضور حاضر ہوئے تھے۔
- س ۱۲۔ صاحب عالم سے کس نے جلدی آنے اور جانے کی وجہ دریافت کیا؟  
جواب۔ حکیم احسن اللہ خان نے صاحب عالم سے جلدی آنے اور جانے کی وجہ دریافت کیا۔

”نصوح اور سلیم کی گفتگو“ از ڈپٹی نذیر احمد

## مشکل الفاظ کے معنی

معنی	الفاظ	معنی	الفاظ
قoul وقرار	- وعدہ	طلب	- بلاوہ
گود	- جھولی	شطرنج	- چونٹھ خانوں اور بیس مہروں کا کھیل
تعجب	- حیرانی	کوڑیوں	- بیسیوں
آموختہ	- پڑھایا ہوا	بہ سرو چشم	- سر آنکھوں پر ابڑے شوق سے
دستور	- اصول / رواج	اصرار	- تقاضا
بالا خانہ	- اوپر والا حصہ	خفا	- ناراض
معقول	- مناسب	گنجفہ	- چھیا نوے گول پتوں کا کھیل
جان پہچان	- واقفیت	منجھلاڑ کا	- درمیانہ لڑکا
ناخوش	- ناراض	قبلدرو	- خانہ کعبہ کی طرف منہ کر کے
بھلے مانس	- شریف آدمی	جتا دینا	- بتا دینا
دل کھٹا ہونا	- نفرت ہونا	برس	- سال
کانوں کان خبر نہ ہونا	- کسی کو بالکل پتہ نہ چلنا	واسطہ	- تعلق
برامانا	- محسوس کرنا		

## کثیر الانتخابی سوالات

(A)	(B)	(C)	(D)
ضلع لاہور	ضلع حصار	ضلع امرتسر	ضلع بجنور
سر سالار جنگ	نظام حیدرآباد	نواب آف جونگرٹھ	نواب آف اودھ
تخلیقی	معاشرتی	معاشی	اصلاحی
پانچ برس	سات برس	نو برس	دس برس
طبیعت پر	نظروں پر	آنکھوں پر	دماغ پر
نظر پر	عقل پر	حافظے پر	دل پر
حیرت	الفت	چاہت	نفرت
چار بجے	تین بجے	دو بجے	ڈیڑھ بجے
کپڑے سی رہی تھی	سورہی تھی	نماز پڑھ رہی تھی	بات کر رہی تھی
بی بی	بی بی جی	حضرت بی	حضرت بی بی
توبۃ النصوح	بناۃ العیش	مرآة العروس	فسانہ بتلا
لکھنؤ میں	دہلی میں	امر تسر میں	انبالہ میں
صبح کے وقت	دوپہر کے وقت	سہ پہر کے وقت	شام کو
ماں کو	بہن کو	باپ کو	بیوی کو

۱۔ ڈپٹی نذیر احمد کی جائے پیدائش ہے؟  
 ۲۔ ڈپٹی نذیر احمد نے کس کی ایما پر انگریزی ملازمت چھوڑی؟  
 ۳۔ ڈپٹی نذیر احمد کے ناول کس طرز کے ہیں؟  
 ۴۔ سلیم کی عمر کتنی تھی؟  
 ۵۔ شطرنج سے زور پڑتا ہے؟  
 ۶۔ گنجفہ سے زور پڑتا ہے؟  
 ۷۔ تعجب سے مراد ہے؟  
 ۸۔ ایک گھنٹے کی چھٹی کب ہوا کرتی تھی؟  
 ۹۔ بوڑھی عورت کیا کر رہی تھی؟  
 ۱۰۔ لوگ بوڑھی عورت کو کیا کہتے ہیں؟  
 ۱۱۔ نصوح اور سلیم کی گفتگو، ماخوذ ہے؟  
 ۱۲۔ ہیضے کی وبا کس شہر میں پھوٹ پڑی؟  
 ۱۳۔ نصوح نے اپنے بیٹے سلیم کو کب بلایا؟  
 ۱۴۔ نصوح نے خاندان کی اصلاح کے لیے کسے مددگار بنایا؟

۱۵۔ ڈپٹی نذیر احمد نے انڈین پینل کوڈ کا ترجمہ کیا؟	۱۸۶۱ء میں	۱۸۶۲ء میں	۱۸۶۳ء میں
۱۶۔ ڈپٹی نذیر احمد دلی میں کس کے شاگرد ہوئے؟	مولوی نور احمد	مولوی محمد باقر	مولوی عبدالحق
۱۷۔ کھیل کے پیچھے کون دیوانہ بنا رہا تھا؟	نصوح	سلیم	منجھلاڑ کا
۱۸۔ اکثر کون گھبرا کرتا ہے؟	مبتدی	چور	نالائق
۱۹۔ سلیم ڈرتے ڈرتے کہاں گیا؟	مدرسے	بازار	مسجد
۲۰۔ سلیم کو کس نے جگایا؟	نصوح نے	بیدارانے	ماں نے

### سوالات کے مختصر جوابات

س۔ ڈپٹی نذیر احمد تحصیل دار اور افسر بندوبست کیسے بنے؟

جواب۔ ڈپٹی نذیر احمد انڈین پینل کوڈ کے ترجمے کی وجہ سے پہلے تحصیل دار اور پھر افسر بندوبست بنے۔

س۔ ڈپٹی نذیر احمد کے ناول کس طرز کے ہیں؟

جواب۔ ڈپٹی نذیر احمد کے ناول اصلاحی طرز کے ہیں، کیوں کہ انھوں نے ان سے مسلمانوں کی اصلاح کا کام لیا۔

س۔ نصوح نے اپنی گزشتہ زندگی کی تلافی کا عہد کیوں کیا؟

جواب۔ نصوح نے خواب میں عاقبت کے دل اد بلا دینے والے مناظر دیکھے تو تائب ہوا اور اپنی گزشتہ زندگی کی تلافی کا عہد کیا۔

س۔ حضرت بی کون تھیں۔ انھوں نے سلیم کو کیا نصیحت کی؟

جواب۔ حضرت بی ان چار لڑکوں کی نانی تھیں۔ جو شریف، منسا اور نظم و ضبط کے پابند تھے۔ انھوں نے سلیم کو نصیحت کی کہ بیٹا بڑوں کو سلام کیا کرتے ہیں۔

س۔ ڈپٹی نذیر احمد کی مشہور تصانیف کا نام لکھیے؟

جواب۔ مرآة العروس، بنات العرش، توبۃ النصوح، فسانہ ہنلا، ابن الوقت

س۔ سلیم نے چار لڑکوں کی کیا خوبیاں بیان کیں؟

جواب۔ سلیم نے چار لڑکوں کے بارے میں بتایا کہ آپس میں چار بھائی ہیں۔ نہ کبھی لڑتے، نہ جھگڑتے، نہ گالی بکتے، نہ قسم کھاتے، نہ جھوٹ بولتے، اور نہ ہی کسی قسم کو چھیڑتے ہیں

س۔ ڈپٹی نذیر احمد نے عملی زندگی کا آغاز کیسے کیا؟

جواب۔ ڈپٹی نذیر احمد نے عملی زندگی کا آغاز کنجاہ ضلع گجرات کے ایک سکول میں مدرس کی حیثیت سے کیا۔

س۔ سلیم اپنے بھائی کے ساتھ مدرس سے کیوں نہیں جاتا تھا؟

جواب۔ سلیم کا بھائی امتحان کی تیاری کے لیے کافی دیر پہلے اپنے ایک دوست کے پاس چلا جاتا تھا، اس لیے سلیم اپنے بھائی کے ساتھ مدرس سے نہیں جاتا تھا۔

س۔ بیدارانے سلیم کو جگا کر کیا پیغام دیا؟

جواب۔ بیدارانے سلیم کو پیغام دیا کہ صاحب زادے اٹھیے، بالا خانے پر میاں بلاتے ہیں۔

س۔ سلیم کی ماں نے سلیم کے ساتھ جانے سے کیوں انکار کر دیا؟

جواب۔ سلیم کی ماں نے سلیم کے ساتھ جانے سے اس لیے انکار کر دیا کیوں کہ اس وقت اس کی گود میں لڑکی سوتی تھی۔

## ”پنجائیت“ از پریم چند

### مشکل الفاظ کے معنی

الفاظ	معنی	الفاظ	معنی
پنجائیت	- مقامی عدالت	یارانہ	- دوستی
ساجھے	- مشترکہ	لین دین	- کاروبار
کامل	- مکمل	سونپ دینا	- حوالے کر دینا
ذائے تلمذتہ کرنا	- شاگردی اختیار کرنا	فیض	- نفع
تقدیر	- مقدر	پرسش	- خبرگیری
ملکیت	- جائیداد	پدر	- باپ
دقیقہ فروگزاشت نہ کرنا	- کوئی کمی نہ چھوڑنا	تازیانہ	- چابک / کوڑا
قرب و جوار	- اردگرد کا علاقہ	خاطر داری	- خدمت
مہر لگ جانا	- بند ہونا	شرمندہ منت	- احسان مند
دانست	- سمجھ / سوچ	دم لینا	- آرام کرنا
ان بن	- زبانی لڑائی	دغا بازی	- دھوکا
رزم گاہ	- میدان جنگ / لڑائی کی جگہ	ہبہ نامہ	- بخشش کا اقرار نامہ
وبال	- مصیبت	خوبی تقدیر	- اچھ قسمت
زخم پر نمک چھڑکنا	- ستائے ہوئے کو ستانا	اندیشہ	- ڈر
زور شور سے ٹھن گئی	- زبردست جھگڑا ہوا	شیریں بیانی	- خوب صورت انداز گفتگو
رت جگا	- رات جاگ کر کاٹنا	یہاں مراد بدکلامی	- یہاں مراد بدکلامی
پچھاڑیں کھانا	- تڑپنا	صبح کا آغاز ہونا	- صبح کا آغاز ہونا
کلیجہ منھ کو آنا	- بہت صدمہ ہونا	ما تم کرنا	- ماتم کرنا
بہ ہزار دقت	- بڑی مشکل سے	کرتی	- کرتی
ہرا	- سبز	دل صاف ہونا	- دشمنی ختم ہونا

### کثیر الانتخابی سوالات

(A)	(B)	(C)	(D)
کرشن	پرتھوی راج	نہس راج	دھنپت رائے
ریلوے میں	پولیس میں	ڈاک خانے میں	محکمہ مالیات میں
طالب علموں کے	عمورتوں کے	بزرگوں کے	مزدوروں اور کسانوں کے
پرانی وضع کے	تنگ ذہن کے	پرانی سوچ کے	وسیع ذہن کے

۱۔ پریم چند کا اصل نام تھا؟  
 ۲۔ پریم چند کے والد کس محکمے میں ملازم تھے؟  
 ۳۔ پریم چند نے افسانوں میں مسائل بیان کیے ہیں؟  
 ۴۔ الگو کے والد کیسے آدمی تھے؟

صلح پسند	امن پسند	انصاف پسند	ترقی پسند
۱۵۔ جمن آدمی تھا؟			
انتظامیہ سے	عدالت سے	صحافیوں سے	شکار یوں سے
۶۔ الگو کو آئے دن واسطہ رہتا تھا؟			
ایک دن بعد	ایک ہفتہ بعد	ایک مہینہ بعد	ایک سال بعد
۷۔ پنچایت کے کتنے عرصے بعد بیل مر گیا؟			
خدمت خلق پر	حقوق العباد پر	استاد کی خدمت پر	اپنے آپ پر
۸۔ جمن کے والد کو زیادہ بھروسہ تھا؟			
بیٹا	بھائی	وارث	رشتہ دار
۹۔ شیخ جمن کی خالہ کا کوئی نہ تھا؟			
شعلہ بیانی کی	شیریں بیانی کی	خلوص کی	محبت کی
۱۰۔ الگو چودھری نے چودھرائن کو اپنے ڈنڈے سے داد دی؟			
پیار کے	ظلم کے	تازیانے کے	محنت کے
۱۱۔ شیخ جمہراتی زیادہ قائل تھے؟			
پیسے دے کر	سبز باغ دکھا کر	لاچ لے کر	زبردستی
۱۲۔ جمن نے خالہ کی ملکیت اپنے نام کرائی؟			
تنوع	تغیر	فرق	تضاد
۱۳۔ پریم چند کے افسانوں میں پایا جاتا ہے؟			
ضرورت	کسر	حاجت	مجبوری
۱۴۔ بوڑھی خالہ نے گریہ و زاری میں اٹھانہ رکھی؟			
دو	تین	چار	پانچ
۱۵۔ الگو چودھری میلے سے بیل لائے؟			
وزیر کا	مشیر کا	بندے کا	اللہ کا
۱۶۔ پنچ کا حکم ہوتا ہے؟			
انصاف پسند	قانونی	صلح پسند	امن پسند
۱۷۔ الگو آدمی تھے؟			
پہلے	دوسرے	تیسرے	چوتھے
۱۸۔ پریم چند نے انجمن ترقی پسند کے اجلاس کی صدارت کی؟			
۱۸۹۸ء	۱۹۰۰ء	۱۹۰۵ء	۱۹۱۰ء
۱۹۔ پریم چند نے سرکاری ملازمت کا آغاز کیا؟			
پنجاب یونیورسٹی	علی گڑھ یونیورسٹی	الہ آباد یونیورسٹی	جامعہ ملیہ اسلامیہ
۲۰۔ پریم چند نے کس یونیورسٹی سے بی اے کیا؟			
منطق	سوچ	تندرستی	عقل مندی
۲۱۔ شیخ جمن کو کامل اعتماد تھا اپنی طاقت، رسوخ اور۔۔؟			

### سوالات کے مختصر جوابات

- ۱۔ جمن شیخ اور الگو چودھری میں دوستی کا آغاز کب ہوا؟  
جواب۔ جمن شیخ اور الگو چودھری میں دوستی کا آغاز اس وقت ہوا جب وہ شیخ جمہراتی کے شاگرد تھے۔
- ۲۔ جمن اور الگو کا باہمی تعلق کیسا تھا؟  
جواب۔ دونوں میں بڑا یارانہ تھا، ایک کو دوسرے پر کامل اعتماد تھا۔
- ۳۔ الگو کے والد کا استاد کے بارے میں کیا مقولہ تھا؟  
جواب۔ وہ کہا کرتے تھے کہ استاد کی دعا چاہیے، جو کچھ ہوتا ہے فیض سے ہوتا ہے۔
- ۴۔ الگو نے استاد کی کس طرح خدمت کی؟  
جواب۔ الگو نے استاد کی بہت خدمت کی، خوب رکابیاں مانگیں، خوب پیالے دھوئے، استاد کا حقدوم نہ لینے پاتا تھا۔
- ۵۔ جمن پرتازیانے کے بے دریغ استعمال نے کیا رنگ دکھایا؟  
جواب۔ اسی کا فیض تھا کہ آج جمن کی قرب و جوار کے مواضع میں پرش ہوتی تھی۔
- ۶۔ الگو چودھری خالہ کے کہنے پر پنچایت میں کیوں نہیں آنا چاہتے تھے؟  
جواب۔ الگو جمن کے گہرے دوست تھے اور اس سے بگاڑنا نہیں چاہتے تھے۔

س۔ خالہ کی جائیداد جمن کے نام ہیہ ہونے کے کتنے عرصے بعد جھگڑا کھڑا ہو گیا؟  
جواب۔ خالہ کی جائیداد جمن کے نام ہیہ ہونے کے سال چھ مہینے بعد جھگڑا کھڑا ہو گیا۔

س۔ جمن نے خالہ سے کیا وعدہ کیا تھا؟

جواب۔ جمن نے خالہ سے تاجین حیات روٹی کپڑے کا وعدہ کیا تھا۔

س۔ الگو کو جرح کرنے میں کیوں مہارت تھی؟

جواب۔ الگو کو آئے دن عدالت سے واسطہ رہتا تھا، اورہ قانونی آدمی تھے، اس لیے جرح میں مہارت تھی۔

س۔ الگو نے سمجھو سیٹھ کو بیل کتنے روپے میں فروخت کیے؟

جواب۔ الگو نے سمجھو سیٹھ کو بیل ڈیڑھ سو روپے میں فروخت کیے۔

س۔ الگو کے بیل کس نسل کے تھے؟

جواب۔ پچھائیں نسل کے خوب صورت بیل تھے۔

## ”آرام و سکون“ از سید امتیاز علی تاج

### مشکل الفاظ کے معنی

معنی	الفاظ	معنی	الفاظ
فکر	نامراد	تردد	برے نصیب والا
پریشانی	کواڑ	الجینیں	دروازے کا پٹ
طبیعت ٹھیک ہونا	نغمہ سرائی	طبیعت بحال ہونا	گانا گانا
زور دے کر کہنا	یک نہ شد دوشد	تاکید	دہری مصیبت
پٹھے	راہ مولا	اعصاب	اللہ کے نام پر
قوت	چڑجانا	تقویت	ناراض ہونا / غصہ میں آنا
ماشکی / بہشتی	بوکھلا دینا	سقا	پریشان کرنا
بلاوجہ	کسر	ناحق	کسی
دودھ میں پکا جو کا دلیہ	صدا	مالٹا ملک	آواز
دکھ ہونا	بے طرح	دل بھر آنا	بری طرح
تنگ ہونا	نصیب دشمنان	زیج ہونا	خدا آپ کی تکلیف دشمنوں کو
مٹی / دھول	دے دے	گرد	دے دے
بیمار	کان پر جوں نہ رہینگنا	علیل	کوئی اثر نہ ہونا
بالکل	ریٹھا	مطلق	نزلہ کھانسی میں دوا کے طور پر
نقصان دہ	کام آنے والا پھل	مضر	کام آنے والا پھل
تسلی	مہلت	اطمینان	فرصت
تکلیف سے ہائے ہائے کرنا	گستاخ	کراہنا	بے ادب
ڈھیل دینا	بہرے	طرح دینا	جسے کچھ سنائی نہ دے

بہت مصروف ہونا	سر کھجانے کا وقت نہ ہونا۔	جی گھبرانا	-	دم الجھنا
ناراض	-	خفا	-	مقوی
			-	ہنگامہ
			-	فساد

## کثیر الانتخابی سوالات

(D)	(C)	(B)	(A)	
۷۴ سال	۷۳ سال	۷۲ سال	۷۰ سال	۱۔ سید امتیاز علی تاج نے عمر پائی؟
ورزش کی	آرام و سکون کی	سیر کی	پرہیز کی	۲۔ مریض کو دو اسے زیادہ ضرورت تھی؟
ورزش کا	دیر تک جاگنے کا	غذا کی کمی کا	شور و غل کا	۳۔ اعصاب پر مضر اثر پڑتا ہے؟
جوس	ساگودانہ	بجنی	کھیر	۴۔ میاں نے اپنے لیے خوراک پسند کی؟
گرم مسالہ	ریٹھے	مرچیں	نمک	۵۔ ملازم کیا چیز کوٹ رہا تھا؟
۱۹۳۴ء	۱۹۳۲ء	۱۹۳۰ء	۱۹۲۸ء	۶۔ امتیاز علی تاج نے ڈرامہ ”انارکلی“ لکھا؟
للو	سقا	بچہ	فقیر	۷۔ کو اڑ توڑ رہا تھا؟
خاموشی	ورزش	دودھ	خوراک	۸۔ اعصاب کو تقویت بخشتی ہے؟
بچہ	پر	دم	چونچ	۹۔ مریض کے کمرے میں پرندہ نہیں مارے گا؟
مکتوب نسواں	حسن نسواں	تہذیب نسواں	تعلیم نسواں	۱۰۔ امتیاز علی تاج رسالہ ”پھول“ اور۔۔۔۔۔ کے مدیر ہے؟
عید کے روز	سال گرہ پر	شادی کے روز	شب برات کو	۱۱۔ ننھا کھلونا گاڑی میلے سے لایا تھا؟
کرتی پر	بستر پر	میز پر	انگلیٹھی پر	۱۲۔ بلانے کے لیے بیوی نے گھٹی رکھی تھی؟
دوست کے گھر کے لیے	دفتر کے لیے	باغ کے لیے	بازار کے لیے	۱۳۔ میاں ٹوپی اور شیر وانی پہن کر تیار ہوئے؟
صبح دس بجے	صبح نو بجے	صبح آٹھ بجے	صبح سات بجے	۱۴۔ میاں کتنے بجے دفتر جایا کرتے تھے؟
گورنمنٹ کالج	ایچی سن کالج	سائنس کالج	دیال سنگھ کالج	۱۵۔ امتیاز علی تاج نے سنٹرل ماڈل سکول لاہور کے بعد کہاں تعلیم پائی؟
سر	شمس العلماء	شیر بہادر	خان بہادر	۱۶۔ امتیاز علی تاج کے والد کو خطاب ملا؟
عزت کا	لباس کا	آرام کا	غذا کا	۱۷۔ ڈرامہ ”آرام و سکون“ سے سبق ملتا ہے کہ مریض کا خیال رکھنا چاہیے؟
فقیر کی	جہاز کی	سقا کی	موٹر سائیکل کی	۱۸۔ بچے کے رونے اور پڑوسی کے گانے کے دوران تیسری آواز تھی؟
ہزاروں مرتبہ	سینکڑوں مرتبہ	بیسوں مرتبہ	کئی مرتبہ	۱۹۔ بیگم نے سقے کو کہا کہ صبح ہو جایا کرے؟
اسحاق	اشفاق	مشاق	اشتیاق	۲۰۔ ڈرامے میں میاں صاحب کا نام تھا؟

## سوالات کے مختصر جوابات

- س۔ روزانہ آرام و سکون نہ کیا جائے تو اس کا کیا نتیجہ نکلتا ہے؟  
 جواب۔ روزانہ آرام و سکون کے لیے تھوڑا تھوڑا وقت نہ نکالا جائے تو اس کا نتیجہ بیماری کی صورت میں نکلتا ہے۔  
 س۔ بیمار کے باوجود میاں دفتر جانے کے لیے کیوں تیار ہو جاتا ہے؟  
 جواب۔ گھر میں آرام و سکون میسر نہ ہونے کی وجہ سے میاں دفتر جانے کے لیے تیار ہو جاتا ہے؟

س۔ صحت مند رہنے کے لیے کیا باتیں ضروری ہیں؟

جواب۔ صحت مند رہنے کے لیے آرام و سکون کا خیال رکھا جائے اور متوازن غذا کھائی جائے۔

س۔ ہمسائے کی کون سی حرکت سے میاں کے آرام و سکون میں خلل پڑتا تھا؟

جواب۔ ہمسائے کے ہارمونیم اور گانے کی وجہ سے میاں کے آرام میں خلل پڑتا تھا۔

س۔ سید امتیاز علی تاج کے مزاحیہ خاکے کس نام سے شائع ہوئے؟

جواب۔ ”چچا چھکن“ کے نام سے شائع ہوئے۔

س۔ سید امتیاز علی تاج نے ریڈیو پاکستان پر کون سا پروگرام شروع کیا؟

جواب۔ ”پاکستان ہمارا ہے“ کے نام سے۔

س۔ ڈاکٹر نے بیگم کو کیا ہدایت کی؟

جواب۔ ڈاکٹر نے بیگم کو ہدایت کی کہ مریض کے کمرے میں شور و غل نہیں ہونا چاہیے۔

س۔ ڈاکٹر صاحب نے کھانے کے لیے کیا تجویز کیا تھا؟

جواب۔ مالخد ملک، نارنگی کارس، ساگودانے کی کھیر

س۔ ننھا کھلونا گاڑی کہاں سے لایا تھا؟

جواب۔ ننھا عید کے روز میلے سے کھلونا گاڑی لایا تھا۔

س۔ بیوی نے بیچنی کیوں نہ بنوائی؟

جواب۔ لہو بازار سے چوزہ لینے جاتا تو وہیں کاہور ہتا، اس لیے دیر ہونے کا خدشہ تھا، اسی وجہ سے بیوی نے بیچنی نہیں بنائی۔

س۔ سید امتیاز علی تاج مجلس ترقی ادب کے کس عہدے پر فائز رہے؟

جواب۔ سید امتیاز علی تاج مجلس ترقی ادب کے سیکرٹری رہے۔

