

## CSA - FINAL

## PART - II

## SECTION - I

## Q.No.2 (a)

## FORMATION OF BLACK HOLES

A Black hole is a place in space where gravity pulled so much that even light can not get out. It was discovered by Albert Einstein in 1938. According to scientist, the smallest black holes are formed when the universe began. Stellar black holes are made when the centre of a very big star falls in upon itself or collapses. When this happens, it causes a supernova. A supernova is an exploding star that blasts part of the star into the space. A black hole cannot be seen because strong gravity pulls all of the light into the middle of the black hole.

## Q.No.2 (b)

## OCTET RULE

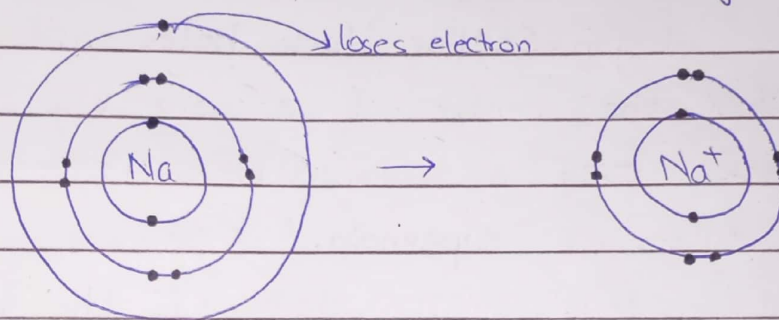
The octet rule states that the tendency of atoms to prefer to have eight electrons in the valence shell. When atoms have fewer than eight electrons in the valence shell, they tend to react and form more stable compounds, by through chemical bonds.

## TABLE SALT : FORMATION OF IONIC BOND

Table Salt or Sodium Chloride forms ionic bond by obtaining octet rule in their valence shells. Sodium forms a positively charged cation and Chloride form a negatively charged anion.

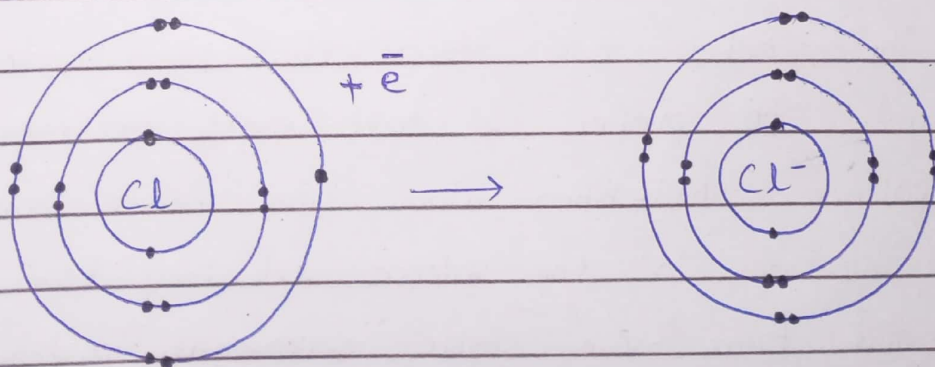
### Formation of Sodium ion ( $\text{Na}^+$ )

Sodium has 11 electrons in its shell. Its valence shell contains 1 electron. To complete its octet rule, sodium loses one electron from its valence shell, and obtain stability.



### Formation of Chloride ion ( $\text{Cl}^-$ )

Chlorine has 17 electrons in its shells. Its valence shell contains 7 electrons. To complete its ~~octet~~ octet rule, chlorine gains 1 electron to gain stability and form a negatively charged ion.





## Formation of NaCl (Table salt)

The Sodium and Chloride ions are thus held by strong electromagnetic forces of attraction and an ionic compound sodium chloride is formed. Hence, the formation of sodium chloride follows the octet rule.

### Q.No.2 (c)

## USES OF MICROWAVE, RADIO WAVES AND X-RAYS IN DAILY LIFE:

Microwaves, Radiowaves and X-rays are electromagnetic radiations - a form of energy that surrounds us in the environment - Each have different wavelength and frequency.

### Uses of Microwaves:

Microwaves have frequency from upto  $30\text{GHz}$  to  $50$  trillion  $\text{GHz}$  and wavelength about  $10\text{mm}$  to  $100$  micrometer. It is used for.

- i. For large bandwidth communication radar, satellite and telephone etc.
- ii. Used in heating of food in microwave oven
- iii. It is used for radio relay system.

### Uses of Radiowaves:

Radiowaves have frequency upto  $30\text{GHz}$  and wavelength greater than about  $100$ . Its uses are

- i- It is primarily used for communication including voice, data and entertainment media i.e. T.V, Radio, satellites etc.
- ii It is used in RADAR (Radio Detection and Ranging) and in mobile phones.

### Uses of X-Rays

X-Rays have frequency range from  $30\text{EHz} - 30\text{PHz}$  and wavelength from  $0.01$  to  $10\text{nm}$ . It is used in

- i Used in X-Ray machines to visualize internal structure of human body.
- ii It is used to study arrangement of atoms in different materials through X-ray diffraction.

### Q No. 2 (d)

#### UK - CONFERENCE REGARDING THREATS OF AI:

In November, 2023, UK hosted a conference of 28 countries in Bucolic English country estate. The conference was held regarding threats of AI and how to responsibly use and develop AI. The main points of agenda are-

#### 1. Adoption of Bletchley Declaration:

The conference adopted Bletchley Declaration which states principles of responsible development and use of AI including need for



AI system to be transparent, accountable and fair.

## 2. Launch of AI safety institute:

Rishi Sunak announced the launch of AI safety institutes at the conference. The AI safety institute will work for the responsible and safe development and usage of AI.

## 3. UK Investment in Supercomputer.

UK announced an investment of Euro 225 million in supercomputer **Isambard-AI** to achieve breakthrough across healthcare, energy and various other sectors.

## 4. Highlighting Current Threats of AI by Kamla Harris and Elon Musk

Kamla Harris and Elon Musk highlighted current threats of AI. According to Kamla Harris, the threats of AI are discrimination, misinformation, democratic challenges affecting vulnerable populations. She assured that Biden administration will take steps to manage these threats. While Elon Musk was concerned about AI getting out of human control.

These agendas discussed at the conferences are a step towards a safe, transparent and responsible development and usage of AI.

## Q No 5 (a) STRUCTURE OF KIDNEY IN EXCRETORY SYSTEM:

Kidneys are the most important organ in excretory system - a system in which metabolic waste products are excreted from the body. The kidneys are ~~two~~ in a pair attached to the dorsal body wall on either side of vertebral column.

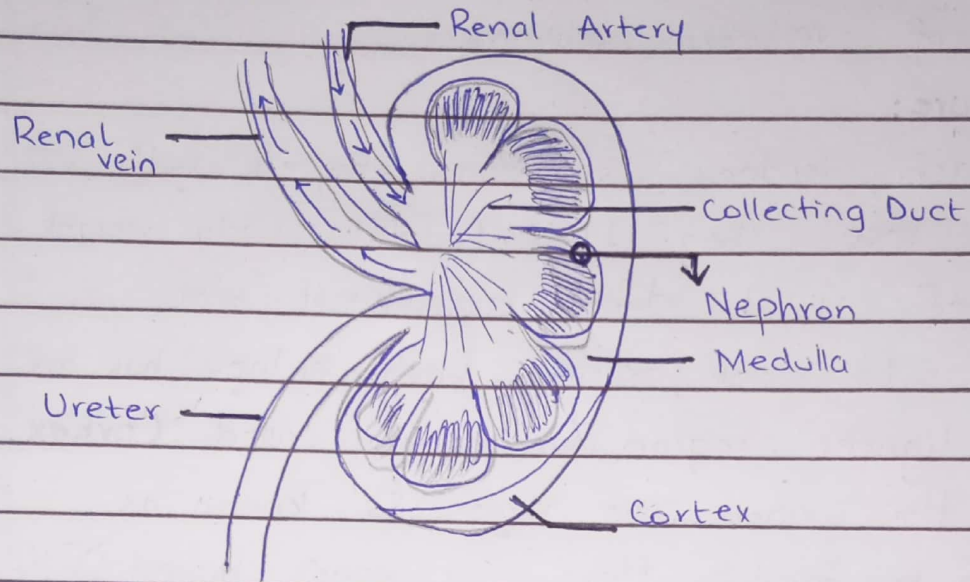
### Structure:

Each kidney is bean shaped with weight less than 1% of total body weight. 20% of blood during each heart beat is supplied to each kidney. Each kidney has an outer lighter region, which is called **Cortex**. While the inner pale region is known as **Medulla**. In medulla, there are cone shaped structures known as **Pyramids**. Pyramids are projected into a funnel-like space known as **Pelvis**. From Pelvis a duct emerges called as **Ureter**. While the blood is transported to and from the kidneys with **Renal artery** and **Renal vein** respectively.

Each pyramid contains hundreds and thousands of nephrons, and each kidney have millions of nephrons. **Nephrons** are the basic structural and functional unit of kidneys which filterate the blood. Nephrons are arranged in both cortex and medullar regions. There is a cup shaped structure present at



The proximal end of each nephron called **Bowman's capsule**. From Bowman's capsule, there arises a long narrow tube, further divided into three parts. First convoluted part is known as **Proximal tubule**. The next long U-shaped part is known as **Loop of Henle** and second convoluted part is called **Distal Tubule**.



Structure of kidney

Q.No.5 (b)

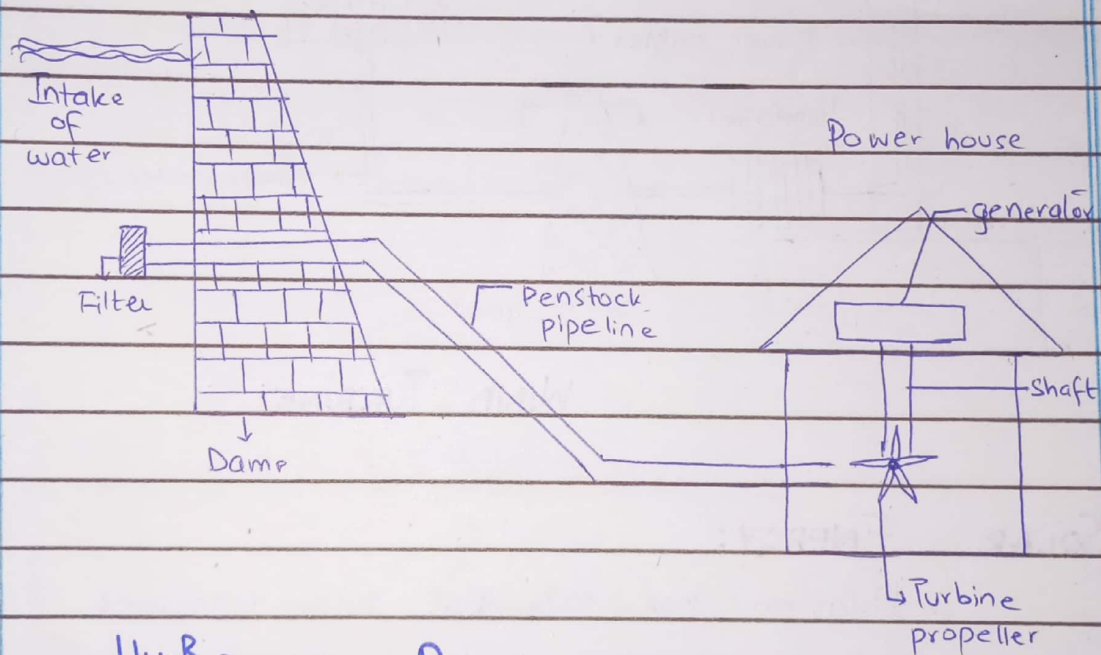
**RENEWABLE ENERGY SOURCES UNDER CPEC:**

Renewable energy sources under CPEC include wind power project, hydropower projects, solar energy projects.

**1) HYDROPOWER PROJECTS:**

Hydropower projects are one of the oldest and most reliable sources of energy. The theory behind the projects is to build

a dam on a large river that has a drop in elevation. The dam stores alot of water behind it in the reservoir. Near the bottom of the dam wall, there is the water intake. Gravity causes it to fall through the penstock pipeline inside the dam. At the end of pipeline, there is a turbine propeller which is turned by the moving water. The shaft from the turbine goes up into the generator that carries electricity to your homes and mines. The various hydropower projects under CPEC are Dasu Hydropower Project, Karot hydropower Project.



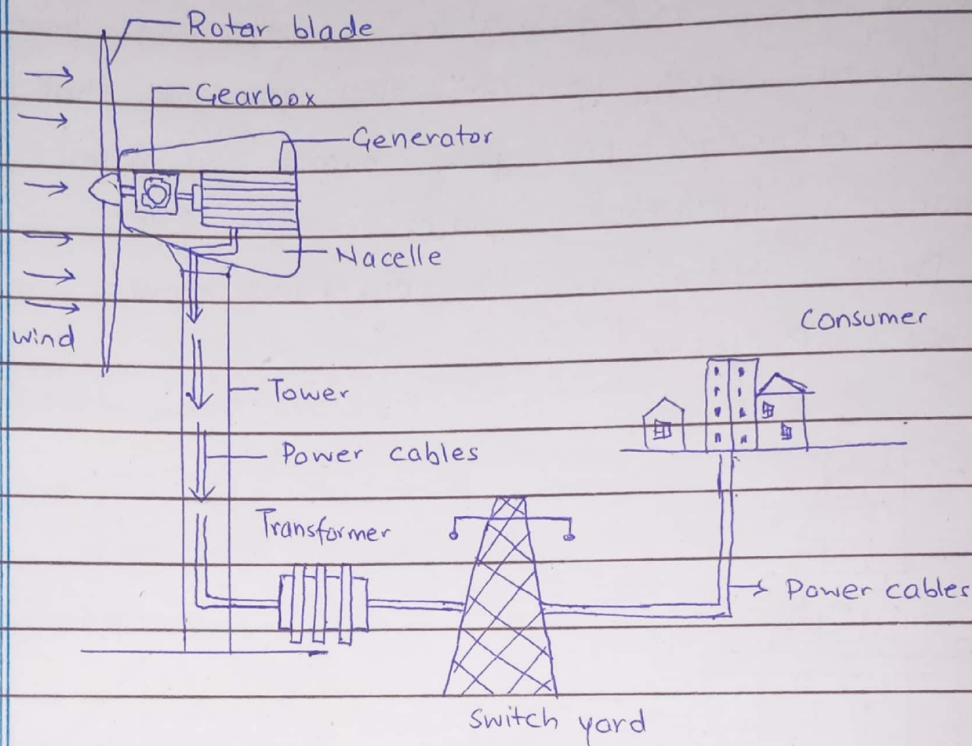
## HYDROPOWER PLANT

## 2 WIND ENERGY PROJECTS

Pakistan's coastal areas and inland regions have significant wind energy potential. Wind turbines convert the kinetic energy



in the wind into the mechanical energy, this mechanical energy can be used as in tasks like pumping water - or a generator can convert this mechanical energy into electric energy to power homes, businesses etc. The projects under CPEC include Jhimpir Wind Power Plant in Sindh.

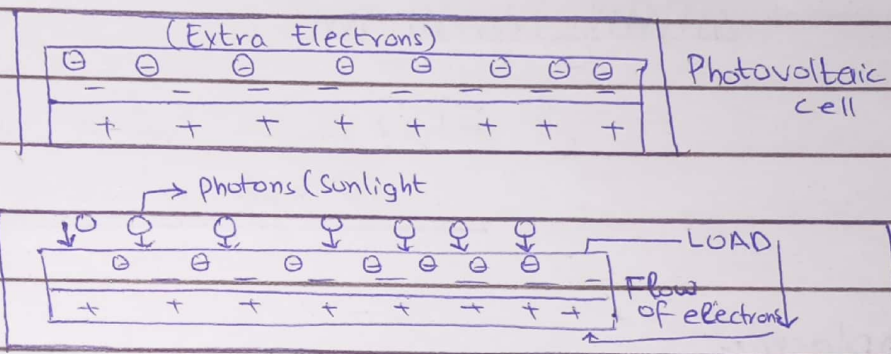
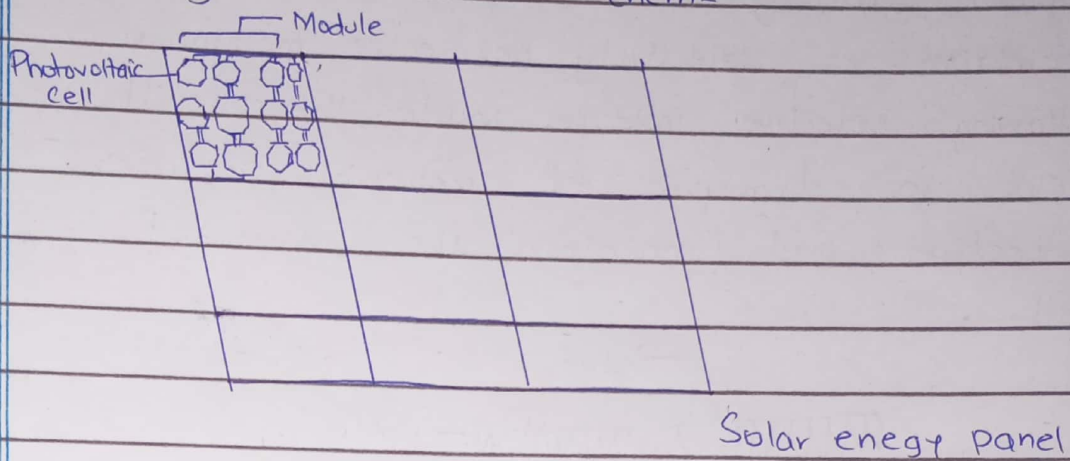


## WIND TURBINE

### 3) SOLAR ENERGY:

Pakistan has abundant solar resources with high solar insolation levels throughout the year. Solar energy projects include Quaid-e-Azam solar park in Punjab, developed under CPEC. Solar energy uses Photovoltaic cell / Solar Panels. Solar panels consist of electronic system known as Photovoltaic cells, it takes the energy from the reflected light and turns

it into electrical energy. The photovoltaic cells which have semiconductor feature creates voltage and current by providing electron movement between (+) positive and (-) negative poles as a result of photons of sunlight that hit them-



## WORKING OF PHOTOVOLTAIC CELL

Q No. 5 (c)

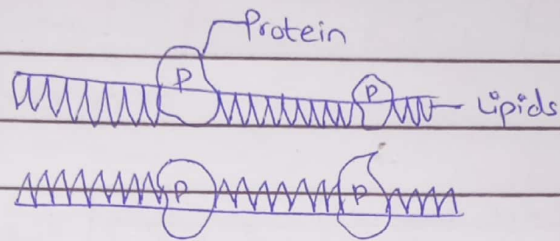
### PARTS OF CELL IN HUMAN BODY:

Human body consists of animal cell - structural and functional unit of life. The cell in human body consists of plasma membrane, cytoplasm, nucleus, golgi complex, mitochondria, lysosomes, endoplasmic reticulum, vacuoles and centrioles.



## 1. Plasma Membrane

The outermost layer of cell - It is made up of proteins, lipids and small quantity of carbohydrates in conjugated form. The protein molecules are embedded in lipid bilayer according to Fluid Mosaic Model. Plasma membrane is selectively permeable membrane allowing selective molecules inside the cell. It helps in transport of materials, provides protection and maintain the shape of cell.



Fluid mosaic model of Plasma membrane

## 2. Cytoplasm:-

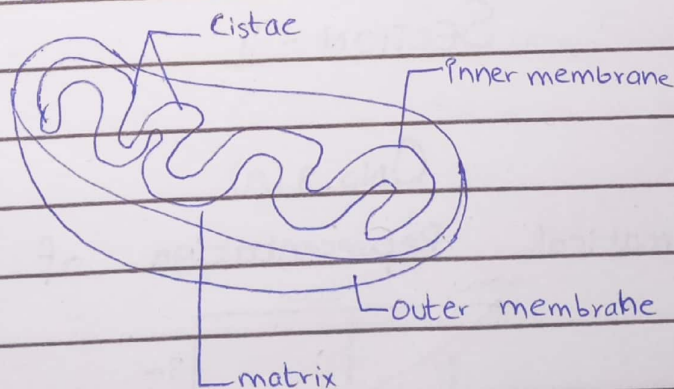
Cytoplasm is the fluid filled region between plasma membrane and nuclear membrane. It is a thick, semi-transparent fluid, constitute of 90% water, vitamins, minerals and sugars plus 2% gases. It is responsible to provide site and protection to other cell organelles. It provide shape and movement. Maximum cellular activity takes place in the cytoplasm and is act as a medium for genetic material to pass.

### 3. Nucleus:

Nucleus is present in the centre of cell. It consists of **nuclear membrane** and **nucleoplasm**. ~~nucleolus~~ - The nuclear membrane is a double membrane and separates the nucleoplasm and cytoplasm. The nucleoplasm is a liquid material present inside nuclear membrane and contains nucleolus and chromosomes. Nucleus helps in formation of genetic material (DNA and RNA). It contains genetic information and responsible for regulating the cellular activity.

### 4. Mitochondria:

Mitochondria consists of double membrane. It is a self-replicating organelle and its number varies from cell to cell. Cellular respiration occurs at mitochondria. It is called the power house of cell due to synthesis of ATP (Adenosine triphosphate). The inner membrane of mitochondria forms finger like foldings known as **cristae** and mitochondria has a plasma liquid known as **matrix**. Mitochondria have their own DNA.



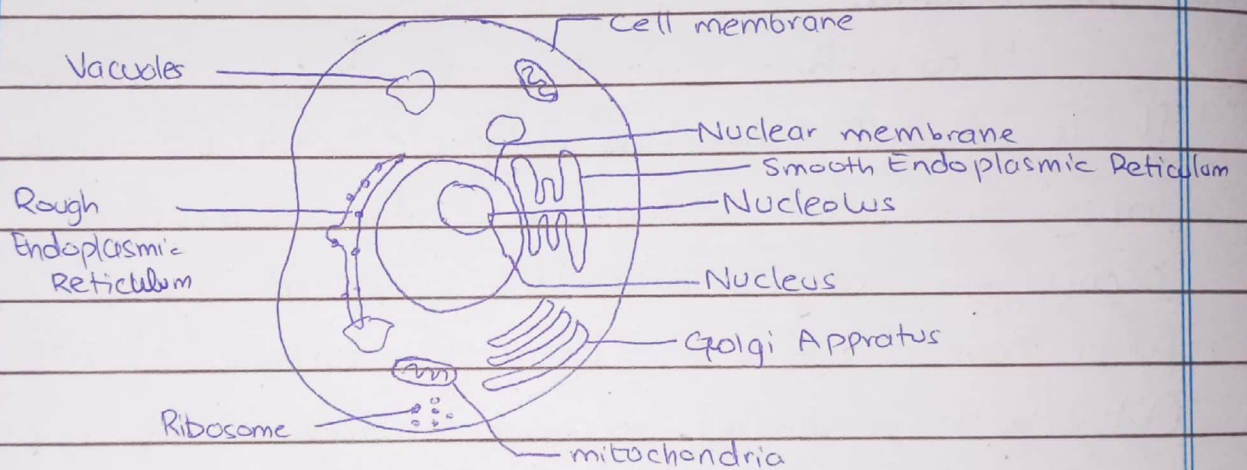
**MITOCHONDRIA**



## 5. Endoplasmic Reticulum

It is a network of channels (tubes) extending from nuclear membrane to the cell membrane - Endoplasmic Reticulum has two types based on the presence of ribosomes - **Rough ER** has ribosomes attached and is responsible for the synthesis of proteins. While **Smooth ER** are without ribosomes and involved in the metabolism of lipids, detoxification of harmful drugs and transport of materials.

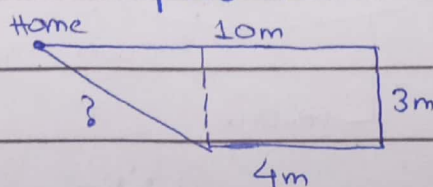
## DIAGRAM OF CELL IN HUMAN BODY

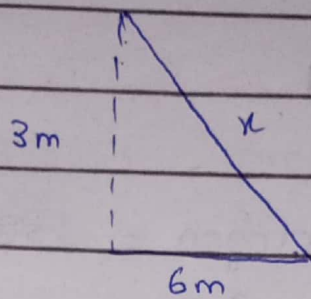


## SECTION - II

Q No. 8 (a)

## Diagrammatical Representation of Data





### Data:

The distance on the base of  $= 10\text{m} - 4\text{m}$   
right-angled triangle  $= 6\text{meter}$

The height of triangle  $= 3\text{m}$

Hypotenuse of triangle  $= x$

(Distance from initial point)

### Solution:

To find the distance from the initial point, we will use pythagoras theorem

$$\therefore (\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$$

$$(x)^2 = (6)^2 + (3)^2$$

$$x^2 = 36 + 9$$

$$x^2 = 45$$

$$\sqrt{x^2} = \sqrt{45}$$

$$= 6.708 \text{ meter.}$$

$\therefore$  The distance travelled by Sara from her initial point is 6.708 meters



Q No 8 (b)

## PERIMETER OF OCTAGON

### Data

Length of side of octagon = ~~150~~ 5cm

Perimeter of octagon = ?

Angle of octagon = ?

### Solution

1) Perimeter of octagon

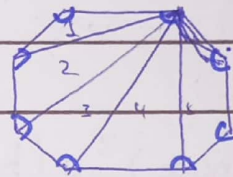
$$\therefore P = 8a$$

(a = side of octagon)

$$P = 8(5)$$

$$\text{Perimeter} = 40\text{cm}$$

2) Angle of octagon



Octagon can be divided into six triangles.

So, the interior angles of octagon will be

$$\text{total interior angles} = 6 \times 180^\circ$$

(where  $180^\circ$  is the sum of angles of triangle)

$$= 1080^\circ$$

And the each angle of octagon will be

$$= \frac{\text{Interior Angle Sum}}$$

$$8 (\text{No. of angles})$$

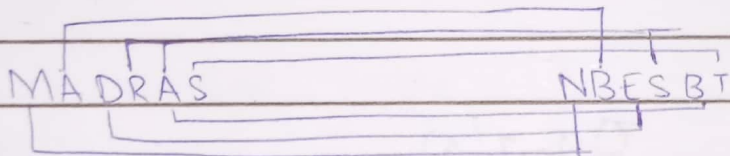
$$= \frac{1080^\circ}{8} = 135^\circ$$

Hence, the each angle of octagon will be  $135^\circ$  and the perimeter of octagon is 40cm-

Q No 8 (d)

BOMBAY CODE :

The first letter of word MADRAS will be compared to first letter of word NBESBT. The first letter in NBESBT is the next word after of first letter in MADRAS and so on. So, the code for Bombay will be "CPNCBZ"



Q No 8 (c)

Data:-

Number of green balls = 6

Number of yellow balls = 10

Probability of yellow ball = ?

Solution

To find the probability of yellow ball picked, total number of balls in the box



needs to be calculated

$$\begin{aligned} \text{Total number of balls in box} &= 6 + 10 \\ &= 16 \text{ balls} \end{aligned}$$

∴ probability of picking a yellow ball is

$$= \frac{\text{Total yellow balls}}{\text{Total balls in box}}$$

$$= \frac{10}{16}$$

$$= \frac{5}{8}$$

The probability of picking a yellow ball is  $\frac{5}{8}$  or 62.5%.

### Q No. 7 (a)

MISSING NUMBER:

i) 11, 13, 17, ~~21~~, 23

The numbers are odd number in order and the missing number is **21**.

11, 13, 17, **21**, 23

ii) 10, 28, 91, 370, \_\_\_\_\_

The differences in the sequence are increasing by the multiplying previous number by 3. So, the missing number will be **837** as

$$28 - 10 = 18$$

$$91 - 28 = 63$$

$$370 - 91 = 279$$

$$279 \times 3 = 837$$

So, the missing is  $370 + 837 = 1207$

10, 28, 91, 370, 1207.

### Q No. 7 (d)

Data:

Average height of boys = ~~150~~ 150 cm

Number of boys = 30

The difference of wrongly put number =  $165 - 135$   
= 30 cm

New average height = ?

Solution:

$$\therefore \text{Average} = \frac{\text{Sum of heights}}{\text{Total number}}$$

$$150 \text{ cm} = \frac{\text{Sum of heights}}{30}$$

$$\begin{aligned} \text{Sum of heights} &= 150 \times 30 \\ &= 4500 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{New sum after correction} &= 4500 + 30 \\ &= 4530 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{New average height} &= \frac{4530}{30} \\ &= 151 \text{ cm} \end{aligned}$$

$\therefore$  The average height after correction is 151 cm.



DATE: \_\_\_/\_\_\_/\_\_\_

QNo.7 (c)

Data

Mental Age = 10 yrs

Chronological Age = 12 yrs

IQ (Intelligence Quotient) = ?

Solution

$$\therefore IQ = \frac{\text{Mental Age}}{\text{Chronological Age}}$$

$$= \frac{10}{12}$$

$$IQ = \frac{5}{6}$$