

Q 1 How Black holes are formed?

Black is a region in space where gravity becomes so strong - that even light can not pass through it.

(i) How Black Holes are Formed?

Black holes are formed through the collapse of massive stars collapse under their own gravity often followed by supernova.

(ii) Supermassive Black Hole Formation

At galaxy centres, black hole millions of times heavier than sun form by merging of stars, merging of smaller black holes and rapid gas accretion.

(iii) Earlier Black Holes concept

Some theories suggest black holes formed right after Big Bang from extremely dense region.

(iv) Formation of Event Horizon

During collapse gravity becomes infinite at a single point (singularity). Around it forms the event horizon, the boundary beyond which nothing escapes.

(v) Birth from Massive Stars

Black holes are formed from the stars

-that are 25 times or more massive than sun.

vi Supernova Explosion

Outer layer of the star explodes as Supernova. The remaining core collapse into a neutron star, if massive enough a black hole formed.

So Black holes are formed from the collapse of massive star under their own gravity which is 25% more massive than sun.



Black Holes

(2)

What is octet rule? Explain it is the example of table salt in context of Bonding?

Octet rule is the simple "rule of thumb" in chemistry where atoms tend to gain or lose electron so they end up with the eight electrons in their outer (valence) shell and achieving a configuration of near noble gas.

octet rule in table salt (NaCl)

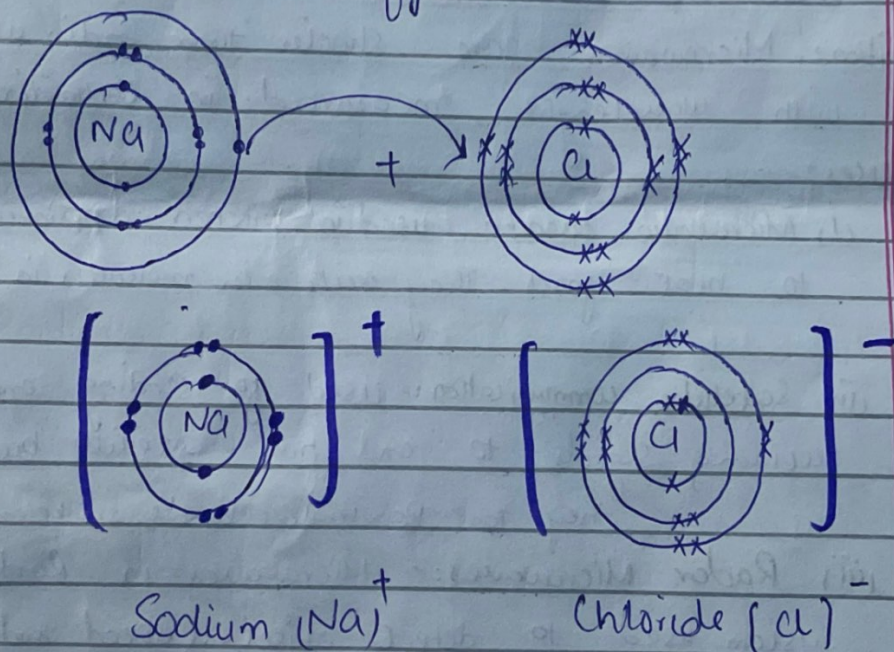
Sodium has electronic configuration 2, 8, 1 so it has one valence electron.

Chlorine has seven electrons in its outer shell. So according to octet rule;

Sodium (Na) has to lose its outer most electron and become Na^+ achieving the electronic ~~for~~ configuration of Neon (2, 8).

Chlorine gains electron and become Cl^- now it has 8 electrons in its valence shell and octet rule achieved.

Thus resulting table salt is stable and unreactive under normal conditions because both ions now satisfy the octet rule.



(3)

USES OF Microwave, Radio waves and X-rays in Daily life?

Electromagnetic waves such as Radio wave, X-rays and microwaves are used in daily life and provide a lot of benefits and ease human doing. It is used in different fields like ~~medicine~~ medicine, dental imaging, space, homes, kitchen appliances.

and its GPS system.

Electromagnetic radiation is a form of energy that is all around us and takes many forms such as light ray, X-rays, gamma and microwaves. This is produced by accelerating charged particle as be naturally emitted, as from sun or other celestial bodies.

The energy in electromagnetic wave is sometimes called radiant energy.

(i) Uses of Microwaves

Definition:- Microwaves are shorter than radio waves with wavelength measured in centimeters

Uses:-

(i) Microwave oven:- used in kitchen appliances to heat food. They excite water molecules in food.

(ii) Satellite communication:- used for sending and receiving signals to and from satellite because they can penetrate clouds, smoke and rain

(iii) Radar Microwaves:- Microwaves in Radar system used to detect objects. (speed and distance)

(ii) Uses of Radio waves:

Definition:- Radiowaves are longer than 1mm to several kilometers. Since these are the longest waves and lowest energy and temperature.

Uses:-

(i) Radio broadcasting:- used in FM and radio stations.

(ii) Cellular communication:- Mobile phone use radio waves to communicate with cell towers.

(iii) WiFi | Bluetooth:- Many wireless devices such as wifi and Bluetooth use radio waves for data transfer.

(iv) Navigation | Radar:- For example in GPS systems and radar in aviation because these are found everywhere as a background radiation of universe and remnants of supernova explosions.

(iii) Uses of x-ray:-

Definition:- range in wavelength from 0.01 - 10nm
They are generated by super-heated gas from exploding stars and quasars.

Uses:-

(i) Medical imaging:- To take image of bones fractures, chest and dental imaging.

(ii) Radiotherapy:- x-rays are used to treat cancer ~~cells~~ by targeting malignant cells.

(iii) Security:- At airport uses scanner that have x-rays to detect hidden items.

(iv) Crystallography:- x-ray crystallography helps determine the structure of crystals and molecules.

(iv) UK's November 2023 AI-Summit Main agenda and Points?

In November 2023, the UK hosted the first global AI safety summit at Bletchley park, attended by 28 countries.

Main Agenda Points of UK's AI Summit.

(i) Recognizing the Risk of "Frontier AI."

Countries recognize that the advanced AI model can cause serious or even catastrophic risk such as misuse, disinformation and loss of control.

(ii) Global Cooperation

All states signed the Bletchley Declaration to work together on AI governance, safety standard and information sharing.

(iii) Safety Testing of AI Models

Agreement on independent pre-deployment and post-deployment testing of powerful AI system instead of relying on companies testing.

(iv) State of the Science Report

A scientific panel led by experts (Yoshua Bengio) was proposed to study AI risk and give evidence-based guidance.

(v) Responsible and Human-centric AI

Emphasis on human rights, transparency, accountability and ensuring AI benefits society while keeping humans in control.

The Bletchley Declaration is a landmark because it is one of the first major multilateral politics commitments to AI safety.

The summit set a practical roadmap shared science, testing, evaluation, capacity building and further summits.

It also signals that AI governance is becoming a global issue, not just a national one and that many countries now see it as urgent.

Question No 2

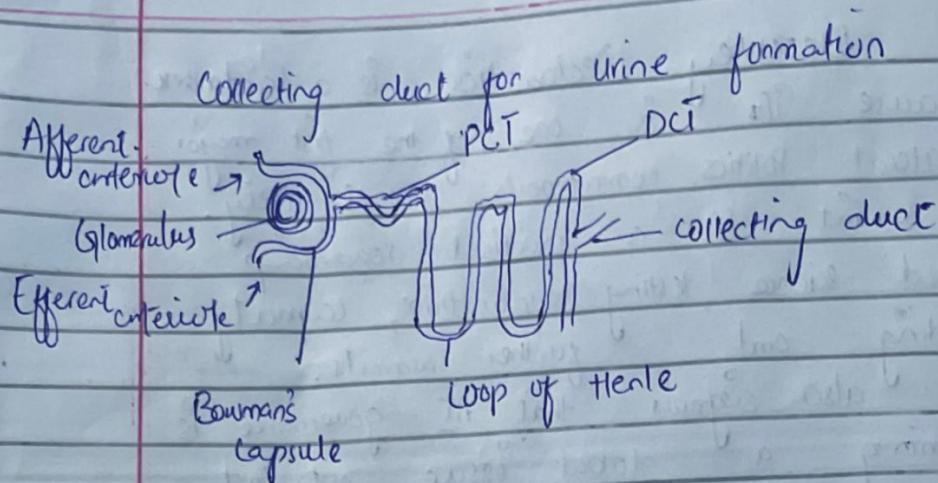
(1) Discuss the structure of kidney in excretory system?

The kidney is a bean-shaped organ responsible for filtering blood and forming urine. Each kidney has the following major structural parts.

Renal cortex = The outer region of kidney. It contains most nephron, the basic filtering unit of kidney.

Renal Medulla = The inner, darker region made of renal pyramids. These pyramids help concentrate urine.

Nephron = Nephron is the filtering unit of kidney. There are 1 million nephron in each kidney. Each nephron has Bowman's capsule and glomerulus for filtration. Tubules (PCT, LHT, DCT) for reabsorption and secretion.



Renal Pelvis = Funnel-shaped cavity where urine from collecting ducts collects before entering the ureter.

Renal Artery and Renal vein - Renal artery brings unfiltered blood and renal vein carries filtered blood back to circulation.

Ureter = A ureter carries urine from the kidney to the urinary bladder.

(2) Discuss different renewable energy sources under CPEC?

Under CPEC while a lot of focus is on coal-based energy, there are significant renewable energy components, especially in hydro, wind, and solar. Here are main types and projects.

(i) Hydropower Project Under CPEC

Hydropower is one of the major renewable energy sources in CPEC's energy portfolio.

- (i) Karot Hydropower project (720 MW) on Jhelum River
- (ii) Suki Kinari hydropower project (884 MW) is also under CPEC.
- (iii) Kohla (1124 MW) and Azaol Pattan (700.7 MW) hydropower projects are in the pipeline.

These hydropower projects help provide clean power.

(ii) Wind power project under CPEC

There are several hydropower and also wind power projects under CPEC.

- (i) Hydrochina Dawood Wind Farm in Thatta Sindh 50MW
 - (ii) UEP Wind Farm, Jhimpur 100MW.
 - (iii) Sachal Wind Farm 50MW in Jhimpir
 - (iv) Three Gorges Second and Third wind power project 100MW.
- Wind energy helps diversify the energy mix and is particularly useful in coastal or windy regions like Sindh.

iii Solar Power Project under CPEC

- (i) One of the flagship renewable projects Quaid-e-Azam Solar Park, Bahawalpur with the capacity of around 1000MW.

Solar power is especially strategic because Pakistan has very high solar irradiation in many regions making it suitable for large-scale solar PV.

(iv) Geothermal Potential in CPEC

Studies suggest there is geothermal potential in CPEC region (esp. in north Balochistan) that could be tapped. Geothermal energy would provide baseload renewable electricity complementing the intermittency of wind and solar.

Under CPEC, renewable energy sources play a crucial role in Pakistan's long-term energy strategy. These renewables help diversify

Pakistan's energy mix, improve sustainability and reduce dependency on conventional fossil-based power.

(B) Discuss different Parts of cell?

A human cell is a basic structural and functional unit of life. Every cell contains specific parts (organelles) and each organelle perform a specific function. Together these maintain life, growth, metabolism, and reproduction.

(i) Cell Membrane:

- (i) Cell membrane is the outer covering of cell which is thin and flexible.
- (ii) it is made up of Phospholipids, cholesterol, proteins and carbohydrates.
- (iii) it controls what enters and leaves the cell.
- (iv) it works like a security gate.

(ii) Cytoplasm:

- (i) A Jelly-like fluid inside the cell where organelles present or float.
- (ii) Most chemical reactions of life occur here like (metabolism).
- (iii) it act as a storage house
- (iv) it has 90% water in it

(iii) Nucleus:

- (i) it contains DNA, which stores genetic information. it visible during non-dividing stage.
- (ii) it controls growth, cell division and protein production.

(iv) Mitochondria:

- (i) It is power house of cell. Produce ATP for all cell functions.
- (ii) More active cells (muscle cells) contain more mitochondria
- (iii) These are self-replicating organelle.

(v) Ribosomes:

- (i) Tiny structures responsible for protein synthesis.
- (ii) Can float freely or attach to ER.
- (iii) Palade was the first person who discovered it.

(vi) Endoplasmic Reticulum:

(i) Rough ER

- Has Ribosomes on it.
- Makes proteins for secretion.

(ii) Smooth ER

- NO Ribosomes
- Make lipids, detoxifies drugs

(vii) Golgi apparatus:

- (i) Modifies, stores and package proteins.
- (ii) Send them to required places inside or outside the cell.

(viii) Lysosomes:

Break down waste material, dead organelles and microbes.

(ix) Centrioles:

- (i) → Help in cell division
- (ii) → organize spindle fibre

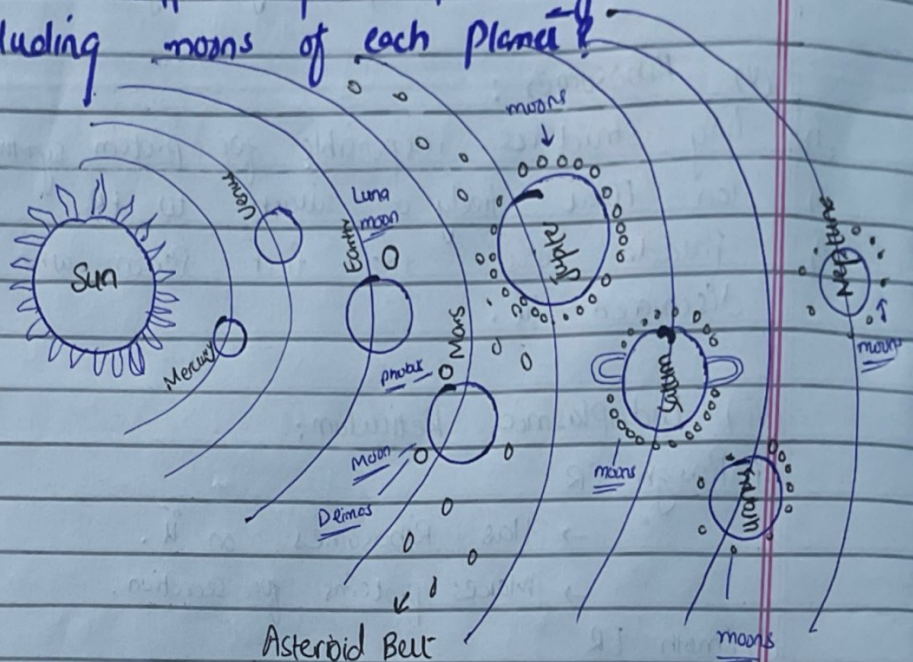
(x) Vacuoles

- (i) → Small sacs for storage and transport of materials inside the cell.

(xii) Cytoskeleton

- (i) A network of protein filament.
- (ii) Maintain shape, provides strength, helps in movement of cell.

(H) Draw different parts of solar system including moons of each planet?



Q NO 7

(i) Find the missing terms

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

A series of Prime number

(ii) 10, 28, 91, 370, _____?

(iii) A cloth merchant bought 35 shirts each at a price of RS 280. He sold them for RS 308. Find the percentage of profit?

Cost price of each shirt = 280

Selling price of each shirt = 308

$$\text{Profit} = \text{S.P} - \text{C.P}$$
$$308 - 280$$

$$\text{Profit} = 28 \text{ Rs} \quad (\text{Profit per shirt})$$

Find Profit %

$$\text{Profit} \% = \frac{\text{Profit} \times 100}{\text{C.P}}$$

$$= \frac{28}{280} \times 100$$

$$\text{Profit \%} = \boxed{10\%}$$

(3) Find IQ of child age 10-years
and Chronological age 12y?

$$\text{IQ} = (\text{Mental age} \div \text{Chronological age}) \times 100$$

Actual age = 10 years

Chronological age = 12 years.

In Psychology Chronological age = real age
Mental Age = 10 years

$$\text{IQ} = \frac{10}{12} \times 100$$

$$\text{IQ} = \frac{1000}{12}$$

$$\text{IQ} = \boxed{83.33}$$

$$\begin{array}{r} 10 \\ 50 \\ \hline 00 \\ 50 \times \\ \hline 500 \\ 6 \sqrt{500} \\ 48 \\ \hline 20 \\ 18 \\ \hline 20 \\ 18 \\ \hline \end{array}$$

(4) The average height ?

Average height of ³⁰ Boys = 150cm
total boys = 30
wrong value = 135cm
correct value = 165cm

Total wrong sum = Mean $\times$ No. of boys

$$150 \times 30 = 4500$$

We must subtract the wrong and add correct.

$$4500 - 135 + 165$$

$$4500 + 30 = 4530$$

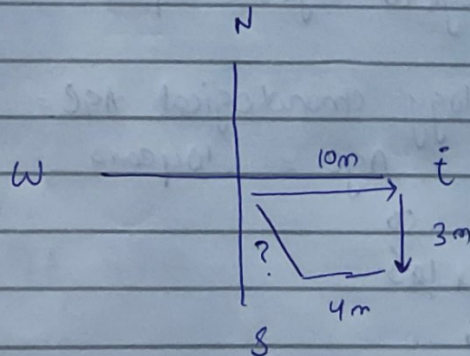
Find the mean

$$= \frac{4530}{30}$$

$$= 151$$

$$\begin{array}{r} 151 \\ 3 \overline{) 453} \\ \underline{3} \\ 18 \\ \underline{15} \\ 3 \\ \underline{3} \\ 0 \end{array}$$

Question NO 8



$$\text{West to E} = 10\text{m}$$

$$\text{E to W} = 4\text{m}$$

$$10 - 4 = 6$$

$$\text{N to S} = 3$$

Use Pythagoras

$$\text{Distance} = \sqrt{6^2 + 3^2}$$

$$= \sqrt{36 + 9}$$

$$= \sqrt{45}$$

$$3 \times 2.236 = \boxed{6.708}$$

$$\sqrt{45} = \sqrt{9 \times 5}$$

$$\sqrt{9} \times \sqrt{5}$$

$$3\sqrt{5}$$

$$\sqrt{5} = 2.236$$

(2) Find Perimeter --- ?

Regular octagon has 8 sides.
each is = 5cm

$$\text{Each interior angle} = \frac{(n-2) 180^\circ}{n}$$

$$= \frac{(8-2) \times 180^\circ}{8}$$

$$= \frac{36 \times 180^\circ}{8}$$

$$= \boxed{135^\circ} \text{ each interior angle.}$$

Perimeter = sum of all exterior sides

$$8 \times 5 = \boxed{40 \text{ cm}}$$

$$\begin{array}{r} 180 \\ \times 3 \\ \hline 540 \\ \times 4 \\ \hline 2160 \end{array}$$

(3) MADRAS → NBESBI

M — N

A — B

D — E

R — S

A — B

S — I

B — C

O — P

M — O

B — C

A — B

Y — Z

(4) A Box contain 6 Green balls 10 yellow
... ?

$$\text{Green Ball} = 6$$

$$\text{Yellow Ball} = 10$$

$$\text{Total ball} = 10 + 6 = 16 \text{ balls}$$

$$\text{Probability of yellow} = \frac{10}{16}$$

$$\boxed{0.625} \text{ or } 62.5\%$$



$$\begin{array}{r} 0.625 \\ 8 \overline{) 50} \\ \underline{48} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 0 \end{array}$$