

General Science and Ability Mock Paper

Section #01

Question # 02

(a) How black Holes are formed? Discuss.

Introduction:

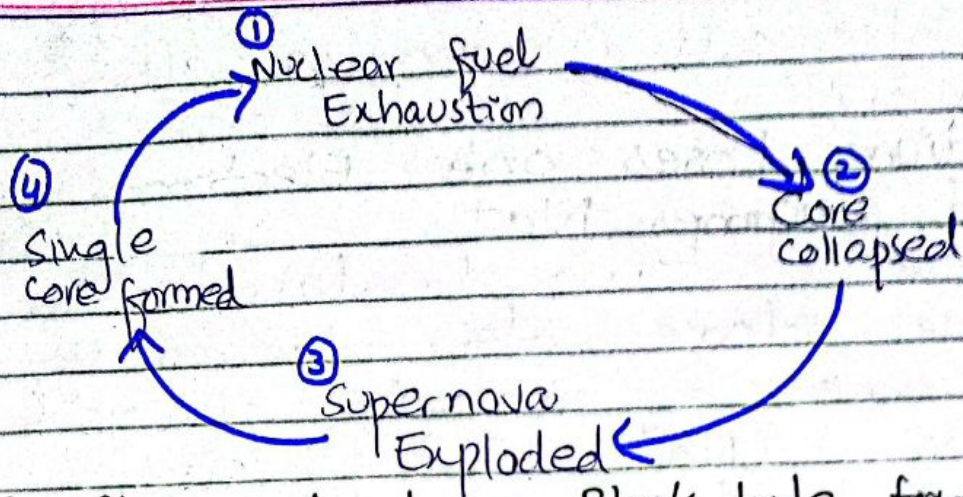
Black holes are one of the most mysterious objects in the universe. They formed when the extremely massive stars reach the end of their life and collapse under their gravity. Their formation is multi steps or multi-stage astrophysical process.

Stellar life cycle Leading to Black Hole Formation:

All stars spend most of their lifetime in converting hydrogen into helium and producing light and heat. When a star, usually 20 times massive than sun runs out of its nuclear fuel, it can no longer support itself against its gravitational pull. This marks the beginning of collapse that forms a black hole.

Process of Black Hole Formation:

- **Step 1: Nuclear Fuel Exhaustion**
Massive stars burn their fuel rapidly. When the fusion process stops, the outward pressure decreases.
- **Step 2: Core^{of star} Collapse**
With no opposing force, the gravity pulls the stars' core inward. This process is extremely fast and intense.
- **Step 3: Supernova Explosion.**
The outer layer of the star blast outward in a spectacular explosion called supernova, and it releases enormous amount of energy.
- **Step 4: Formation of Single Core**
A collapsed core remains, and if it exceeds the mass limit, the core further collapses into a singularity and a black hole is formed.



Steps involved in Black hole formation.

(b) What is octet rule? Explain it in the example of table salt in context of bonding.

Introduction:

Octet rule is a fundamental concept in chemistry which explains why atoms tend to form chemical bonds. It states that atoms are most stable when they have eight electrons in their outermost shell like noble gases similar to the electronic configuration of noble gases. This rule helps to understand how elements combine to form compounds like table salt.

Ionic Bond Formation in Table salt (NaCl):

There are some steps involved in ionic bond formation.

of table salt (known as NaCl).

→ Sodium Loses one Electron and becomes Na^+

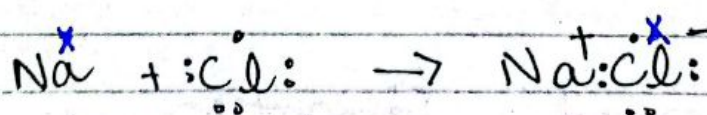
Sodium atom donates its single valence atom electron, by forming a positively charged ion (Na^+). This loss gives sodium a stable configuration similar to neon.

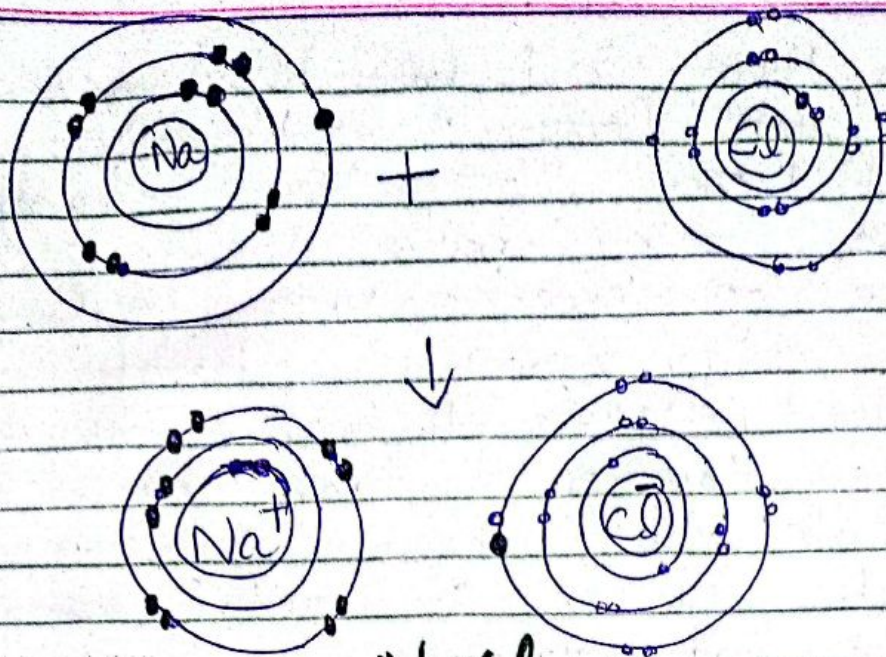
→ Chlorine gain that electron and becomes Cl^-

Chlorine accept the electron donated by sodium, forming a negatively charged ion (Cl^-). This gain completes chlorine's octet.

→ Na^+ and Cl^- attract each other to form ionic bond:

The oppositely charged ions attract each other, forming a strong ionic bond. This bond holds the Na^+ and Cl^- together in a strong crystalline lattice structure, resulting the compound sodium chloride (NaCl).





(C)

Write the uses of Microwaves, radio waves and x-rays in daily life.

Introduction.

Electromagnetic waves, including microwaves, radio waves and x-rays are integral to modern life. Each type of wave has different properties such as wavelength and energy, which determine their practical applications in communication, ~~medicine~~ medicines and household technology.

Properties of Electromagnetic waves relevant to Daily Life.

Microwaves have relatively shorter wavelength and can penetrate materials like food and water.

making them ideal for heating. Radio waves have long wavelengths, allowing them to travel long distances which make them suitable for broadcasting and communications. X-ray have very short wavelength and very high energy allowing them to penetrate soft tissues and materials, which is useful for imaging and inspection.

Applications of Microwaves,

X-rays and Radio waves:

Uses of Microwaves

They are primarily used in cooking food through microwave ovens which heat water molecules efficiently. They are also used in satellite communication, Wi-Fi networks and radar technology for weather monitoring and speed detection.

Uses of Radio Waves:

- They are essential for broadcasting radio and television signals.
- They are used in mobile communication, navigation system like GPS, and air traffic control.

Uses of X-Rays

X-Rays are used in medical imaging to view bones, teeth and internal organs. They are also employed in airport security scanners to identify prohibited items and also in industrial inspections to identify the cracks and defects in machinery and structures.

Conclusion:

By concluding all, microwaves, radio waves and X-rays plays vital role in daily life, from cooking and communication to medical imaging and industrial safety. Understanding their properties will allow anyone to harness their benefits and minimizing the potential risk.

Section-II

Question # 7

Part a: Missing terms

(i) 11, 13, 17, —, 23

All the given numbers are the prime numbers.

Next prime number to 17 is 19, which lies between 17 and 23 while observing the series of prime number.

So the missing number in given series is 19.

(ii) 10, 28, 91, 370

$$1^{\text{st}} \text{ no.} = 10$$

$$2^{\text{nd}} \text{ no.} = (1^{\text{st}} \text{ no.} \times 2) + 8 = (10 \times 2) + 8 = 28$$

$$3^{\text{rd}} \text{ no.} = (2^{\text{nd}} \text{ no.} \times 3) + 7 = (28 \times 3) + 7 = 91$$

$$4^{\text{th}} \text{ no.} = (3^{\text{rd}} \text{ no.} \times 4) + 6 = (91 \times 4) + 6 = 370$$

$$\begin{aligned} \text{So, } 5^{\text{th}} \text{ no.} &= (4^{\text{th}} \text{ no.} \times 5) + 5 \\ &= (370 \times 5) + 5 = 1850 + 5 \\ &= 1855 \end{aligned}$$

So the next number in given series will be 1855

Part (b)

Total shirts bought = 35

Purchasing price per shirt = Rs. 280

Selling price per shirt = Rs. 308

Purchasing price of 35 shirts = 35×280
= 9000

Selling price of 35 shirts = 35×308
= 10,780

Percentage profit = $\frac{\text{Selling price} - \text{Purchasing price}}{\text{purchasing price}} \times 100$

$$= \frac{10780 - 9000}{9000} \times 100\%$$

$$= \frac{1780}{90} \%$$

$$\approx 19.78\%$$

Hence the percentage profit for selling 35 shirts is almost 19.78%

Part (c)

$$\text{IQ of a child} = \frac{\text{Actual age}}{\text{Chronological age}} \times 100$$

in the given data

Actual age = 10 years

Chronological age = 12 years

So

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

$$= \frac{250}{3}$$

$$\approx 83.33$$

83.33

$$\begin{array}{r} 3 \overline{) 250} \\ \underline{24} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

A child whose actual age is 10 years but the chronological age is 12 years will have the IQ of 83.33

Part (d)

Average of height of 30 boys = 150 cm.

165 cm was wrongly copied as 135 cm

then

Sum of 30 boys height = 150 cm

Sum of ³⁰ boys height = 150 × 30 = 4500 cm

~~By~~ ✓

After detecting the error

$$\text{Average} = \frac{\text{sum of 30 boys height} - 135 + 165}{30}$$

$$= \frac{4500 - 135 + 165}{30}$$

$$= \frac{4500 + 30}{30}$$

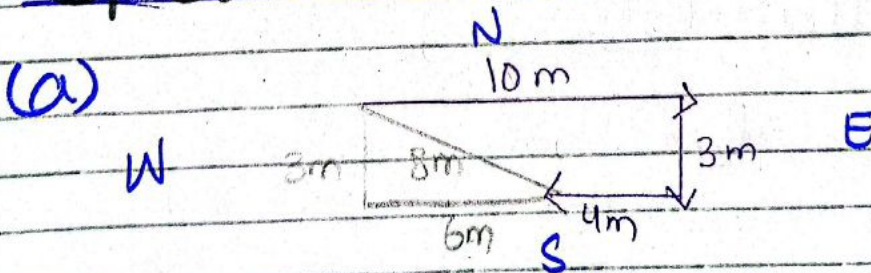
$$= \frac{4530}{30}$$

$$= 151$$

$$= 151 \text{ cm}$$

Hence the new average height of 30 boys will be 151 cm.

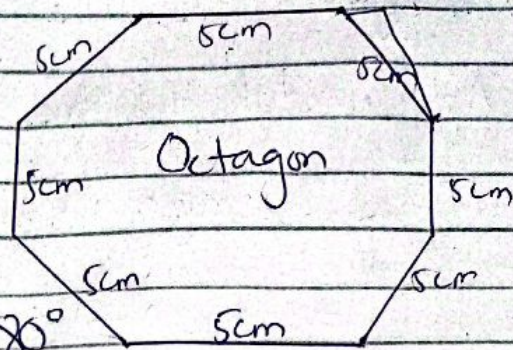
Question #08



Sara is 8m toward east south direction from its initial point. If she walks straight 6m more she will 3m towards 3m south of her original/initial position.

(b)

$$\begin{aligned}\text{Perimeter of octagon} &= 8 \times 5\text{cm} \\ &= 40\text{cm}\end{aligned}$$



$$\begin{aligned}\text{Interior angle} &= \frac{n-2}{n} \times 180^\circ \\ &= \frac{8-2}{8} \times 180^\circ \\ &= \frac{6}{8} \times 180^\circ \\ &= \frac{3}{4} \times 180^\circ \\ &= 135^\circ\end{aligned}$$

$$\begin{aligned}\text{Perimeter of octagon} &= 40\text{cm} \\ \text{Interior angle of octagon} &= 135^\circ\end{aligned}$$

(c)

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

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

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

Probability of picking a yellow ball =

$$P(\text{yellow}) = \frac{\text{no. of yellow balls}}{\text{total balls}} = \frac{10}{16}$$

$$P(\text{yellow}) = \frac{5}{8}$$

(d)

MADRAS is coded as NBESBT

If the pattern of above codes is observed, it can be concluded that every alphabet is coded as the its next alphabet according to english alphabet series.

M $\rightarrow$ N

A $\rightarrow$ B

D $\rightarrow$ E

R $\rightarrow$ S

A $\rightarrow$ B

S $\rightarrow$ T

then the BOMBAY will be coded as

B $\rightarrow$ C

O $\rightarrow$ P

M $\rightarrow$ N

B $\rightarrow$ C

A $\rightarrow$ B

Y $\rightarrow$ Z

Hence the "BOMBAY" is coded as "CPNCBZ"

Question #04

Part (a)

Distinguish the following sentence in one one sentence.

i- Cyclone and Tornadoes

Cyclones are large rotating storms or system of storm that forms over warm ocean waters.

A tornado is a much smaller, violently rotating column of air that forms over land.

ii- Hypocenter and Epicenter

The hypocenter is the point inside the Earth where an earthquake actually starts.

Epicenter is point over the Earth surface just above the hypocenter.

iii- GPS and GIS

GPS is a satellites based system through which the accurate location of anything can be find on the Earth.

GIS is a computer based tool used to store, analyze and display the geographical information.

iv Pesticides and Insecticides

Pesticides are the chemicals that are used to control the pests of various types like fungi, weeds and insects.

Insecticides are a type of pesticides that specifically are made to target the insects.

v- RAM and ROM

RAM (Generally known as random access memory) ~~stores~~ is a temporary memory that stores data while the computer is running.

ROM (Read only Memory) is a permanent memory that stores essential programs used during startup.

Part (B)

How Volcanic Eruption Occurs

Introduction to Volcanic Eruptions

Volcanic eruptions are natural geological events in which molten rock, gases and ash escapes from the Earth's interior.

In 2023, Iceland witnessed a volcanic eruption with three different vents.

Formation of Magma and Pressure:

Volcanic eruption begins when the Earth mantle melts rocks to form magma. This molten material is less dense than the surrounding rocks. It rises through cracks and weak points inside the Earth's crust. This magma contains the mixture of gases including water ~~and~~ vapours, carbon dioxide, which expands as pressure builds.

Mechanism of Volcanic Eruption:

→ Movement of Magma through Vents:

Magma moves in upward direction using different vents. In ~~2022~~, Iceland 2023, three different types of vents allow magma to reach the surface simultaneously, releasing lava and pyroclastic material.

→ Gas Expansion and Pressure Builds:

Dissolved gases expand as magma rises, increasing pressure inside the magma chamber. Once

the pressure exceeds the strength of the surrounding rock, an eruption occurs.

Surface Eruption.

The pressure release causes lava flow, ash clouds and pyroclastic materials to be expelled. Multiple vents can lead to widespread lava distribution and increased eruption intensity.

Conclusion:

By way of summary, volcanic eruptions occur due to magma ascent, gas expansion and pressure build up. The 2023 Iceland eruption with three vents demonstrates how magma release can impact environment and human activity.

Part (C)

Introduction to Solid Waste Management.

Solid waste management is essential for environmental stability. Techniques like pyrolysis, incineration, and composting help reduce waste volume, recover energy and recycle organic matter, support cleaner cities and healthier environments/ecosystems.

Incineration: Waste to Energy process.

Incineration is a technique in which solid waste is burned in the presence of oxygen. It reduces the volume of waste and produces heat energy which ultimately produces electricity. Proper emission control is essential in this technique to prevent the release of toxic gases.

Pyrolysis: A Thermal Decomposition

It involves heating solid waste in the absence of oxygen.

This process breaks down material into bio-oil and syngas.

This technique is commonly used for plastic and biomass waste, provides energy and minimizes the pollution.

Composting: A Biological Decomposition.

Composting is a natural process in which microorganisms decompose organic waste such as food scraps, garden waste and agriculture residues.

The result is the nutrient rich humus that can improve the structure and fertility of soil.

Critical Evaluation:

Each method has some limitations including:

- Incineration may emit harmful gases.

- Pyrolysis * requires high technology,
- Composting cannot treat biodegradable waste.

Efficient solid waste management depends on selecting the right method for specific waste type while minimizing the environmental impacts.

Conclusion:

In conclusion, pyrolysis, incineration and composting are vital techniques for solid waste management. Together, they reduce waste, recover energy and recycle nutrients by promoting a cleaner and sustainable environment.

Part (D)

Introduction to Balanced Diet:

A balanced diet provides all essential nutrients in the right proportions to maintain health, growth and energy level. It is the foundation of good nutrition and disease prevention.

Components of Balanced Diet (and their functions)

- Carbohydrates (Energy)
- Protein (Body repair and growth)
- Fats (Energy storage and insulation)
- Vitamins (body functions)
- Minerals (bone health, enzymes)
- Fiber (Digestion)
- Water (Hydration and metabolism)

Importance of Balanced Diet

- (i) It maintains healthy body weight and prevent malnutrition
- (ii) Supports immune system function and reduce the risk of diseases
- (iii) Provide energy for daily activity & physical growth
- (iv) Promotes mental well-being and concentration

Critical Evaluation:

Although many people consume food regularly, not all diets are balanced. Over reliance on fast food, sugary drinks and processed items can lead to nutrient deficiencies and obesity. Education and awareness over balanced diet is essential for long term health.

Conclusion:

A balanced diet supplies all necessary nutrients in proper proportions, supporting overall health, growth and energy. Adopting a balanced diet is crucial for maintaining physical and mental well being throughout the life.
