

General Science and Ability.

PART - II

Section - I

Q2.

(a)

Difference between a Star and a Planet. Briefly describe the life cycle of a star from Nebula to a Black Hole.

Star

A star is a massive, self-luminous celestial body that produces its own light and heat through nuclear fusion reactions occurring in its core.

Planet

A planet is a non-luminous body that does not generate its own energy. It only reflects the light of a nearby star and revolves around that star in a fixed orbit.

Life cycle of a star.

Nebula

A cloud of gas and dust where a star begins to form.

Protostar

Gas contracts and heats, forming a young developing star.

Super-giant.

The star expands after exhausting hydrogen in its core.

Supernova to Blackhole

A massive star explodes as a supernova and its dense core collapses into a black hole.

(b)

What are semi-conductors? Explain difference between n-type and p-type semi-conductors and list two of their modern applications?

Semi-conductors:-

A semi-conductor is a substance whose electrical conductivity lies between that of a conductor and an insulator. Its conductivity increases when impurities are added or temperature rises.

(i) n-Type semi-conductor

An n-type semi-conductor is formed by adding pentavalent impurity atoms such as phosphorus. These atoms provide extra electrons, so electrons become the majority charge carriers.

(ii) p-Type semi-conductor.

A p-type semi-conductor is formed by adding trivalent impurity atoms such as boron. These atoms create holes (positive vacancies), so holes become the majority charge carriers.

Modern Applications

Semi-conductors are widely used in devices such as transistors and solar cells.

(c)

Define Global Warming. Explain the mechanism of the Greenhouse Effect and list three major greenhouse gases.

Global Warming:-

Global warming is the long-term rise in the Earth's average temperature caused mainly by the increased concentration of greenhouse gases in the atmosphere.

Mechanism of Green-house Effect

Natural Process:-

The sun's rays reach the Earth, warming its surface. The Earth then emits this energy back as infrared radiation.

Trap of Heat

Greenhouse gases in the atmosphere absorb and trap part of this outgoing infrared radiation. This trapped heat keeps the Earth warm enough to support life.

Enhanced effect

Human activities increase greenhouse gas levels, trapping more heat than necessary. This strengthened greenhouse effects leads to global warming.

(2)

Major Greenhouse Gases.

The three major greenhouse gases are

- (i) Carbon-dioxide
- (ii) Methane
- (iii) Nitrous oxide.

(d)

What is a Tsunami? Explain the natural processes that trigger a tsunami and the potential impact on coastal areas.

Tsunami

A tsunami is a series of large ocean waves caused by sudden displacement of water due to natural events like earthquakes, volcanic eruptions, or underwater landslides.

Natural Processes that trigger a Tsunami:

Underwater earthquakes push the seafloor and displace water. Volcanic eruptions force water outwards and underwater landslides push large volumes of water forming waves.

Potential Impact on Coastal Areas:-

Tsunami waves can flood coastal regions, destroy homes and infrastructure, cause loss of life and injuries, and damage ecosystems such as mangroves and coral reefs.

Q4: (d)

(a)

Explain the Rock Cycle. Differentiate between Igneous, Sedimentary and Metamorphic rocks with examples.

Rock Cycle

The rock cycle is the continuous process in which rocks are formed, broken down, and transformed into different types over time due to natural processes like heat, pressure, and weathering.

Types of Rocks

Igneous Rocks

Igneous rocks are formed when magma or lava cools and solidifies. Examples include granite and basalt.

Sedimentary Rocks

Sedimentary Rocks are formed from the accumulation and compression of sediments over time. Examples include sandstone and limestone.

Metamorphic Rocks:

Metamorphic rocks are formed when existing rocks are subjected to high heat and pressure, causing them to change physically and chemically. Examples include marble and slate.

(b)

What is Acid rain? Discuss the chemical reactions involved in its formation and its harmful effects on aquatic life and vegetation.

Acid Rain

Acid rain is precipitation such as rain, snow, or fog that is more acidic than normal due to the presence of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) in the atmosphere.

Formation (Chemical Reactions)

Acid rain forms when sulfur dioxide and nitrogen oxide react with water and oxygen to produce acids.

Harmful Effects

On Aquatic Life.

Acid rain lowers the pH of lakes and rivers, making the water too acidic for fish and other organisms, which can lead to death and reduced biodiversity.

On Vegetation

Acid rain damages leaves, reduces nutrient availability in soil, and weakens or kills sensitive plants.

(c)

Discuss the role of Remote sensing and GIS in environmental monitoring and disaster management.

Remote Sensing

It is a collection of information about the Earth's surface using satellites or aircraft.

GIS (Geographic information system)

It is a technology used to store, analyze, and visualize spatial data.

Role in Environmental Monitoring and Disaster Management

Remote sensing provides data on land use, vegetation, water bodies, and pollution, while GIS helps analyze and map these changes over time for better decision making.

Remote sensing also detects floods, earthquakes, wildfires and storms, and GIS helps plan evacuation routes, assess damages and manage resources efficiently during disasters.

(d)

Explain the concept of Solid Waste Management. What are the environmental hazards associated with improper disposal of Urban waste?

Solid Waste Management (2)

It is the collection, treatment, and disposal of solid materials generated by households, industries, and commercial activities in an environmentally safe manner.

Environmental Hazards of Improper Disposal -

Improper disposal of Urban waste can pollute air, water, and soil, spread diseases, attract pests, and contribute to green house gas emissions and land degradation.

SECTION - II

Q: 7

(a)

In a survey, of 100 people, 65 watch cricket, 40 watch Hockey, and 20 watch neither. How many people watch both cricket and Hockey?

As 20 people out of 100 watch neither sport. Therefore remaining 80 people ~~may~~ watch sports. In remaining 80 people, 65 watch cricket and 40 watch Hockey. If 40 people watch Hockey ~~as~~ then other 40 are watching just cricket to make it 80 (i.e. $40+40=80$). Therefore, 25 (i.e. $65-40=25$) watch both ~~cricket and Hockey~~ ~~cricket and Hockey~~ : 25

Answer: 25 people watch both cricket and Hockey

(b)

A rectangular swimming pool has a length ~~of~~ that is 4 meters more than its width. If the perimeter of the pool is 72 meters, what is the volume of water needed to fill the pool to ~~the~~ a uniform depth of 2.5 meters?

Given:-

$$\text{Let width of swimming pool} = x \quad \text{--- (1)}$$

$$\text{length of swimming pool} = y = x + 4 \text{ m} \quad \text{--- (2)}$$

$$\text{perimeter of swimming pool} = 2(x+y) = 72$$

$$\text{or } n+y = 36\text{m}$$

$$n+n+y = 36\text{m}$$

$$2n+y = 36\text{m}$$

$$2n = 32\text{m}$$

$$n = 16\text{m} \quad (2)$$

Volume of water needed to fill the pool to a uniform depth of 2.5 meters is

$$= \text{length} \times \text{width} \times \text{height}$$

$$= (n+y) \times n \times 2.5$$

$$= (16+y) \times 16 \times 2.5$$

$$= 20 \times 16 \times 2.5$$

$$= 800\text{m}^3$$

Answer: Volume of water = 800m^3

(c) A train leaves City A at 8:00 AM traveling at 60 km/hr. Another train leaves City B at the same time, traveling towards City A at 40 km/hr. If the distance between City A and City B is 400 km, at what time will the two trains meet?

First train leaves City A towards City B at 8:00 AM traveling at 60 km/hr will travel 240 km after 4 hours at 12:00 P.M. And second train leaves City B at same time traveling towards City A at 40 km/hr will travel 160 km after 4 hours at 12 P.M. Therefore, two trains will meet

at 12 P.M.

Answer: Both trains will meet at 12:00 P.M.

(d)

The sum of the present ages of a father and his son is 75 years. Ten years ago, the father's age was four times the son's age. What are their current ages?

Let the current age of father = x

the current age of son = y

At present

$$x + y = 75 \quad \text{--- (1)}$$

Ten years ago,

$$x = 4y$$

$$x - 4y = 0 \quad \text{--- (2)}$$

From eq (1) and eq (2)

$$\begin{array}{r} x + y = 75 \\ - \quad x - 4y = 0 \\ \hline \end{array}$$

$$5y = 75$$

$$y = 15$$

From eq (1)

$$x + 15 = 75$$

$$x = 75 - 15$$

$$x = 60$$

Answer: Current ages of father and son are
→ 62 and 13 respectively.

11.8.00-51 for team 11th point at 15.00.11

Q: 8 (b)

(a)

In a certain code language if 'ROAD' is coded as 'U@DG', how would 'LAKE' be coded in the same language? Explain the rule of coding.

ROAD is coded as U@DG

R $\xrightarrow{+3}$ U

O $\xrightarrow{+2}$ @

A $\xrightarrow{+3}$ D

D $\xrightarrow{+3}$ G

Then, LAKE would be coded as

L $\xrightarrow{+3}$ O

A $\xrightarrow{+2}$ C

K $\xrightarrow{+3}$ N

E $\xrightarrow{+3}$ H

Answer: LAKE would be coded as OCNH

(b)

A man tells a woman, "The son of my sister's husband is the father of your son. How is the woman related to the man?"

The son of a husband of sister of man is also son of man's sister. Therefore, son of man's sister is man's nephew. The nephew is the father of the woman's son. Therefore that woman is wife of man's nephew. Therefore, woman is niece-in-law of the man.

Answer: Niece-in-law

(c)

Find the next number in each of the following sequences and explain the pattern

(i)

4, 12, 6, 18, 9, 27, —

The first series 4, 6, 9 are increasing from 2, 3 and onward. The second series ~~is~~ 12, 18, 27 increases from 6, 9 and onward. Therefore next number will be of first series and next jump is of 4 numbers therefore next number will be 13 (i.e. $9+4=13$)

Answer: 13

(ii)

1, 2, 6, 24, 120, 720

Each number is multiplied by consecutive numbers starting from 2 (i.e. $1 \times 2 = 2 \times 3 = 6 \times 4 = 24 \times 5 = 120 \times 6 = 720$.)

Answer: 720

(d)

Five friends (P, Q, R, S, T) have different heights.

P is shorter than Q but taller than R.

S is shorter than T but taller than Q.

The shortest person is 150 cm tall, and tallest is 180 cm tall. Who among the friends is the third tallest and what is the possible maximum range of their heights?

Q is the third tallest among the friends as arrangement is as follows descending.

T, S, Q, P, R

The range of their heights is $180 - 150 = 30$ cm

Answer: Q is the third tallest friend and range of heights is 30 cm.