

PART - II

SECTION - A

QUESTION # 2

ANSWER

Part (a)

In the Big Bang theory, the universe is structured as an ever-expanding system, evolving from a simple, uniform state into a complex arrangement of galaxies, clusters, and vast empty regions, governed by gravity, dark matter and dark energy. According to this theory, the structure of universe is understood as the result of its origin, expansion, and large scale organization over time.

i) Origin of Universe:

The Universe began about 13.8 billion years ago from an extremely hot, dense, and a compact state called singularity. Space, time, matter, and energy all came into existence with the big bang. It was not an explosion in space, but an explosion of space itself.

(ii) Early Expansion and formation of Matter:

Immediately after the Big Bang, the universe expanded rapidly. As it cooled, the fundamental particles (quarks, electrons) formed. These combined to form protons and neutrons which ultimately formed the hydrogen and helium atoms.

(iii) Development of Large-Scale Structure:

Over millions of years, slight density variations caused matter to clump together due to gravity forming stars, galaxies, clusters and superclusters of galaxies.

(iv) Expanding Universe:

The Universe is still expanding as observed from various observations and theories such as redshift theory and cosmic microwave background radiation.

(v) Composition of the Universe:

According to Big Bang framework, the universe's structure is made up of:
5% known matter, 25% dark matter (cosmic glue for galaxies) and 68% dark energy.

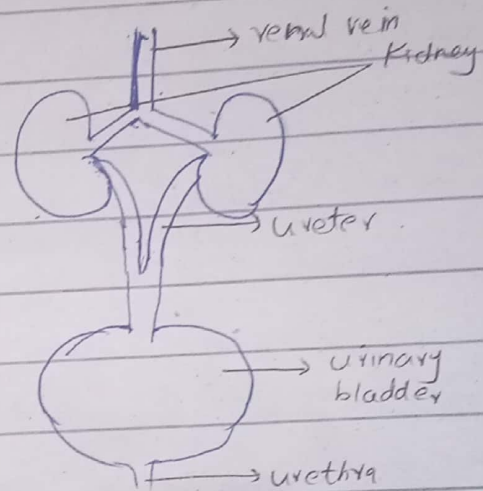
Part (b)

1) URINARY SYSTEM:

The system which is responsible for filtration of blood and excretion of waste from the body is called urinary system.

The main components of this system include:

- i) Renal vein
- ii) Kidneys
- iii) Ureter
- iv) Urinary bladder
- v) Urethra



2) WORKING OF NEPHRON:

Nephron is the fundamental structural and functional unit of kidneys. It helps in the filtration of blood and separation of waste.

Working:

1) ~~Afferent Arteriole~~ ^{Afferent Arteriole}: the unfiltered blood enters the nephrons through afferent arteriole.

2) Glomerulus:

From the afferent arteriole, blood enters

the glomerulus which is a network of thin capillaries. The filtration takes place here.

3) Efferent Arteriole:

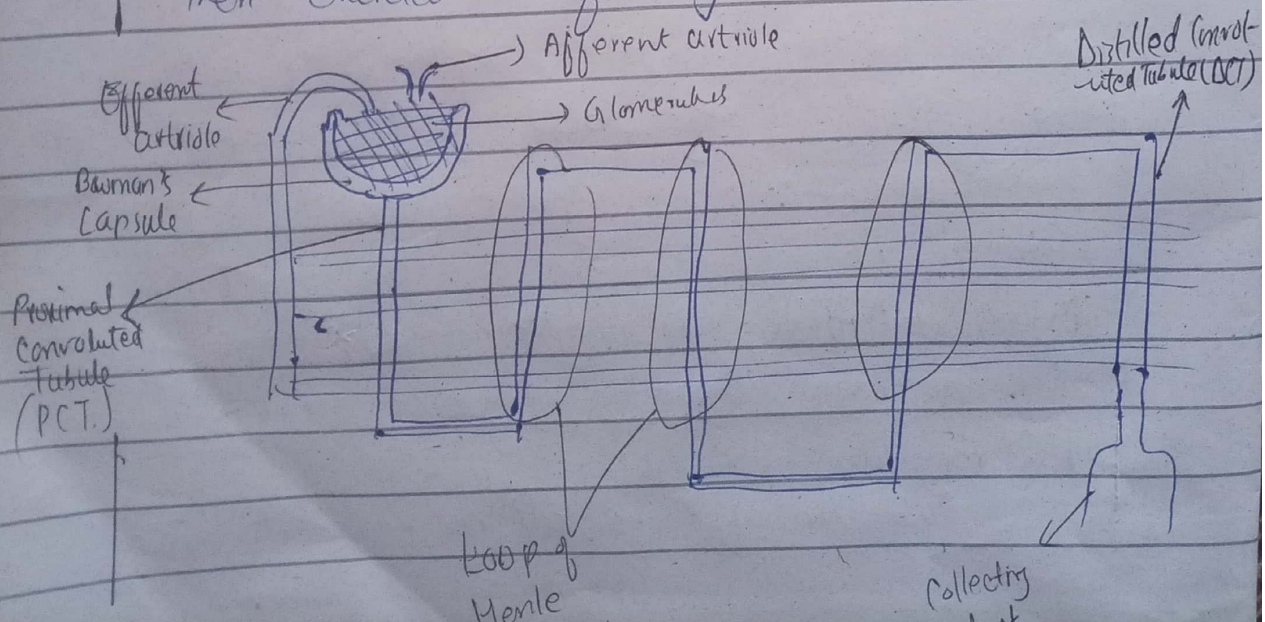
The filtered blood moves into efferent arteriole which is linked to peri-tubular capillaries.

4) Bowman's Capsule:

The separated waste from glomerulus moves into a cup-shaped structure called Bowman's capsule.

5) Tubulus:

The waste from Bowman's capsule enters into tubules: Proximal convoluted tubule, loop of Henle and distal convoluted tubule where the reabsorption of nutrients and minerals takes place from the waste. The rest of waste moves to collecting duct which is then excreted out of body.



Part-C

1) UN-BALANCED DIET:

The diet which lacks the balanced amount of macro-nutrients (carbohydrates, fats and proteins) and micro-nutrients (vitamins and minerals) is called an unbalanced diet.

The excess or deficiency of either micro or macro nutrients in a diet make it un-balanced and unhealthy.

2) EFFECTS OF UN-BALANCED DIET ON HEALTHY LIVING:

(i) DETERIORATION OF HUMAN HEALTH:

The un-balanced diet results in the deterioration of human health due to improper functioning of body organs. It is because the balanced diet ensures the normal functioning of organs which gets disrupted due to intake of unbalanced diet.

(ii) ~~EXPOSURE~~ WEAKENING THE IMMUNE

SYSTEM:

The unhealthy diet weakens the immune system and exposes the body to various diseases such as cardio-vascular diseases, heart failure, obesity etc.

(iii) RETARDATION OF GROWTH AND DEVELOPMENT:

The un-balanced diet leads to retardation of growth and development in children. The deficiency of balanced nutrition may cause physical disorders such as gigantism, dwarfism as well as internal conditions such as neural disorders.

(iv) REDUCE THE LIFE EXPECTANCY DUE TO UNHEALTHY LIFESTYLE:

The unhealthy and un-balanced diet affects the life expectancy, shortening it significantly. Due to healthy and clean lifestyle in China, the ^{average} life expectancy of the country is around 75 years. In contrast, average life expectancy in Pakistan is around 64 years due to unbalanced diet and unhealthy lifestyle.

Part-d

i) Cell Wall:

a) Structure:

It is rigid, non-living outermost covering found in plant cells, fungi, bacteria but absent in animal cell. It is composed of cellulose, microfibrils embedded in a matrix of hemicellulose, pectin and lignin.

b) Functions:

It provides mechanical strength and rigidity to the cell. It also maintains the cell's shape by providing structural support. It allows the free diffusion of water and other small molecules.

ii) Cell Membrane:

a) Structure:

Cell membrane is a thin flexible living boundary surrounding the cytoplasm. It is the outermost layer in the ~~plant~~ ^{animal} cell while lies inner to the cell wall in plant cell.

b) Functions:

It is a semipermeable membrane

which ^{controls} allows the entry and exit of substances into the cell and maintains intercellular environment. It also facilitates the mechanisms such as osmosis, diffusion and active transport, along with the structural and mechanical support.

iii) CYTOPLASM:

a) Structure: The cytoplasm is a semi-fluid jelly like substance present inside the cell which contains all the organelles and is rich in enzymes and proteins.

b) Functions:

Cytoplasm serves a site for protein synthesis as well as other metabolic activities and chemical reactions inside the cell. It also supports the intracellular transport of the materials.

iv) MITOCHONDRIA:

a) Structure: These are the double membrane bounded organelles with an outer layer and an inner layer which is folded into cristae. There is the inner membranous space which increases the area for the cellular respiration.

b) Functions :

It is known as power house of the cell as it carries out cellular respiration for Adenosine Triphosphate Production. It also regulates apoptosis and controls metabolic activities such as Krebs's cycle and fatty acid oxidation.

QUESTION #3

ANSWER

PART - A

1. WAYS FOR REVERSING GLOBAL WARMING:

There are several ways which can be focused on to reverse the perilous threat of global warming.

a) ADOPTING ECO-FRIENDLY TECHNOLOGY:

The global warming can be reversed by adopting eco-friendly technology such as electrical vehicles for transport, solar panels for energy generation etc. This will help in limiting and controlling the greenhouse gas emissions — the main constituent of global warming, thereby reversing the global warming.

b) THROUGH AFFORESTATION AND REFORESTATION TECHNIQUES:

The global warming can be reversed through incorporating the afforestation and reforestation techniques. Doing so will not only help in rejuvenating the previously forested land but

also employ the dead lead, thereby creating a large amount of carbon sinks to reduce global warming.

c) SHIFTING THE INDUSTRIAL FOCUS TO 3R'S TECHNIQUE:

Global warming can also be reversed by shifting the industrial focus entirely to 3R's technique that is reduce, reuse and recycle. This approach will put a restraint on the greenhouse gases emission owing to which the effects of global warming will be curtailed significantly.

d) THROUGH POPULATION CONTROL POLICIES IMPLEMENTATION AND AWARENESS:

The global warming can be reversed significantly by implementation of population control mechanism and raising awareness among masses through community groups at the grass-root levels.

Part-6

1) CERAMICS:

The material which is neither organic nor metallic but exhibits the properties of both, is known as ceramics.

2) PROPERTIES OF CERAMICS.

They are generally hard and brittle. They have high compressive strength but low tensile strength. They are also resistant to heat, water and corrosion. They are also good ~~conductors~~ electrical and thermal insulators. Moreover, they are chemically stable and non-reactive.

3) APPLICATIONS OF CERAMICS:

(i) STRUCTURAL COMPONENTS:

Ceramics are used in the manufacturing of several structural components such as tiles, bricks, cement etc.

(ii) Electronics :

Ceramics are used to make

electronic such as capacitors and insulators.

(iii) **Automotives:**

In automotive industry, ceramics are used to make plugs, catalytic converters and engines.

(iv) **MEDICAL Field:**

Ceramics are used to make dental implants, prosthetic joints etc in the medical field.

(v) **NUCLEAR Industry:**

They are also used to make fuel cells and sensors in the nuclear industry.

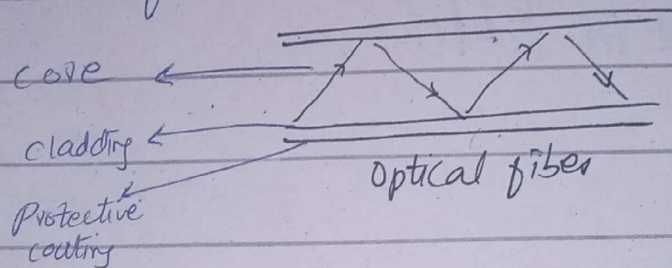
(vi) **OTHER USES:**

Ceramics are used as cutting tools as well. They are used to make pottery and tiles for art and decor.

Part - C

1) Working of Optical Fibers:

Optical fiber is a thin, flexible strand of plastic or glass used to transmit information in the form of light signals. It works on the principle of total internal reflection.



a. Working:

Light signals from transmitter enter the core of the fiber. When the light hits the boundary between the core and cladding at an angle greater than critical angle, it undergoes total internal reflection. The light continues to reflect inside the core without loss and travel long distances. At the receiving end, the light signals are converted back into electrical signals.

2) WORKING OF A MOBILE PHONE:

A mobile phone is a device which transmits voice and data using radio waves.

It works on the principle of wireless communication through electromagnetic waves and cellular network technology.

a) Working:

The data to be transmitted (sound, photo etc) is converted into electrical signals. These signals are converted into digital data. The phone then transmits this data as radio waves to the nearest cell tower (base station). The cellular network routes the signal to the receiver's nearest tower. The receiving mobile phone converts the digital signal back into electrical signals and then to its original form.

Part-d

1- FOOD ADDITIVES:

Food additives are substances added to food intentionally to improve its taste, color, texture, appearance or shelf life.

Examples:

Monosodium glutamate (for enhancing flavour), food colors (for improving appearance), emulsifiers (for improving texture) etc.

2- FOOD PRESERVATIVES:

Food preservatives are chemicals or natural substances added to food to prevent spoilage caused by microorganisms and to extend shelf life.

Examples:

Salt, sugar, sodium benzoate etc

3- FOOD ADULTERATION:

Food adulteration is the intentional mixing of inferior, harmful, or unnecessary substances in food to increase profit or quantity.

Examples:

Mixing water in milk, adding brick powder in chilli powder, mixing argemone oil in mustard oil etc.

4. FOOD CONTAMINATION:

Food contamination occurs when food becomes unsafe due to presence of harmful microorganisms, chemicals or foreign substances, usually unintentionally.

Examples:

Bacteria in uncooked or spoiled meat, pesticide residues on fruits and vegetables, dust or insects falling into uncovered food etc.

SECTION-B

QUESTION # 7

SOLUTION

PART-A

let the numbers be 'x' and 'y'

Given condition :

$$40\% \text{ of } x = \frac{2}{3} \times y$$

This implies :

$$\frac{40}{100} x = \frac{2}{3} y$$

$$\Rightarrow \frac{24}{10} x = \frac{2}{3} y$$

$$\Rightarrow \frac{2x}{10} = \frac{1}{3} y$$

$$\Rightarrow \frac{x}{5} = \frac{y}{3}$$

$$\Rightarrow \frac{x}{y} = \frac{5}{3}$$

Therefore , $\frac{\text{first number (x)}}{\text{second number (y)}} = \frac{5}{3}$

PART - B

The selling price of 17 balls = Rs 720

Selling price (S.P) of 1 ball = Rs. $\frac{720}{17}$

Let C.P be the cost price of a ball

then loss = -S.P

$\Rightarrow$

Loss = Cost price - selling price

$$-S.P = C.P - \frac{720}{17}$$

$\Rightarrow$

$$-17 \cdot C.P = -120$$

$$C.P = \frac{120}{17}$$

$$C.P = 7.05$$

Hence, the cost price of a ball is
Rs. 7.05

PART - C

Let the ^{present} age of son = n

Then, the present age of father = $n + 24$

After two years:

$$n + 24 + 2 = 2(n + 2)$$

$$\Rightarrow n + 26 = 2n + 4$$

$$2n - n = 26 - 4$$

$$\Rightarrow n = 22$$

Therefore, the present age of son is 22 years.

PART - D

Number of pages typed by Rashid in 6 hrs = 32

Number of pages typed by Rashid in 1 hr = $\frac{32}{6}$

Number of pages typed by Kamran in 5 hrs = 40

Number of pages typed by Kamran in 1 hr = $\frac{40}{5} = 8$

Number of pages typed by both in 1 hr = $\frac{32}{6} + 8$

$$= \frac{32 + 48}{6}$$

$$= \frac{80}{6}$$

$\therefore$ Time ⁸ taken by both to type 140 pages = $\frac{140 \times 6}{80}$

$$t \left(\frac{80}{6} \right) = 110$$

$$t = 110 \times \frac{83}{4}$$

$$= \frac{33}{4}$$

$$= 8.25 \text{ hours} \quad \text{or} \quad 8 \text{ hours } 15 \text{ minutes}$$

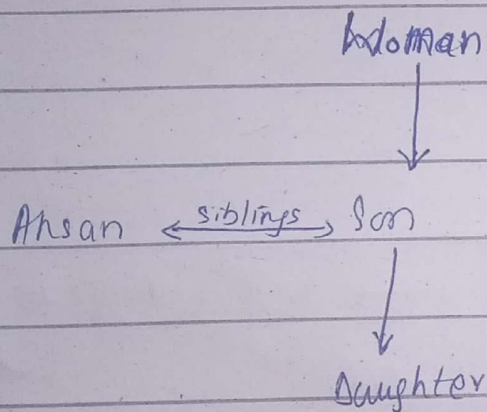
Therefore, both took 8 hours 15 minutes to type 110 pages.

QUESTION # 6

SOLUTION

PART-A

Since, the granddaughter of the woman is Ahsan's niece as Ahsan is the brother of the woman's son, therefore the woman Ahsan is pointing to, is his mother.



PART-B

let the length be 'l' and breadth be 'b'

$$\text{then : } \frac{l}{b} = \frac{3}{2}$$

$$\Rightarrow l = 3x \quad \text{and} \quad b = 2x$$

The perimeter of the park can be calculated by using the speed 's' = 12 km/hr and time = 8 minutes

$$\text{Distance} = 2 \times 12 \times 1000 \text{ m} \times 8 \text{ min}$$

~~again~~

$$\text{Perimeter} = \text{Distance} = 1600 \text{ meter}$$

$$\text{As perimeter} = 2(l + b)$$

$$\Rightarrow 2(3x + 2x) = 1600$$

$$5x = 800$$

$$x = 160$$

$$\therefore \text{length 'l'} = 3(160) = 480 \text{ m}$$

$$\text{breadth 'b'} = 2(160) = 320 \text{ m}$$

$$\begin{aligned} \Rightarrow \text{Area of rectangular park} &= \text{length} \times \text{breadth} \\ &= 480 \times 320 \\ &= 153600 \text{ m}^2 \end{aligned}$$

Therefore, area of rectangular park is 153600 m^2 .

Part C

PART-C

let the ten's digit be 'n'

then, unit's digit be: 'n+2'

$$\text{Number} = 10n + (n+2) = 11n+2$$

$$\text{Sum of digits} = n + n+2 = 2n+2$$

Given condition:

$$2 \times (11n+2) (2n+2) = 144$$

$$22n^2 + 22n + 4n + 4 = 144$$

$$22n^2 + 26n - 140 = 0$$

divide by '2'

$$\Rightarrow 11n^2 + 13n - 70 = 0$$

$$11n^2 + 35n - 22n - 70 = 0$$

$$11n^2 - 22n + 35n - 70 = 0$$

$$11n(n-2) + 35(n-2) = 0$$

$$(n-2)(11n+35) = 0$$

$$\Rightarrow n = 2 \quad , \quad n = -\frac{35}{11} \rightarrow \text{not possible}$$

$\Rightarrow$

$$\begin{aligned} \text{Hence, the required number is } 11n+2 &= 11(2)+2 \\ &= 22+2 \\ &= 24 \end{aligned}$$

PART - D

the ratio between the two numbers is $\frac{2}{3}$

$$\Rightarrow \text{first number} = 2x$$

$$2^{\text{nd}} \text{ number} = 3x$$

Given : L.C.M of the two numbers = 48

$\Rightarrow$ (by definition of L.C.M)

$$2x \times 3x = 48$$

$$\Rightarrow 6x = 48$$

$$\Rightarrow x = 8$$

$$\Rightarrow \text{first number} = 2(8) = 16$$

$$2^{\text{nd}} \text{ number} = 3(8) = 24$$