

Section A

Q2. (a):- Structure of Universe according to Big Bang Theory.

Answer:-

The origin of universe is explained by the widely accepted scientific theory known as the Big Bang Theory.

According to this theory,

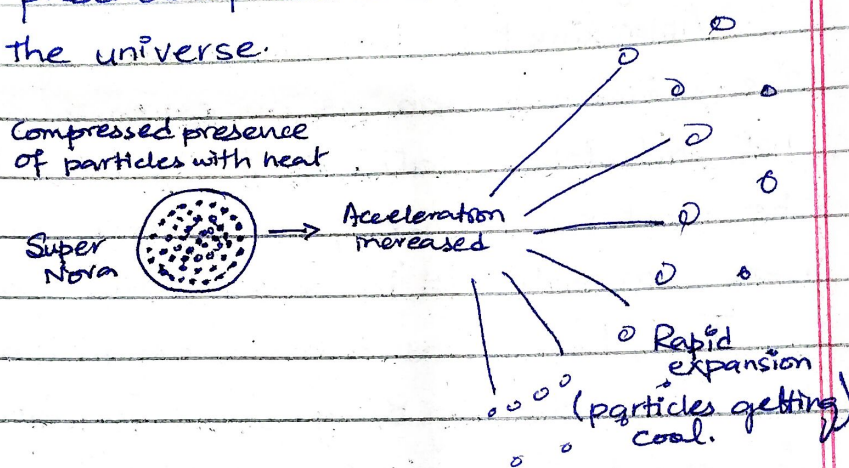
Approximately 13.8 billion years ago, the universe began as an extremely hot and dense state. At this point, all the matter and energy we observe today were concentrated in a very small space.

Then, there was a rapid expansion known as the Big Bang. In a fraction of second, the universe underwent an exponential growth, expanding from a singularity to a much larger and cooler state.

As the universe expanded and cooled, elementary particles formed, and eventually protons and neutrons combined to form first atomic nuclei. This process is called nucleosynthesis.

Over millions of years, the universe continued to cool, allowing

electrons to combine with nuclei forming neutral atoms. This marked the transition from a hot, opaque plasma to a transparent universe filled with neutral atoms and from a dense singularity to a dispersed cool presence of atoms and matter in the universe.



Gravity played a crucial role in the evolution of the universe, causing matter to clump together and form galaxies and galaxy clusters. Moreover, after cooling down the matter took different structures and life began on Earth due to suitable life conditions. According to Big Bang, the Universe is dynamic and is continuously expanding.

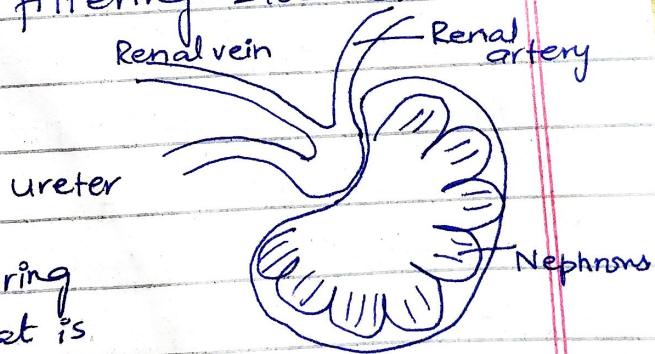
(b): Urinary System and working of nephron:

(i): Urinary System:-

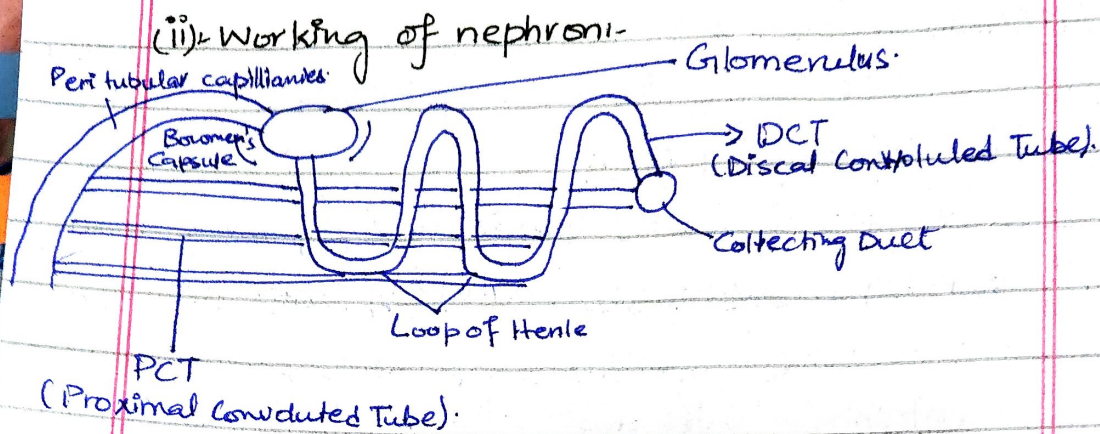
The ~~ana~~ urinary system is a vital excretory system in human body responsible for removing metabolic waste products, maintaining water and electrolyte balance, regulating blood pressure, and controlling the chemical composition of body fluids. It plays a crucial role in maintaining homeostasis. The urinary system consists of two kidneys, two ureters, a urinary bladder, and a urethra.

The kidney is the principal organ of the urinary system, and its functional unit is called nephron.

Each ~~ana~~ kidney includes approximately one million nephrons, which are responsible for filtering blood and forming urine.



⇒ 20% blood during each heart beat is supplied to kidney.



Nephron is the structural and functional unit of kidney, they are arranged along both cortex and medulla of kidney.

⇒ Working:-

(i) Filtration:- Blood with waste products enter Glomerulus and gets filtered due to pressure and porous walls.

(ii) Reabsorption:- Useful constituents like glucose, salt and water are re-absorbed by peritubular capillaries.

(iii) Secretion:-

Inner layer of nephron also secretes nitrogenous waste products.

At the end, after filtration and reabsorption, the Distal convoluted tube moves waste to collecting duct which opens into pelvis, then it enters into ureter. Then it is stored urinary bladder and excreted through urethra.

(c):- Unbalanced diet, its effect on healthy living:-

An unbalanced diet refers to a diet that lacks essential nutrients or contains excessive amounts of certain nutrients while being deficient in others. Such a diet fails to provide the body with the proper proportions of all nutrients like carbohydrates, proteins, fats, vitamins, minerals and fibres, which are collectively required for normal growth and development of body.

An unbalanced diet can negatively affect healthy living in multiple ways:-

- Deficiency of proteins can lead to muscle wasting, weak immunity and delayed growth, particularly in children. It also weakens hair, and nails of human being.

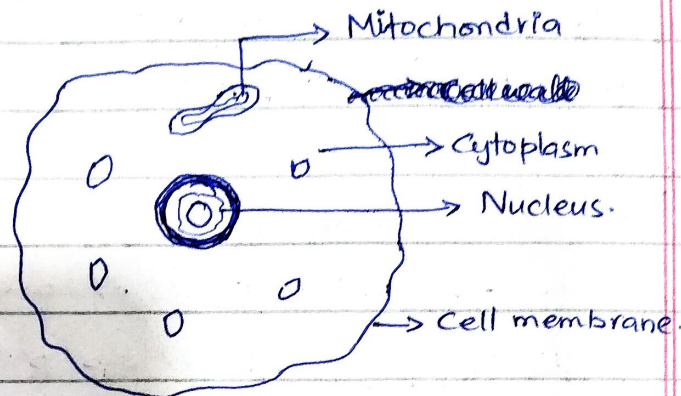
- Lack of vitamins and minerals results in various deficiencies such as anemia due to iron deficiency, night blindness by lack of Vitamin A, and scurvy due to lack of Vitamin C.

On the other hand, excessive intake of one category while avoiding others may also result in problems related to health. As,

- Excessive intake of fats and carbohydrates may result in obesity and diabetes, also leading to cardiovascular diseases, hypertension and joint problems.
- Poor intake of dietary fibres and excess of sugars and carbohydrates result in severe constipation, gut issues, fatigue, irritability and lack of concentration often causing mental health issues.

So, one must take balanced diet to ensure a healthy body.

(d)- Structure and functions of cell wall, cell membrane, cytoplasm, and mitochondria.



(i)- Cell wall: Above is the structure of animal cell, but "Cell wall" is present in plant cells as the outermost covering providing it protection and keeping it in definite shape. It is mostly composed of cellulose.

It has three types;

Primary cell wall contains cellulose and it is innermost part of cell wall, it develops in newly grown cells.

Secondary cell wall contains Hemicellulose, it is outermost part providing the rigidity to a fully grown plant cell.

Middle lamella is a small region, not actually a wall, comprising of sticky gel like material holding both walls together.

(ii) Cell Membrane - It is present in both plants and animal cells. It is composed 60-80% of proteins and 20-40% of lipids. Its function is to protect cell, provide passage for transport of nutrients of selected categories, it also regulates flow of ions and transmits nerve impulses to other parts of body.

It is a lipid-bi-layer as protein molecules are embedded in it

(iii) Cytoplasm -

It is a semi-fluid substance present in the cellular structure and surrounds nuclear membrane.

Composition:-

→ 90% H₂O + Salt, Minerals,
Amino acids, fatty acids.
10%.

Function:-

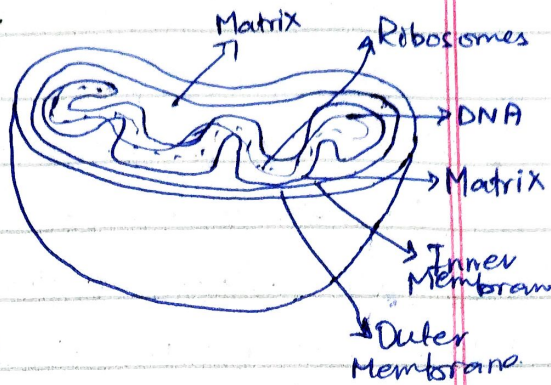
- Storehouse of cell organelles,
- Maintains fluid balance in cell,
- Responsible for bio-chemical activities,
- Provide passage to genetic material.

Layers

- 1- Ectoplasm: Outer glossy layer.
- 2- Endoplasm: Inner granular mass.

(iv) Mitochondria:-

⇒ Mitochondria is the "powerhouse" of cell. Their number vary according to the nature of cell. They are bound by two membranes; Outer membrane that is smooth and Inner membrane which finger like foldings called cristae.



⇒ Mitochondria have their own DNA and it is a self-replicating body.

Composition:-

Mitochondrial membrane have similar composition as other membranes; composed of lipids and proteins.

A liquid is present inside it called "Matrix" which includes enzymes, co-enzymes, organic and inorganic salts.

It also contains own DNA and Ribosomes which produce own protein called ATP (Adenosine tri phosphate) providing energy to cells.

Q3:-

(a): Global Warming Reversal:

Global warming refers to the gradual increase in the average temperature of Earth's atmosphere due to excessive accumulation of greenhouse gases such as CO_2 , CO and NO_x . These gases trap heat in atmosphere, leading to climate change, melting glaciers, rising sea levels, and extreme weather events. Although complete reversal of global warming is difficult, its impacts can be significantly reduced and gradually controlled through collective global efforts.

One of the most effective measures to reverse global warming is reduction of greenhouse gas emissions. This can be achieved by shifting from fossil fuels to renewable energy sources such as:

- solar,
- wind and
- hydroelectric power.

Another crucial step is afforestation and reforestation. Trees act as natural carbon sinks by absorbing CO_2 during photosynthesis. Large scale plantation programs and protection of existing forests can also be helpful for the cause.

Energy efficiency and sustainable industrial practices also play a vital role. Using fuel efficient vehicles, energy-saving appliances and green building designs can reduce energy consumption.

Moreover, adopting sustainable agricultural practices as organic farming and reducing fertilizer excess can help lower methane and ~~NOx~~ emissions.

On global level, international agreements like Paris Climate Agreement should start acting more vigilantly and countries should also cooperate with it to reduce global warming.

12 min

(b) - Ceramics, properties, applications.

Ceramics are inorganic, non-metallic materials that are typically produced by shaping and heating raw materials such as clay, silica, and alumina at high temperatures. The heating process known as "firing" causes chemical and physical changes that give ceramics their characteristic hardness and durability. Ceramics are ^{being} used by human beings since ancient times and remain vital in modern times.

Properties:-

- High hardness and strength,
- Resistance to wear and abrasion,
- Excellent heat resistance,
- Poor conduction of heat and electricity.
- Brittle and get fractures by hitting.

Application:-

⇒ Household items as: tiles, pottery, crockery, sanitary ware.

⇒ Medical field :

bone implants and dental crowns because of their biocompatibility.

⇒ Engineering :

Aerospace engineering uses for heatshields for spacecraft.

⇒ Used as:

electrical insulators, furnace linings and cutting tools.

12 mm.

(C):- Optical fibres & mobile phones:-

(i):- Optical fibres are thin strands of glass or plastic designed to transmit light signals over long distances with minimal loss.

Principle of operation:

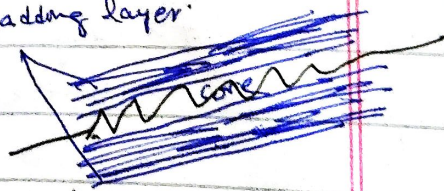
"Total internal reflection."

Structure:-

(i):- Central Core.

(ii):- Cladding layer.

Cladding layer



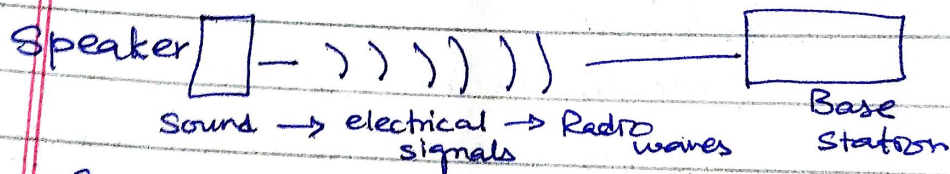
→ No escape of light → longer travel distance.

Uses:

- Telecommunication,
- Internet,
- Medical instruments,
- Rapid data transmission medium.

(ii) Mobile phone:

⇒ Wireless communication device that operates through network of "cell towers" and "satellites".



Speaker's sound waves are converted to electrical signals, which turn into Radio waves and lastly are transmitted to nearest Base Station, then when reached to receiver they're in form of Sound wave again.

Technology involved:

- Digital Signal processing,
- Satellite Communication,
- Internet connectivity.

10 min

(d):- Food additives, food preservatives, food adulteration, food contamination.

(i):- Food Additives

→ intentionally added,

→ Purpose:- flavor,
colour,
texture and appearance.

→ Examples:

→ Artificial sweeteners,

→ Flavor enhancers,

→ Coloring agents for
biryani, icecream and jelly.

They may improve food quality
but they have expiry and excessive
use may cause health risks.

(ii) Food preservatives

→ Chemicals or natural
substances added to food to
prevent food spoilage due to
micro organisms.

Example:-

Sodium benzoate, → increase shelf life.

Salt, Sugar, Vinegar, Oil.

These stop or delay bacterial growth.

iii:- Food adulteration

→ Deliberate addition of inferior, harmful, unnecessary substance to food for increasing quantity or profit.

Examples:-

- Mixing water in milk,
- Artificial colors in spices,
- Liquid & densifying agents.

iv:- Food Contamination

⇒ Food polluted by:

- harmful microorganisms,
- chemicals,
- foreign substances during...
- processing,
- storage,
- handling.

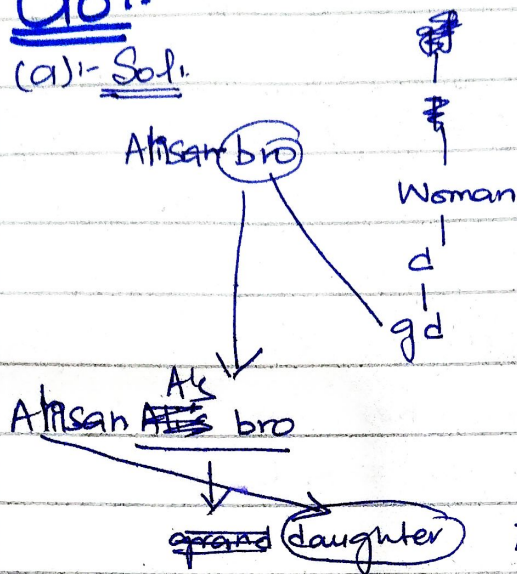
⇒ Contaminated food can lead to:

- food poisoning,
- dysentery,
- outbreaks,
- stomach issues.

Section-B

Q61-

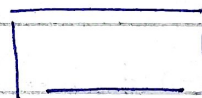
(a) Sol.



A's niece is that woman's grand daughter,

So, that woman is A's mother.

(b) $1:b$
 $3:2$



speed of cycling = 12 km/h

Time for one round = 8 min = $\frac{8}{60} = \frac{2}{15}$ hrs.

Perimeter:-

$$D = S \times t \Rightarrow 12 \times \frac{2}{15} = 1.6 \text{ km} \\ \text{(cycled place) (Perimeter).} \quad 1600 \text{ m}$$

$$\rightarrow 2(L+B) = \frac{1600}{2} = \boxed{800}$$

Apply relation: $L = 3x$
 $B = 2x$

So, $3x + 2x = 800 \Rightarrow 5x = 800$
 $x = \boxed{160}$

$$\text{So, } L = 480 \text{ m, } B = 320 \text{ m,}$$

$$\text{Area} = L \times B$$

$$= 480 \times 320 = \boxed{153,600 \text{ sq.m.}}$$

(C) ← unit digit incr. by '2'
product of number and
sum of digits = 144.

$$\text{tens digit} = x$$

$$\text{unit } = x+2$$

$$\Rightarrow 10x + (x+2) = 11x+2$$

$$\text{Sum } x + (x+2) = 2x+2$$

$$\text{Condition: } (11x+2)(2x+2) = 144$$

divide by

$$(11x+2)(x+1) = 72$$

$x=2$, then

$$(11 \times 2 + 2)(2 + 1) = 24 \times 3 = \boxed{72}$$

$$\text{So, tens} = 2$$

$$\text{unit} = 2.$$

$$\text{Answer } \boxed{24}.$$

(d) LCM = 48,

Ratio: 2:3

Let numbers,

$$2x \text{ \& \& } 3x, \rightarrow \text{LCM} = 2 \times 3 \times x = 6x.$$

$$6x = 48$$

$$x = 8,$$

Numbers are,

$$2x = 16,$$

$$3x = 24,$$

$$\text{Sum} = 16 + 24 = \textcircled{40}.$$

—————