Tayyaba Khalid
Batch#83

Day: Date:

Question#2

(a)

According to Big Bang theory, the universe has a large-scale structure that evolved over time from an extremely hot, dense beginning. Its structure can be understood in layers, from the overall geometry of universe down to distribution of matter within it.

1. **Overall Structure of Universe:**
   - The universe began about 13.8 billion years ago in a very hot, dense state.
   - Space itself has been expanding ever since; galaxies are moving apart because space between them is stretching.
   - On the largest scales, the universe appears homogeneous and isotropic, meaning it looks roughly the same in all directions and locations.
2. **Geometry of Universe:**

Big Bang cosmology allows for different possible geometries:

- Flat (Euclidean): parallel lines never meet.
- Open (negatively curved): space expands forever.
- Closed (positively curved): space could eventually stop expanding and recollapse.

Current observations suggest the universe is

Day: Date:

very close to flat.

3. **Large-Scale Structure (Cosmic Web):**

As the universe expanded and cooled:

- Small density fluctuations grew under gravity.
- Matter organized into a vast comic web consisting of:
  - Galaxies
  - Galaxy clusters
  - Superclusters
  - Filaments of matter connecting them
  - Voids – large, nearly empty regions

This web-like structure is one of the most important predictions of Big Bang cosmology.

4. **Distribution of matter and energy:**

The universe is composed of:

- Dark energy (~68%) – drives accelerated expansion of the universe.
- Dark matter (~27%) – provides gravitational framework for galaxy formation.
- Organic (baryonic) matter (~5%) – stars, planets, gases, and dust.

Dark matter dominates the structure formation, even though it cannot be seen directly.

5. **Cosmic Microwave Background (CMB):**

- About 380,000 years after the Big Bang, the universe

Day: Date:

cooled enough for atoms to form.

- Light from that era still ~~finds~~ fills the universe today as the cosmic microwave background radiation.
- The CMB provides a 'snapshot' of early universe and shows tiny temperature variations that later grew into today's large-scale structures.

6. **Observable vs. Total Universe:**

- The observable universe is limited by how far light has traveled since the Big Bang.
- The entire universe may be much longer—possibly infinite—but only a portion is observable.

Conclusion:

Under the Big Bang theory, the universe is an expanding nearly flat space filled with a cosmic web of matter shaped by dark matter and dark energy, with its early structure preserved in cosmic microwave background.

(b)

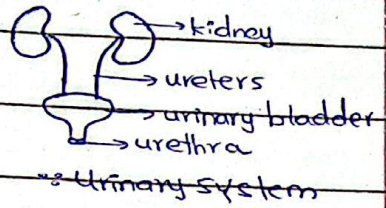
→ **Urinary System:**

It is the body system responsible for removing metabolic wastes, maintaining water and electrolyte balance, and regulating blood pressure and pH.

Day: Date:

Parts of Urinary System:

1. **Kidneys (2):**
   - Bean-shaped organs located on either side of backbone.
   - Filter blood to remove wastes and excess water
   - Form urine.
2. **Ureters (2):**
   - Narrow muscular tubes
   - Carry urine from kidneys to urinary bladder.
3. **Urinary Bladder:**
   - A muscular sac.
   - Temporarily stores urine.



Urinary System

4. **Urethra:**
   - A tube that carries urine from bladder to outside of body.

Functions of Urinary System:

- Excretion of nitrogeneous wastes (urea, uric acid, creatinine)
- Regulation of water balance.
- Maintenance of electrolyte levels (Na^+, K^+, Cl^-)
- Regulation of blood pressure
- Maintenance of acid-base balance

→ **Nephron:**

It is a structural and functional unit of kidney.

Each kidney contains about 1 million nephrons.

Structure of Nephron:

1. Renal Corpuscle

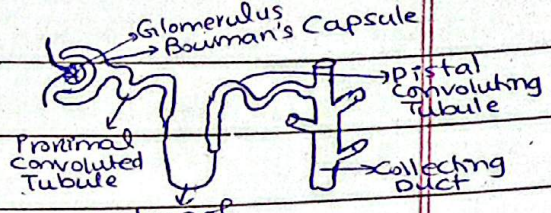
CamScanner

Day: _____ Date: _____

- Glomerulus: A network of capillaries
- Bowman's capsule: Cup-shaped structure surrounding the glomerulus.

2. **Renal Tubule:**

- Proximal convoluted Tubule (PCT)
- Loop of Henle
  - → Descending limb
  - → Ascending limb
- Distal Convoluted Tubule (DCT)
- Collecting duct



:: Nephron

Working of Nephron (Urine Formation):

Urine formation occurs in three main steps:

1. **Glomerulus Filtration:**

- Takes place in glomerulus.
- Blood is filtered under high pressure.
- Water, glucose, salts, urea pass into Bowman's Capsule.
- Blood cells and proteins are not filtered

→ The fluid formed is called glomerular filtrate.

2. **Tubular Reabsorption:**

- Occurs mainly in PCT, and also in loop of Henle & DCT.
- Useful substances are reabsorbed into blood: Glucose, Amino acids, salts and most of the water.

→ This prevents loss of essential substances.

3. **Tubular Secretion:**

Day: Date:

- Occurs mainly in DCT
- Additional wastes and excess ions are actively secreted into tubule: Hydrogen ions(H^+), Potassium ions(K^+), Ammonia, drugs

→ Helps regulate pH and ion balance.

Final Urine Formation:

- The remaining fluid becomes urine.
- Urine flows through:

Collecting Duct → Renal Pelvis → Ureter → Bladder → Urethra

Conclusion:

- The urinary system removes wastes and maintaining internal balance
- The nephron filters blood and forms urine through filtration, reabsorption, and secretion.

(c)

Unbalanced Diet:

It is a diet that doesn't provide nutrients in the correct proportion required by body. It may involve excess or deficiency of one or more essential nutrients such as carbohydrates, proteins, fats, vitamins, minerals, water, or fiber.

Effects of Unbalanced Diet on Healthy Living:

An unbalanced diet negatively affects both physical

Date:

Page:

and mental health.

1. **Deficiency Diseases:**

Lack of essential nutrients can cause:

- Protein Deficiency → stunted growth, muscle wasting
- Iron Deficiency → anemia, fatigue
- Vit A deficiency → poor vision, night blindness
- Vit D & calcium deficiency → weak bones, rickets, osteoporosis
- Iodine deficiency → goiter, mental reduction

2. **Weak Immune System:**

- Insufficient vitamins & minerals reduce immunity
- Increases risk of ~~reduction~~ infections & slow recovery from illness.

3. **Poor Growth & Development:**

- Especially in children & adolescents.
- leads to delayed physical & mental development.

4. **Obesity & Lifestyle Diseases:**

Excess intake of fats & sugars can cause obesity, diabetes, high blood pressure, heart disease

5. **Digestive Problems:**

- Lack of fiber leads to constipation & indigestion.
- Excess junk food causes acidity & gastric problems

6. **Low Energy and Poor Mental Health:**

- Cause tiredness, weakness, lack of concentration
- may lead to stress, anxiety, and depression

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Day: _____ Date: _____

7. **Hormonal and Metabolic Imbalance:**

- Poor nutrition disrupts hormone production
- Affects metabolism & body regulation

Conclusion:

An unbalanced diet prevents the body functioning properly & increases risk of diseases. Healthy living requires a balanced diet that includes all nutrients in right proportion alongwith regular exercise & adequate rest.

(d)

1. **Cell Wall:**

Structure:

- Present in plant cells, fungi, and bacteria (absent in animal cells)
- Located outside the cell membrane
- In plants, made mainly of cellulose
- Rigid, thick, and freely permeable

Functions:

- Gives shape and support to the cell.
- Protects the cell from mechanical damage
- Prevents cell from bursting due to osmotic pressure
- Allows passage of water and gases.

Day: Date:

2. **Cell Memberane (Plasma Membrane):**

Structure:

- Thin, flexible, and living membrane
- made of phospholipid bilayer with embedded proteins
- Present in all cells
- Semi-permeable (selectively permeable).

Functions:

- Controls movement of substances into & out of cell.
- maintains internal environment of cell.
- Helps in cell communication and recognition.
- Protects the contents of the cell.

3. **Cytoplasm:**

Structure:

- Jelly-like, semi-fluid substance.
- Lies between cell membrane and nucleus.
- Composed mainly of water, proteins, enzymes & salts.
- Contains cell organelles

Functions:

- Site of most metabollic reactions.
- Supports & holds cell organelles in place.
- Helps in transport of materials within cell.
- Stores nutrients & waste products temporarily.

4. **Mitochondria:**

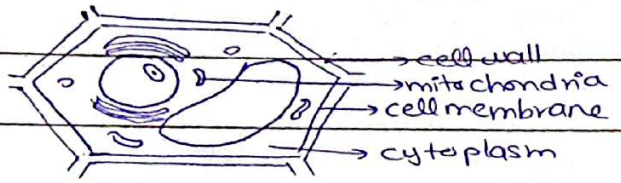
Structure:

Day: _____ Date: _____

- Double-membrane bound organelle.
- Outer membrane is smooth.
- Inner membrane is folded into structures called cristae.
- Inner space contains matrix with enzymes, DNA, and ribosomes.

Functions:

- Known as powerhouse of cell.
- Site of cellular respiration.
- Produces ATP (energy) for cellular activities
- Regulates programmed cell death (apoptosis)



∴ Plant cell

Question #3

(a)

Global warming can't be reversed instantly, but it can be slowed, stopped, and gradually reversed by reducing greenhouse gases and restoring natural systems that absorb carbon dioxide. This requires combined action at individual, national, and global levels.

Ways to Reverse Global Warming:

1. **Reducing Greehouse gas emissions:**

- Shift from fossil fuel (coal, gas etc) to renewable energy

Page: Date:

such as solar, wind, and hydropower.

- Improve energy efficiency in industries, buildings, and homes.
- Promote electric and hybrid vehicles instead of petrol and diesel vehicles.

2. **Increasing use of Renewable Energy:**
   - Solar Panels and wind turbines produce energy without releasing CO_2.
   - Use of clean energy reduces dependence on fossil fuels, lowering emissions.
3. **Afforestation & Reforestation:**
   - Planting more trees absorb carbon dioxide from the atmosphere.
   - Protecting forests prevents release of stored carbon.
   - Forests act as natural carbon sinks.
4. **Sustainable Agriculture:**
   - Reduce use of chemical fertilizers.
   - Practice organic farming & efficient irrigation.
   - Reduce methane emissions from livestock.
   - Improve soil management to store more carbon.
5. **Reducing Waste & Promoting Recycling:**
   - Reduce, reuse, and recycle materials.
   - Proper waste management reduces methane emissions from landfills.

CamScanner

Day: Date:

- Avoid single-use plastics.

6. **Carbon capture & Storage (CCS):**
   - Technologies that capture CO_2 from industries & store it underground.
   - Helps remove existing CO_2 from atmosphere.
7. **Lifestyle Changes:**
   - Use public transport, cycling, or walking.
   - Save electricity & water.
   - Eat more plant-based foods.
   - Reduce overconsumption.
8. **Strong Environmental Policies & Global Cooperation:**
   - Enforce strict laws on pollution.
   - International agreements (like climate accords) to limit emissions
   - Support climate-friendly technologies.

Conclusion:

Global warming can be reversed gradually by reducing emissions, increasing green cover, using clean energy, and adopting sustainable lifestyles. Immediate & collective action is essential to protect the planet & ensure healthy living for future generations.

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Day: Date:

(b)

Ceramics:

Ceramics are inorganic, non-metallic materials made by shaping & then hardening compounds such as oxides, carbides, nitrides & silicates at high temperatures. They are typically crystalline & are produced by firing in a kiln or furnace.

Properties of Ceramics:

1. **Mechanical Properties:**
   - High hardness
   - High compressive strength
   - Brittle in nature (low tensile strength)
   - High wear & abrasion resistance
2. **Thermal Properties:**
   - High melting point
   - Good thermal stability
   - Low thermal conductivity (good thermal insulators)
   - Good resistance to thermal shock (in some advanced ceramics)
3. **Electrical Properties:**
   - Good electrical insulators
   - Some ceramics show piezoelectric or ferroelectric behavior
4. **Chemical Properties:**
   - High corrosion & oxidation resistance
   - Chemically inert in many environments

Day: Date:

5. **Physical Properties:**

- Low density compared to metals
- High dimensional stability

Application of Ceramics:

1. **Traditional Ceramics:**

Bricks & kilns, pottery & porcelain, Sanitary ware (toilets, wash basins), cement & glass.

2. **Engineering / Advanced Ceramics:**

Cutting tools (silicon carbide, alumina), refractory lining for furnaces & kilns, electrical insulators & spark plugs, bearings & seals.

3. **Electronic Application:**

Capacitors & resistors, piezoelectric sensors & actuators, substrates for integrated circuits

4. **Medical Application:**

Dental crowns & implants, bone substitutes (bioceramics like hydroxyapatite.

5. **Aerospace & Automative:**

Heat shields, brake discs (carbon-ceramic brakes), engine components

(c)

→ **Working of Optical Fibre:**

It is a thin, flexible strand of glass or plastic used

Day: _____ Date: _____

to transmit data in the form of light.

Principle:

It works on principle of Total Internal Reflection (TIR).

Construction:

It has three main parts:

1. Core - central part of fibre that carries light signals.
2. Cladding - surrounds core & has a lower refractive index.
3. Protective coating - protects fibre from damage.

Working:

1. A light signal enters core of fibre.
2. When the light strikes boundary between core & cladding at an angle greater than the critical angle, it undergoes total internal reflection.
3. The light keeps reflecting inside the core & travels long distances with very little loss.

Advantages:

- Very high data transmission speed.
- Low signal loss
- Immune to electromagnetic interference.

→ **Working of Mobile Phone:**

It is a wireless communication device that uses radio waves to transmit voice & data.

Principle:

Communication occurs through a cellular network using radio

Day: _____ Date: _____

frequency signals.

Working:

1. When you speak into a mobile phone, the microphone converts sound waves into electrical signals.
2. These signals are converted into digital form & modulated into radio waves.
3. Radiowaves are transmitted to nearest cell tower (base station)
4. Signal is routed through mobile network to receiver's cell tower
5. Receiving mobile phone picks up radio waves.
6. Signals are demodulated, decoded & converted back into sound by speaker.

Key Components:

Microphone, speaker, antenna, SIM card, transmitter & receiver.

Advantages:

- Wireless communication over long distances
- Supports voice, text, & internet services
- Portable & easy to use

(d)

1. **Food Preservatives:**

These are substances added to food to prevent spoilage caused by microorganisms & to increase shelf life.

Example: vinegar, sodium benzoate, sugar (used in jams)

Day: Date:

common salt (used in pickles).

2. **Food Additives:**

These are substances added to food to improve its colour, flavour, texture, or appearance.

Example: Food colours (used in sweets), Flavouring agents (vanila essence), Emulsifiers (lecithin in chocolate) & sweetness (aspartame).

3. **Food Adulteration:**

It is intentional addition of inferior, harmful, or cheaper substances to food, reducing its quality & safety.

Example: mixing water in milk, adding stones to pulses, adding artificial colours to spices & mixing argemone oil in mustard oil.

4. **Food Contamination:**

It occurs when food is accidentally polluted by harmful substances such as microorganisms, chemicals, or foreign matter.

Example: Bacteria in uncovered food, pesticide residues on fruits & vegetables, dust or insects falling into food, & chemicals entering food during processing.

Day: Date:

Question#7

(a)

40% of A = 2/3 of B

0.4A = 2/3 of B

Multiply by 15

A : B = 5 : 3

(b)

Selling 17 balls at Rs 720

Loss = cost of 5 balls

let, CP of one ball = x

CP of 17 balls = 7x

Sell price = CP − Loss

720 = 17x − 5x

720 = 12x

x = Rs 60

(c)

let, son's present age = x

man's present age = x+24

In 2 years:

man = x+26

Son = x+2

Given:

x+26 = 2(x+2)

x = 22 (son's present age)

Day: Date:

(d)

Rashid : 32 pages in 6 hrs → 1 hr = 32/6

Kamran : 40 pages in 5 hrs → 1 hr = 8

Together per hour :

= 32/6 + 8

= 16/3 + 24/3

= 40/3 pages/hr

Time for 110 pages :

= 110 ÷ (40/3)

= $\frac{110 \times 3}{40}$

= 8.25 hours (8 hours & 15 mins)

Question#8

(a)

D – B – A – E – C

middle hous = A

(b)

(i) Distance from start : $\sqrt{(1)^2+(1)^2}$

$= \sqrt{2}$ km

(ii) Direction while finishing = North

(iii) To return to start : Sout - West

(c)

Shirt, coat, Blouse, Skirt, sweater

→ EUOBSL (Blouse) is the odd one.

Day: _____ Date: _____

—— (d) ——

Total triangles = 18

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