YASASVI Science

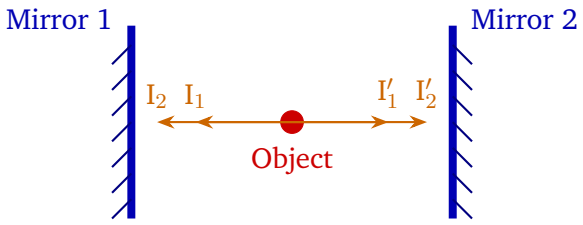
Sample Paper – 4

Duration: 38 Minutes **Maximum Marks: 100**

Instructions

- This paper contains **25** Multiple Choice Questions (Single Correct Answer), modelled on the Science portion of **YASASVI (PM-YASASVI YET)** entrance.
- Each correct answer carries **+4 marks**. There is **a penalty of 1 mark** for incorrect or unattempted answers.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Class 8 NCERT Science (for Class 9 YET entry)**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Q1. Two plane mirrors are placed facing each other (parallel to each other) with a small object placed between them. What happens to the number of images formed?



(A) Exactly 2 images are formed.

(B) Exactly 3 images are formed.

(C) Exactly 5 images are formed.

(D) Theoretically infinite images are formed.

Q2. A convex lens acts as a magnifying glass when the object is placed within its focal length. Which of the following correctly describes the image formed in this case?

(A) Real, inverted, and magnified.

(B) Virtual, erect, and magnified.

(C) Real, erect, and of the same size as the object.

(D) Virtual, inverted, and diminished.

Q3. A kaleidoscope produces beautiful patterns. Which of the following correctly explains how a kaleidoscope works?

(A) A single reflection of coloured glass pieces in one plane mirror.

(B) Refraction of white light through coloured glass pieces.

(C) Multiple reflections of coloured glass pieces between inclined mirrors produce symmetrical patterns.

(D) Diffraction of light through tiny coloured glass beads.

Q4. Which of the following statements is **correct** regarding contact and non-contact forces?

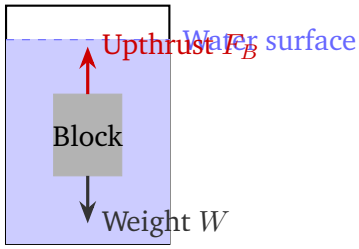
(A) Gravity and magnetic force are non-contact forces because they act without physical touch.

(B) Friction is a non-contact force since it acts at a distance.

(C) Muscular force is a non-contact force that operates through fields.

(D) All forces in nature require direct physical contact between objects.

Q5. A solid block is fully submerged in a liquid. According to Archimedes' Principle, what does the upthrust (buoyant force) acting on the block equal?



(A) Weight of the block.

(B) Volume of the block.

(C) Density of the liquid multiplied by the volume of the block.

(D) Weight of the liquid displaced by the submerged block.

Q6. In which of the following situations is friction considered a **disadvantage**?

(A) Walking on a rough road without slipping.

(B) Wear and tear of engine parts and heat loss in machinery.

(C) Writing with a pencil on paper.

(D) Applying brakes to stop a moving bicycle.

Q7. SONAR is used to measure the depth of the ocean floor and to locate underwater objects. What does the abbreviation SONAR stand for?

(A) Sound Navigation And Radar.

(B) Surface Observation Navigation And Ranging.

(C) Sound Navigation And Ranging.

(D) Sub-Ocean Notification And Ranging.

Q8. Three musical instruments — sitar, flute, and tabla — are classified by the part that vibrates to produce sound. Which option correctly identifies their types?

Simplified Stringed Instrument

(A) Sitar — stringed; Flute — wind; Tabla — percussion.

(B) Sitar — percussion; Flute — stringed; Tabla — wind.

(C) Sitar — wind; Flute — stringed; Tabla — percussion.

(D) All three are wind instruments.

Q9. Tungsten is chosen as the material for the filament of an electric bulb. Which of the following best explains why?

(A) Tungsten has the lowest electrical resistance of all metals.

(B) Tungsten is the cheapest metal and is easily available.

(C) Tungsten glows at a very low temperature of about $100\,^{\circ}\text{C}$.

(D) Tungsten has a very high melting point ($\approx 3422\,^{\circ}\text{C}$) and conducts electricity well.

Q10. During a thunderstorm, clouds become electrically charged. What is the primary cause of this charging?

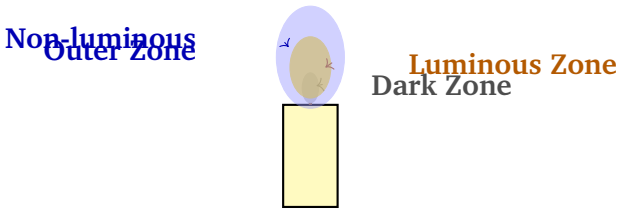
(A) Condensation of water vapour at high altitudes.

(B) Friction between water droplets, ice crystals, and air currents inside the cloud.

(C) Evaporation of water from the ocean surface.

(D) Cosmic radiation from the Sun ionising the water droplets.

Q11. A candle flame has distinct zones when observed carefully. Which option correctly identifies all three zones and their properties?



(A) Two zones: a dark inner zone and a bright luminous outer zone.

(B) Four zones: dark, blue, yellow, and red — each at different temperatures.

(C) Three zones: dark innermost zone (unburnt wax vapour), luminous yellow middle zone (partial combustion), and non-luminous blue outer zone (complete combustion, hottest).

(D) A single uniform zone where complete combustion takes place throughout.

Q12. Petroleum (crude oil) is refined by fractional distillation to obtain various useful products. Which of the following lists only the products obtained from a petroleum refinery?

(A) Petrol, kerosene, diesel, LPG (liquefied petroleum gas), and paraffin wax.

(B) Coal tar, coke, coal gas, and ammonia water.

(C) Oxygen, hydrogen, nitrogen, and carbon dioxide.

(D) Rubber, plastic, nylon, and polyester.

Q13. Alloys are mixtures of metals that have improved properties compared to pure metals. Which of the following correctly identifies the constituents of brass, bronze, and steel?

(A) Brass = Cu + Fe; Bronze = Cu + Zn; Steel = Fe + Ni.

(B) Brass = Cu + Al; Bronze = Cu + Fe; Steel = Fe + Cr.

(C) Brass = Fe + Zn; Bronze = Fe + Sn; Steel = Cu + C.

(D) Brass = Cu + Zn; Bronze = Cu + Sn; Steel = Fe + C.

Q14. Some metals are found in their free (native) state in nature because they are unreactive. Which group of metals is found in the free state?

(A) Iron, copper, and aluminium.

(B) Gold, silver, and platinum.

(C) Sodium, potassium, and calcium.

(D) Mercury, lead, and tin.

Q15. Nylon was the first fully synthetic fibre to be developed. Which of the following correctly describes the properties of nylon that make it comparable to silk?

(A) Nylon is weak, inelastic, and dull — it is only valued because it is cheaper than silk.

(B) Nylon has the same moisture-absorbing property as cotton and is used interchangeably.

(C) Nylon is strong, elastic, lustrous, and light, making it an excellent substitute for silk.

(D) Nylon is obtained from natural wood pulp, just like rayon, and is fully biodegradable.

Q16. Which of the following statements about mitochondria is **correct**?

(A) Mitochondria is the site of cellular respiration and ATP (energy) production and is called the powerhouse of the cell.

(B) Mitochondria controls all cell activities and carries the genetic information (DNA).

(C) Mitochondria is responsible for protein synthesis using mRNA instructions.

(D) Mitochondria stores cell sap and provides turgidity to the cell.

Q17. Vacuoles are membrane-bound organelles found in cells. Which statement correctly compares vacuoles in plant cells and animal cells?

(A) Vacuoles are completely absent in both plant and animal cells.

(B) Vacuoles in plant cells are smaller than those in animal cells.

(C) Vacuoles in plant cells store only water and have no role in cell shape.

(D) Vacuoles in plant cells are large (store sap, maintain turgidity), while in animal cells they are small or absent.

Q18. Microorganisms are used in the preparation of several food items. Which option correctly matches the food product with the microorganism responsible for its preparation?

(A) Curd — Yeast; Bread — Lactobacillus; Vinegar — Penicillium.

(B) Curd — Lactobacillus; Bread — Yeast (Saccharomyces); Vinegar — Acetobacter.

(C) Curd — Acetobacter; Bread — Lactobacillus; Vinegar — Yeast.

(D) Curd — Penicillium; Bread — Acetobacter; Vinegar — Lactobacillus.

Q19. Malaria is a major disease in tropical regions. Which of the following correctly identifies its causative organism and vector?

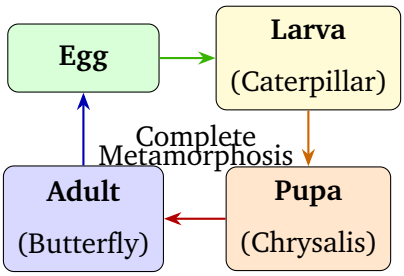
(A) Caused by a bacterium; transmitted by male Anopheles mosquito.

(B) Caused by Plasmodium; transmitted by female Culex mosquito.

(C) Caused by Plasmodium; transmitted by female Anopheles mosquito.

(D) Caused by a virus; transmitted by female Aedes mosquito.

Q20. A butterfly undergoes complete metamorphosis. Which of the following correctly shows the sequence of stages in the life cycle of a butterfly?



(A) Egg → Larva → Pupa → Adult.

(B) Egg → Nymph → Adult (this is complete metamorphosis).

(C) Egg → Larva → Adult (no pupa stage in butterfly).

(D) Egg → Pupa → Larva → Adult.

Q21. India has three types of protected areas for conservation. Which option correctly distinguishes a wildlife sanctuary, a national park, and a biosphere reserve?

(A) A wildlife sanctuary and a national park are identical; a biosphere reserve additionally permits human habitation.

(B) A national park has the strictest protection, while a wildlife sanctuary allows unlimited human settlement.

(C) A biosphere reserve is always the smallest area while a national park is the largest.

(D) A wildlife sanctuary focuses on protecting specific animals with limited human activity; a national park prohibits human interference; a biosphere reserve conserves both biodiversity and traditional human lifestyles in defined zones.

Q22. Crop rotation is an important agricultural practice. Which of the following best describes crop rotation and its benefit?

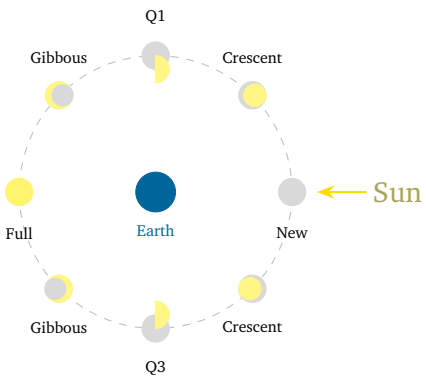
(A) Growing the same crop season after season in the same field to achieve uniform yield.

(B) Alternating different crops in successive seasons in the same field to maintain soil fertility and reduce pest buildup.

(C) Irrigating crops at fixed regular intervals using drip irrigation.

(D) Applying heavy doses of chemical fertilisers to replace lost nutrients.

Q23. The Moon appears to change its shape every day over a month. Which of the following correctly explains why the Moon shows phases?



(A) Moon phases occur because the Moon produces its own light and we see it at different angles.

(B) Phases of the Moon are caused by Earth's shadow falling on the Moon each month.

(C) Moon phases occur because, as the Moon orbits Earth, we see different portions of its illuminated half from Earth.

(D) The Moon physically changes its shape each month, causing the different phases.

Q24. The ozone layer in the stratosphere protects living beings from harmful ultraviolet radiation. Which of the following is the main cause of ozone layer depletion?

(A) Chlorofluorocarbons (CFCs) released from refrigerants, air conditioners, and aerosol sprays react with and destroy ozone molecules.

(B) Carbon dioxide released from vehicle exhaust and industries depletes the ozone layer directly.

(C) Sulphur dioxide from industrial chimneys reacts with ozone in the stratosphere.

(D) Methane released from landfills and paddy fields destroys the ozone layer.

Q25. Adolescence is a critical phase for reproductive health. Which of the following statements about maintaining good reproductive health during adolescence is **correct**?

(A) Adolescents should avoid physical exercise to conserve energy for growth.

(B) Substance abuse such as smoking has minimal effect on the health of adolescents.

(C) Consuming junk food is beneficial for adolescents as it provides quick bursts of energy.

(D) Maintaining personal hygiene, following a balanced diet, and avoiding substance abuse are key practices for good reproductive health during adolescence.

Detailed Solutions

Q1.

Solution

Concept — Multiple Images in Parallel Mirrors: When two plane mirrors face each other, the image formed in one mirror acts as an object for the other, and this process repeats indefinitely. As a result, theoretically infinite images are formed. In practice, the intensity of reflected light decreases with each successive reflection, so a very large (but finite) number of images is observed.

Key Fact: For two mirrors inclined at angle θ, the number of images $= \frac{360^\circ}{\theta} - 1$. For parallel mirrors $\theta \to 0^\circ$, giving $n \to \infty$.

Why other options are wrong:

- (A), (B), (C): Fixed numbers (2, 3, 5) are formed only when mirrors are inclined at specific angles — not when they are parallel.

Final Answer: Theoretically infinite images are formed $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q1

Q2.

Solution

Concept — Convex Lens as Magnifying Glass: A convex lens forms different types of images depending on the position of the object relative to the focal length (f). When the object is placed *between the optical centre and the focal point* (i.e., within f), the refracted rays diverge after passing through the lens. When extended back, they meet on the *same side as the object*, forming a virtual, erect, and magnified image.

Key Rule: Object within focal length $\Rightarrow$ Virtual, Erect, Magnified image (used in magnifying glasses, reading glasses).

Why other options are wrong:

- (A): Real, inverted, magnified image forms when object is beyond f but within $2f$.
- (C): Real, erect images are not formed by a single convex lens.
- (D): Virtual, inverted images are never formed by a convex lens.

Final Answer: Virtual, erect, and magnified $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Kaleidoscope: A kaleidoscope consists of three plane mirrors arranged at 60° to each other inside a tube, with broken coloured glass pieces at one end. Light undergoes multiple reflections between the three inclined mirrors, producing several identical, symmetrical images of the coloured pieces, forming beautiful geometric patterns.

Key Points:

- Works on the principle of *multiple reflections*, not refraction or diffraction.
- Three mirrors at 60° produce $\frac{360}{60} - 1 = 5$ images of each glass piece.

Why other options are wrong:

- (A): A single reflection gives only one image — no pattern.
- (B): Refraction is not the working principle; light is reflected, not bent.
- (D): Diffraction occurs with very small apertures and is not involved here.

Final Answer: Multiple reflections between inclined mirrors $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q3

Q4.

Solution

Concept — Contact vs. Non-Contact Forces: A *contact force* requires direct physical contact between objects (e.g., friction, normal force, muscular force). A *non-contact force* acts over a distance without physical touch (e.g., gravitational force, magnetic force, electrostatic force).

Key Examples:

- Non-contact: Gravity pulls objects downward without touching them; a magnet attracts iron filings without touching them.
- Contact: Friction, muscular force, spring force — all require physical contact.

Why other options are wrong:

- (B): Friction always requires surfaces to be in contact — it is a contact force.

- (C): Muscular force needs the body/muscles to be in physical contact with the object.
- (D): Non-contact forces exist and are very common in nature.

Final Answer: Gravity and magnetic force are non-contact forces $\Rightarrow$ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept — Archimedes' Principle: When an object is partially or fully submerged in a fluid, the fluid exerts an upward force (buoyant force or upthrust) on it. This upthrust equals the *weight of the fluid displaced* by the submerged portion of the object.

Mathematical Form:

$$F_{\text{buoyant}} = \rho_{\text{liquid}} \times V_{\text{displaced}} \times g = \text{Weight of displaced liquid}$$

Why other options are wrong:

- (A): Upthrust equals the weight of displaced liquid, *not* the weight of the object (object may be denser or lighter).
- (B): Volume alone (without density and g) does not equal a force.
- (C): Density $\times$ Volume gives mass, not the weight of displaced liquid (missing factor of g).

Final Answer: Upthrust = weight of the displaced liquid $\Rightarrow$ D

Answer: (D) Go Back to Q5

Q6.

Solution

Concept — Friction as a Disadvantage: While friction is essential for many activities (walking, braking, writing), it is *undesirable* in machines because it causes:

- Wear and tear of engine parts, reducing the lifespan of machinery.
- Conversion of useful kinetic energy into heat (energy loss), reducing efficiency.

Why other options are wrong:

- (A): Walking without slipping is a *benefit* of friction.
- (C): Writing with a pencil is a *benefit* of friction — the pencil tip wears to deposit graphite.
- (D): Brakes use friction deliberately to stop vehicles — this is an *advantage*.

Final Answer: Engine wear and heat loss in machinery $\Rightarrow$ B

Answer: (B) Go Back to Q6

Q7.

Solution

Concept — SONAR: SONAR stands for **So**und **N**avigation **A**nd **R**anging. It uses ultrasonic sound waves (frequency above 20,000 Hz) to detect and locate underwater objects, measure ocean depth, and find schools of fish.

Working Principle:

$$\text{Depth} = \frac{v \times t}{2}$$

where v is the speed of sound in water and t is the time for the echo to return.

Why other options are wrong:

- (A): "Radar" uses electromagnetic (radio) waves, not sound waves.
- (B): "Surface Observation" — SONAR works underwater, not on the surface.
- (D): "Sub-Ocean Notification" — not a real term; SONAR is *ranging*-based.

Final Answer: Sound Navigation And Ranging $\Rightarrow$ C

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Classification of Musical Instruments: Musical instruments are classified by the part that vibrates to produce sound:

- **Stringed instruments**: Stretched strings vibrate (e.g., sitar, guitar, violin).
- **Wind instruments**: Air column inside the instrument vibrates (e.g., flute, trumpet, shehnai).
- **Percussion instruments**: A membrane or solid surface is struck to vibrate

(e.g., tabla, drum, dholak).

Why other options are wrong:

- (B): Assigns sitar as percussion and flute as stringed — both are incorrect.
- (C): Sitar is not a wind instrument; it produces sound from vibrating strings.
- (D): Flute is a wind instrument and tabla is a percussion instrument, not all wind.

Final Answer: Sitar — stringed; Flute — wind; Tabla — percussion $\Rightarrow$ A

Answer: (A) Go Back to Q8

Q9.

Solution

Concept — Tungsten Filament: An electric bulb filament must glow (become incandescent) at very high temperatures to produce visible light. Tungsten is chosen because:

- It has an extremely high melting point ($\approx 3422\,^\circ$C), the highest of all pure metals.
- It is a good conductor of electricity.
- It can sustain the operating temperature ($\approx 2500\,^\circ$C) without melting.

Why other options are wrong:

- (A): Low resistance would cause excessive current flow and energy loss.
- (B): Tungsten is rare and expensive; cost is not the reason for choosing it.
- (C): A filament must glow at very *high* temperatures (not $100\,^\circ$C) to emit visible light.

Final Answer: Very high melting point and good electrical conductivity $\Rightarrow$ D

Answer: (D) Go Back to Q9

Q10.

Solution

Concept — Charging of Clouds: Inside a thundercloud (cumulonimbus), strong upward air currents carry water droplets upward, where they collide with ice crystals moving downward. This rubbing (friction) causes *charge separation*: the upper part of the cloud becomes positively charged and the lower part negatively charged. This is similar to rubbing a glass rod with silk — charge is produced by friction.

Key Point: The process is a form of *triboelectric charging* (charging by friction) — not condensation, evaporation, or cosmic radiation.

Why other options are wrong:

- (A): Condensation involves vapour turning to liquid — it does not separate charges.
- (C): Ocean evaporation does not directly charge clouds.
- (D): Cosmic radiation plays no role in cloud charging as described in Class 8 NCERT.

Final Answer: Friction between water droplets and ice crystals/air currents $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Zones of a Candle Flame: A burning candle flame has three distinct zones:

- **Innermost dark zone**: Unburnt wax vapour, no combustion occurs, coolest zone.
- **Middle luminous zone**: Partial (incomplete) combustion of wax vapour; glows yellow due to incandescent carbon particles. This zone is used to blacken objects.
- **Outermost non-luminous zone**: Complete combustion, appears blue, is the hottest zone. Goldsmiths use this zone.

Why other options are wrong:

- (A): There are three zones, not two.
- (B): There is no distinct "red" zone; the zones are dark, luminous yellow, and blue.

- (D): Combustion is not uniform; each zone has a different degree of burning.

Final Answer: Three zones — dark inner, luminous middle, non-luminous blue outer ⇒ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Petroleum Refinery Products: Crude petroleum is a complex mixture of hydrocarbons. Fractional distillation separates it into fractions based on boiling points. The useful products obtained are:

Product	Use
Petroleum gas (LPG)	Cooking fuel
Petrol	Fuel for cars
Kerosene	Aviation fuel, stove fuel
Diesel	Trucks, buses
Lubricating oil	Engine lubrication
Paraffin wax	Candles, polish

Why other options are wrong:

- (B): Coal tar, coke, and coal gas are products of *coal* — not petroleum.
- (C): Oxygen, hydrogen etc. are atmospheric gases, not petroleum fractions.
- (D): Rubber, plastic, nylon are synthetic polymers — not direct petroleum fractions.

Final Answer: Petrol, kerosene, diesel, LPG, and paraffin wax ⇒ A

Answer: (A) Go Back to Q12

Q13.

Solution

Concept — Common Alloys: Alloys are homogeneous mixtures of two or more metals (or a metal and a non-metal) that have improved properties over the pure metals.

Alloy	Constituents	Key Property
Brass	Copper (Cu) + Zinc (Zn)	Corrosion-resistant, shiny
Bronze	Copper (Cu) + Tin (Sn)	Hard, used in statues
Steel	Iron (Fe) + Carbon (C)	Strong, used in construction

Why other options are wrong:

- (A): Brass is Cu+Zn (not Cu+Fe); Bronze is Cu+Sn (not Cu+Zn).
- (B): Bronze contains Sn (tin), not Fe; Steel contains C (carbon), not Cr.
- (C): Iron is not used to make brass or bronze.

Final Answer: Brass = Cu+Zn; Bronze = Cu+Sn; Steel = Fe+C $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Native (Free State) Metals: Metals that are very unreactive (low reactivity) are found in their free elemental form in nature without combining with other elements. These are called *native metals*.

Key Examples: Gold (Au), Silver (Ag), and Platinum (Pt) — all are noble/precious metals with very low reactivity and are found as free elements in the Earth's crust.

Why other options are wrong:

- (A): Iron, copper, and aluminium are reactive — they are found as ores (oxides, sulphides, carbonates).
- (C): Sodium, potassium, and calcium are *extremely* reactive — they combine with air and water immediately.
- (D): Mercury occurs both free and combined; lead and tin are found as sulphide ores.

Final Answer: Gold, silver, and platinum are found in the free state $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Properties of Nylon: Nylon is a fully synthetic polyamide fibre developed in 1935. It was the first synthetic fibre and is compared to silk because it shares several properties:

- **Strong**: Very high tensile strength (stronger than silk and steel of the same thickness).
- **Elastic**: Returns to original shape after stretching.
- **Lustrous**: Shiny appearance, similar to silk.
- **Lightweight**: Easy to wear and carry.

Why other options are wrong:

- (A): Nylon is actually *stronger* than silk, not weaker; it is lustrous, not dull.
- (B): Nylon does not absorb moisture well — it is quick-drying, unlike cotton.
- (D): Nylon is fully synthetic (from coal, water, and air) — it does not come from wood pulp.

Final Answer: Strong, elastic, lustrous, and light — comparable to silk $\Rightarrow$ C

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Mitochondria: Mitochondria (singular: mitochondrion) are double-membrane organelles found in the cytoplasm of eukaryotic cells. They carry out *cellular respiration* — the process of breaking down glucose to release ATP (adenosine triphosphate), the cell's energy currency.

$$\text{Glucose} + O_2 \longrightarrow CO_2 + H_2O + \text{ATP (energy)}$$

This is why mitochondria are called the **"powerhouse of the cell."** They also have their own DNA and ribosomes.

Why other options are wrong:

- (B): The *nucleus* controls cell activities and carries genetic information.

- (C): Protein synthesis occurs at *ribosomes* (using mRNA from the nucleus).
- (D): *Vacuoles* store cell sap and provide turgidity.

Final Answer: Mitochondria = powerhouse, site of respiration and ATP production $\Rightarrow$ A

Answer: (A) Go Back to Q16

Q17.

Solution

Concept — Vacuoles: Vacuoles are fluid-filled, membrane-bound sacs. Their size differs between cell types:

- **Plant cells**: One large central vacuole occupying up to 90% of the cell volume. It stores water, minerals, and waste products, and maintains cell turgidity (rigidity of the plant).
- **Animal cells**: Several small vacuoles (or none); they do not maintain rigidity since animal cells have no cell wall.

Why other options are wrong:

- (A): Vacuoles are *present* in plant cells and sometimes in animal cells.
- (B): The reverse is true — plant cell vacuoles are *larger*.
- (C): Vacuoles store many substances (minerals, pigments, waste) in addition to water, and they directly influence cell shape.

Final Answer: Larger in plant cells; small or absent in animal cells $\Rightarrow$ D

Answer: (D) Go Back to Q17

Q18.

Solution

Concept — Microorganisms in Food Production: Several food items are prepared with the help of specific microorganisms:

- **Curd**: *Lactobacillus* bacteria ferment milk, converting lactose to lactic acid which curdles the milk.
- **Bread**: *Saccharomyces cerevisiae* (baker's yeast) ferments sugar to produce CO_2, which makes the dough rise (leavening).
- **Vinegar**: *Acetobacter* oxidises ethanol to acetic acid (vinegar).

Why other options are wrong:

- (A): Yeast makes bread (not curd); Lactobacillus makes curd (not bread); Penicillium is an antibiotic-producing mould.
- (C) & (D): The organisms are completely mismatched with their food products.

Final Answer: Curd — Lactobacillus; Bread — Yeast; Vinegar — Acetobacter $\Rightarrow$ B

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Malaria: Malaria is a parasitic disease with the following chain of transmission:

- **Causative organism**: *Plasmodium* (a protozoan parasite — not a bacterium or virus).
- **Vector (carrier)**: Female *Anopheles* mosquito (the male does not bite humans).
- **Mechanism**: The mosquito injects Plasmodium sporozoites into the bloodstream. Plasmodium infects red blood cells, causing cyclic fever.

Why other options are wrong:

- (A): Malaria is caused by a *protozoan* (Plasmodium), not a bacterium; the male mosquito does not bite.
- (B): *Culex* mosquito is the vector for filariasis (elephantiasis), not malaria.
- (D): Malaria is *not* caused by a virus; Aedes mosquito transmits dengue and chikungunya.

Final Answer: Plasmodium, female Anopheles mosquito $\Rightarrow$ C

Answer: (C) Go Back to Q19

Q20.

Solution

Concept — Complete Metamorphosis (Holometabolism): The butterfly undergoes *complete metamorphosis* (holometabolism), involving four distinct stages:

1. **Egg**: Laid on a plant leaf.
2. **Larva** (Caterpillar): Hatches from egg; feeds on leaves; grows rapidly.
3. **Pupa** (Chrysalis): Larva encases itself; body is reorganised completely.
4. **Adult** (Butterfly): Emerges from pupa; capable of reproduction.

Why other options are wrong:

- (B): Egg → Nymph → Adult is *incomplete* metamorphosis (e.g., cockroach, grasshopper) — there is no pupa stage.
- (C): Skipping the pupa stage is incorrect for butterfly; it is essential for reorganisation.
- (D): Pupa stage cannot precede the larva stage — the larva forms the pupa.

Final Answer: Egg → Larva → Pupa → Adult ⇒ $\boxed{\text{A}}$

Answer: (A) Go Back to Q20

Q21.

Solution

Concept — Protected Areas in India: India has three categories of protected areas, each with a different level of protection:

- **Wildlife Sanctuary**: Protects specific animals (e.g., one-horned rhino in Kaziranga before it became a national park). Limited human activity (grazing, collection of forest produce) may be allowed.
- **National Park**: Strictly protects all wildlife within defined boundaries. Human activities are completely prohibited. Examples: Jim Corbett, Kaziranga.
- **Biosphere Reserve**: Largest and most comprehensive; conserves biodiversity, ecosystems, and traditional human lifestyles. Has core, buffer, and transition zones. Examples: Nilgiri, Sundarbans.

Why other options are wrong:

- (A): They are not identical; they differ in protection level and purpose.
- (B): Wildlife sanctuaries do not allow *unlimited* human settlement.

- (C): Size varies; a biosphere reserve is *not* always the smallest.

Final Answer: Sanctuary $\subset$ National Park $\subset$ Biosphere Reserve in protection level $\Rightarrow$ $\boxed{D}$

Answer: (D) Go Back to Q21

Q22.

Solution

Concept — Crop Rotation: Crop rotation is the practice of growing a sequence of different crops on the same land across different seasons. It benefits farmers in two main ways:

- **Soil fertility**: Leguminous crops (e.g., beans, peas, lentils) fix atmospheric nitrogen into the soil through root nodules containing *Rhizobium* bacteria, replenishing nitrogen used by cereal crops.
- **Pest control**: Pests specific to one crop cannot build up in the soil when a different crop is grown the next season.

Example rotation: Wheat (depletes nitrogen) $\rightarrow$ Soybean/Pulses (fixes nitrogen) $\rightarrow$ Wheat.

Why other options are wrong:

- (A): Growing the same crop repeatedly depletes specific nutrients and encourages pest buildup.
- (C): Irrigation is a separate practice; it does not change the crop grown.
- (D): Chemical fertilisers replace some nutrients but do not prevent pest buildup.

Final Answer: Alternating crops to maintain soil fertility and reduce pests $\Rightarrow$ $\boxed{B}$

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Phases of the Moon: The Moon does not produce its own light — it reflects sunlight. As the Moon orbits Earth (one complete orbit ≈ 29.5 days = one lunar month), we see different portions of its sunlit half from Earth. This gives rise to the *phases of the Moon*:

New Moon → Waxing Crescent → First Quarter → Waxing Gibbous → Full Moon → Waning Gibbous → Last Quarter → Waning Crescent → New Moon.

Key Distinction:

- Phases $\neq$ Lunar eclipse. In a *lunar eclipse*, Earth's shadow falls on the Moon. This is a different (rarer) event.
- Phases occur every month due to the Moon's *orbital position*, not Earth's shadow.

Why other options are wrong:

- (A): The Moon does NOT produce its own light.
- (B): Earth's shadow causes a *lunar eclipse*, not the monthly phases.
- (D): The Moon does not physically change shape.

Final Answer: We see different portions of the Moon's illuminated half as it orbits Earth $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Ozone Layer Depletion: The ozone (O_3) layer in the stratosphere (15–35 km altitude) absorbs harmful UV-B and UV-C radiation. It is being depleted primarily by:

Chlorofluorocarbons (CFCs) — synthetic chemicals used in:

- Refrigerants (old refrigerators, air conditioners).
- Aerosol spray propellants (deodorants, hairsprays).
- Foam-blowing agents.

CFCs reach the stratosphere and are broken down by UV light, releasing chlorine radicals that catalytically destroy ozone: one Cl atom can destroy up to 100,000

ozone molecules.

Why other options are wrong:

- (B): CO_2 causes the *greenhouse effect*/global warming, not ozone depletion.
- (C): SO_2 causes *acid rain*, not ozone depletion.
- (D): Methane is a greenhouse gas, not an ozone-depleting substance.

Final Answer: CFCs from refrigerants and aerosol sprays $\Rightarrow$ A

Answer: (A) Go Back to Q24

Q25.

Solution

Concept — Reproductive Health in Adolescence: Adolescence (ages 10–19) is a period of rapid physical and emotional change. Maintaining reproductive health during this phase requires:

- **Personal hygiene**: Regular bathing, clean clothes, dental care — especially important as sweat glands become more active.
- **Balanced diet**: Adequate proteins, calcium, iron, and vitamins to support rapid growth and development.
- **Avoiding substance abuse**: Tobacco, alcohol, and drugs harm the developing body, impair judgment, and can disrupt hormonal balance.
- **Regular physical activity**: Exercise promotes healthy growth and mental well-being.

Why other options are wrong:

- (A): Physical exercise is *essential*, not harmful, for adolescent growth.
- (B): Substance abuse is extremely harmful — it damages organs, brain development, and reproductive health.
- (C): Junk food lacks essential nutrients; it leads to obesity and nutritional deficiencies, not good health.

Final Answer: Hygiene, balanced diet, and avoiding substance abuse $\Rightarrow$ D

Answer: (D) Go Back to Q25

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	D	2	B	3	C	4	A	5	D
6	B	7	C	8	A	9	D	10	B
11	C	12	A	13	D	14	B	15	C
16	A	17	D	18	B	19	C	20	A
21	D	22	B	23	C	24	A	25	D