

YASASVI Science

Sample Paper – 3

Duration: 38 Minutes

Maximum Marks: 100

Instructions

- This paper contains **25** Multiple Choice Questions (Single Correct Answer), modelled on the Science portion of YASASVI entrance.
- Each correct answer carries **+4 marks**. There is a **penalty of –1 mark** for every incorrect answer. Unattempted questions carry **zero** marks.
- Only **one** option is correct per question. Choose carefully.
- Syllabus level: **Class 8 NCERT Science (for Class 9 YET)**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.
- This is an **OMR-based** paper. Mark your answers clearly in the OMR sheet provided.

Q1. The word **AMBULANCE** is written in a reversed (mirror-image) form on the front of an ambulance vehicle. What is the main reason for this?

- (A) It makes the vehicle look more attractive and easily identifiable.
- (B) It allows medical staff inside the ambulance to read the word from inside.
- (C) **A driver ahead can read the word correctly in the rear-view mirror and give way.**
- (D) It is a mandatory legal requirement for the colour scheme of all emergency vehicles.

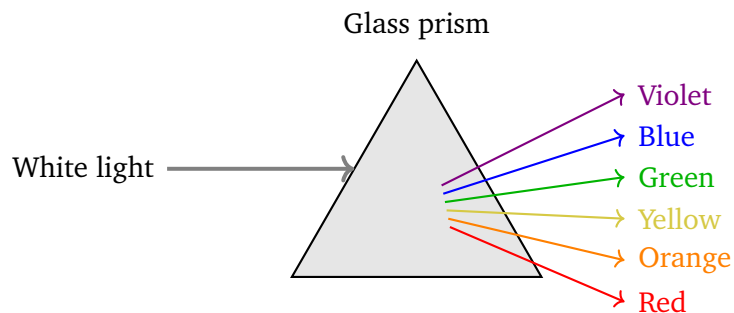
Q2. A concave mirror is used in many everyday applications. Which of the following is **NOT** a use of a concave mirror?

- (A) **As a rear-view (wing) mirror in motor vehicles.**



- (B) As a shaving/make-up mirror to get an enlarged image of the face.
- (C) As a reflector in torches, headlights, and search lights.
- (D) By dentists to examine the inner surfaces of teeth.

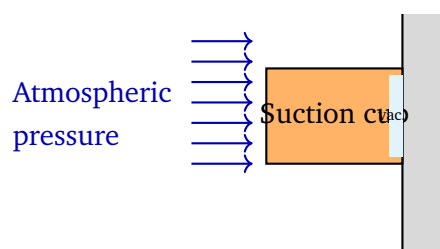
Q3. When a beam of white light passes through a glass prism, it splits into a band of colours called a **spectrum** (VIBGYOR). The figure below shows this dispersion.



Which colour of light is deviated **most** from its original direction when passing through the prism?

- (A) Red — it has the longest wavelength in visible light.
 - (B) Orange — it lies near the red end of the spectrum.
 - (C) Green — it is in the middle of the visible spectrum.
 - (D) **Violet — it has the shortest wavelength and is bent the most.**
- Q4.** Pressure is defined as the **force acting per unit area**. A uniform force of **20 N** acts perpendicularly on a flat surface of area **4 m²**. What is the pressure exerted on the surface?
- (A) 80 Pa
 - (B) **5 Pa**
 - (C) 24 Pa
 - (D) 16 Pa
- Q5.** A rubber suction cup is pressed firmly against a smooth tile wall and it sticks without any glue. The figure below represents this situation. Which force primarily holds the suction cup to the wall?



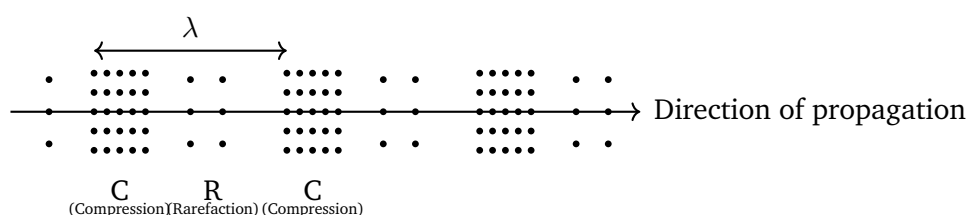


- (A) Gravitational force of the Earth pulling the cup toward the wall.
- (B) Magnetic attraction between the rubber cup and the ceramic tile.
- (C) **Atmospheric pressure acting on the outer surface of the cup, pushing it against the wall because the air inside has been expelled.**
- (D) Friction between the rubber surface of the cup and the smooth tile.

Q6. Early humans made fire by rubbing two stones together rapidly. Even today, a matchstick is lit by striking it against the rough side of the matchbox. Which of the following **best** explains why heat is produced in both these situations?

- (A) Stones and matchsticks contain water that turns into steam when compressed.
- (B) Chemical energy stored inside the stones is directly converted into heat.
- (C) High thermal conductivity of the materials allows rapid heat transfer.
- (D) **Friction between the surfaces converts kinetic (mechanical) energy into heat energy.**

Q7. Sound is a **longitudinal** wave. The figure below shows how particles of the medium are arranged when a sound wave travels through air.



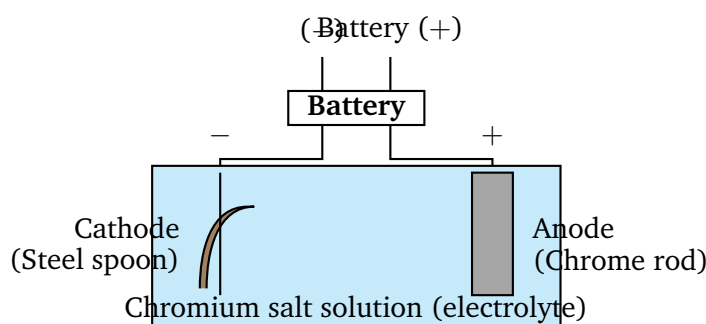
In a longitudinal wave, the particles of the medium vibrate:

- (A) **Parallel (back and forth) to the direction of propagation of the wave, creating compressions and rarefactions.**
- (B) Perpendicular (up and down) to the direction of propagation of the wave.
- (C) In circular orbits centred on the direction of propagation.
- (D) Randomly in all directions with no fixed pattern.

Q8. Ultrasound has a frequency greater than 20,000 Hz (20 kHz) and is beyond the range of human hearing. SONAR stands for **SOund Navigation And Ranging**. What is the primary use of SONAR?

- (A) To measure the speed of sound in open air for meteorological purposes.
- (B) **To detect and locate underwater objects (submarines, fish shoals, sea floor) using reflected ultrasonic pulses.**
- (C) To amplify low-frequency sounds in hearing aids for the hearing impaired.
- (D) To sterilise surgical instruments by exposing them to high-frequency vibrations.

Q9. In the electroplating of a steel spoon with chromium (chrome plating), the components of the electroplating cell are set up as shown below.



Which of the following correctly describes the arrangement?



- (A) The steel spoon acts as the anode and the chrome rod acts as the cathode.
- (B) Plain water is used as the electrolyte in chrome electroplating.
- (C) **The steel spoon acts as the cathode (connected to negative terminal) and the chrome rod acts as the anode (connected to positive terminal).**
- (D) The chrome salt solution becomes more concentrated as the plating proceeds.

Q10. When an amber rod is rubbed with a piece of silk cloth, the amber rod becomes **negatively** charged. This happens because:

- (A) Positive charges (protons) flow from the silk cloth into the amber rod.
- (B) Protons are transferred out of the amber rod into the silk cloth.
- (C) The silk cloth gains electrons from the amber rod and becomes negative.
- (D) **Electrons are transferred from the silk cloth to the amber rod; the amber gains electrons and becomes negatively charged.**

Q11. When a hydrocarbon fuel (such as methane, CH_4 , or octane in petrol) undergoes **complete combustion** in the presence of sufficient oxygen, the products formed are:

- (A) **Carbon dioxide (CO_2) and water vapour (H_2O) only.**
- (B) Carbon monoxide (CO) and water vapour (H_2O) — indicating a lack of oxygen.
- (C) Carbon (soot) and water vapour — produced when combustion is very slow.
- (D) A mixture of carbon dioxide (CO_2) and carbon monoxide (CO) in equal amounts.

Q12. Natural resources can be divided into **exhaustible** (can be used up) and



inexhaustible (cannot be exhausted). In which category do fossil fuels such as coal, petroleum, and natural gas belong?

- (A) Inexhaustible natural resources, because they are found underground in huge deposits.
- (B) **Exhaustible natural resources, because they took millions of years to form and are being consumed far faster than they can be replenished.**
- (C) Renewable energy sources, because they can be recycled through natural processes.
- (D) Biotic-abiotic composite resources that renew themselves every century.

Q13. Graphite is an allotrope of carbon, which is a **non-metal**. Yet it is widely used as electrodes in electrolysis cells and in dry cells. What property of graphite makes it suitable for this purpose?

- (A) Graphite has a shiny metallic lustre and is extremely hard, making it durable.
- (B) Graphite is ductile and can be drawn into thin wires like copper.
- (C) **Graphite is a good conductor of electricity due to the presence of delocalised (free) electrons, despite being a non-metal.**
- (D) Graphite reacts vigorously with dilute acids, releasing hydrogen gas.

Q14. An iron nail is placed in a blue copper sulphate (CuSO_4) solution. After some time, the nail develops a reddish-brown coating and the solution becomes pale green. What chemical process is occurring?

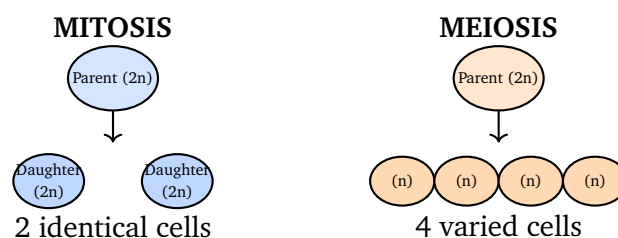
- (A) Iron slowly dissolves in the solution without any chemical change.
- (B) Copper sulphate oxidises the surface of the iron nail.
- (C) Iron acts as a cathode and copper is electrodeposited on its surface.
- (D) **Iron (being more reactive) displaces copper from copper sulphate solution: $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$, depositing copper on the nail.**



- Q15.** Non-biodegradable plastics pose a severe threat to the environment. Which of the following statements **best** explains why they are so harmful?
- (A) **Soil microorganisms cannot break them down, so they persist in the environment for hundreds of years, polluting land, water bodies, and harming wildlife.**
 - (B) They are soluble in water and contaminate groundwater and drinking water supplies.
 - (C) They release toxic gases when they come into contact with moist soil.
 - (D) They absorb all the mineral nutrients from the soil, preventing plant growth.

- Q16.** A student is studying cell organelles under a microscope. She identifies a stack of flattened membrane-bound sacs near the nucleus. This organelle is the **Golgi apparatus**. What is its primary function?
- (A) It produces energy for the cell through aerobic respiration (cellular powerhouse).
 - (B) **It packages proteins and other materials received from the endoplasmic reticulum, modifies them, and dispatches them to their destinations inside or outside the cell.**
 - (C) It contains the cell's DNA and controls all cellular activities.
 - (D) It carries out photosynthesis by trapping sunlight energy.

- Q17.** The diagram below compares **mitosis** and **meiosis**.



Which of the following statements **correctly** distinguishes mitosis from meiosis?



- (A) Mitosis produces 4 daughter cells; meiosis produces 2 daughter cells.
- (B) Mitosis occurs only in reproductive organs; meiosis occurs in all body cells.
- (C) **Mitosis produces 2 genetically identical daughter cells (each with $2n$ chromosomes) used for growth and repair; meiosis produces 4 genetically varied cells (each with n chromosomes) used for sexual reproduction.**
- (D) Both mitosis and meiosis always result in daughter cells that have the same chromosome number as the parent cell.

Q18. *Rhizopus* (commonly known as bread mould) is a fungus that grows on moist bread, fruit, and other organic materials. How does *Rhizopus* primarily reproduce asexually?

- (A) By **binary fission** — splitting into two equal daughter cells as in bacteria.
- (B) By **budding** — forming a small outgrowth on the parent body that detaches to form a new organism.
- (C) By **fragmentation** — breaking into small pieces, each growing into a new organism.
- (D) **By spore formation — producing tiny spores inside round structures called sporangia; the spores are released and dispersed by air currents to germinate in suitable conditions.**

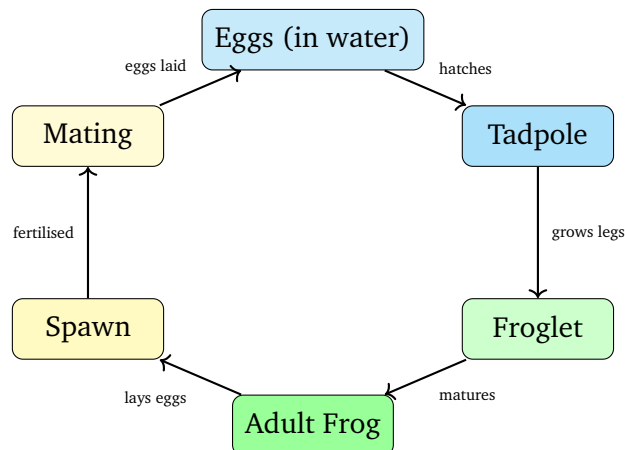
Q19. In 1928, Alexander Fleming noticed that the bacteria (*Staphylococcus*) on one of his culture plates were being killed by a contaminating mould. This accidental discovery led to the development of the world's first antibiotic, **penicillin**. What is the name of the fungus that produced penicillin?

- (A) ***Penicillium notatum* — the blue-green mould from which penicillin is derived.**
- (B) *Aspergillus niger* — a black mould used in the food and beverage industry.



- (C) *Mucor hiemalis* — a common bread mould found in soil.
- (D) *Saccharomyces cerevisiae* — the yeast used in baking and fermentation.

Q20. Frogs reproduce by **external fertilization**. The life cycle of a frog is shown below.



Which of the following **correctly** describes external fertilization in frogs?

- (A) Fertilization occurs inside the body of the female frog before the eggs are laid.
- (B) **The female frog lays eggs in water and the male sheds sperm over them; fertilization takes place outside both bodies, in the water.**
- (C) The eggs are fertilized inside the male frog's body and then transferred to the female.
- (D) The male frog carries and incubates the fertilised eggs in a special pouch until they hatch.

Q21. Many bird species undertake long seasonal **migrations** — they travel from colder regions to warmer areas in search of food and suitable breeding conditions. Siberian cranes migrate from Siberia (Russia) to India every winter. Which Indian location is their most famous wintering destination?

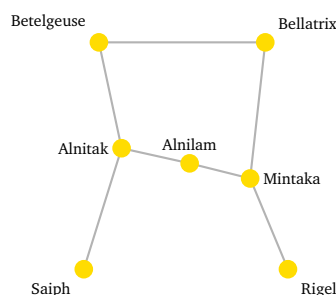


- (A) Kaziranga National Park, Assam — famous for the Indian one-horned rhinoceros.
- (B) Sundarbans Biosphere Reserve, West Bengal — famous for the Royal Bengal tiger.
- (C) **Keoladeo Ghana National Park (Bharatpur Bird Sanctuary), Rajasthan — a UNESCO World Heritage Site and a premier destination for migratory birds.**
- (D) Periyar Wildlife Sanctuary, Kerala — famous for wild elephants and tigers.

Q22. Proper storage of harvested food grains is essential to prevent damage by pests (insects, rodents, fungi). Which of the following is a traditional, eco-friendly method of protecting stored grains from insect pests?

- (A) **Mixing dried neem (*Azadirachta indica*) leaves with the stored grains — neem contains natural insect-repellent compounds (azadirachtin).**
- (B) Spraying DDT (dichlorodiphenyltrichloroethane) directly on the stored grain sacks.
- (C) Sealing grains in synthetic plastic bags with added chemical preservatives.
- (D) Exposing the grains to direct sunlight for 48 continuous hours before storage.

Q23. A **constellation** is a recognisable pattern of stars as seen from Earth. The dot-to-dot diagram below shows a famous constellation.



Constellation: ?



Which of the following statements about the constellation shown is **correct**?

- (A) The constellation shown is Ursa Major (the Great Bear), visible throughout the year in India.
- (B) The constellation is made up of exactly 3 bright stars forming an equilateral triangle.
- (C) The constellation represents a bear and rises in the northern sky just after sunset.
- (D) **The constellation is Orion (the Hunter), identified by 7 prominent stars including a distinctive three-star belt (Alnitak, Alnilam, Mintaka) and bright stars Rigel and Betelgeuse.**

Q24. Acid rain has caused widespread damage to forests, aquatic ecosystems, and historical monuments (such as the Taj Mahal). Which of the following correctly identifies the **primary causes** of acid rain?

- (A) Carbon dioxide (CO_2) from vehicle exhaust dissolves in rainwater to form carbonic acid (H_2CO_3), which is the main cause.
- (B) **Sulphur dioxide (SO_2) and nitrogen oxides (NO_x) released by industries and vehicles dissolve in rainwater to form sulphuric acid (H_2SO_4) and nitric acid (HNO_3).**
- (C) Ozone (O_3) in the upper atmosphere reacts with water vapour to produce an acid that falls as rain.
- (D) Ammonia (NH_3) released from nitrogenous fertilisers reacts with rainwater to form ammonium hydroxide.

Q25. The **endocrine system** consists of ductless glands that secrete hormones directly into the bloodstream. Which of the following correctly matches an **endocrine gland** with its **hormone** and **primary function**?

- (A) Thyroid gland → Insulin → Regulates blood glucose (sugar) level.
- (B) Adrenal gland → Thyroxine → Regulates the body's metabolic rate.



- (C) **Pituitary gland → Growth hormone (GH) → Regulates growth of bones and muscles; often called the “master gland” because it controls other endocrine glands.**
- (D) Pancreas → Adrenaline → Prepares the body for an emergency “fight or flight” response.



Detailed Solutions**Q1.****Solution**

Concept — Lateral Inversion (Light): A plane mirror produces an image in which left and right are swapped — this is called **lateral inversion**. When a driver ahead looks in the rear-view mirror, the laterally inverted image of the reversed word “AMBULANCE” reads correctly as “AMBULANCE”, alerting the driver to give way immediately.

Why other options are wrong:

- Option A: Aesthetics is not the reason; the purpose is purely functional safety.
- Option B: Medical staff need not read the word from inside; they know they are in an ambulance.
- Option D: The reversal is not about colour scheme or a legal lettering requirement; it is an application of the law of reflection (lateral inversion).

Final Answer: The reversed writing is read correctly in a driver’s rear-view mirror due to lateral inversion. $\Rightarrow$ (C)

Answer: (C) [Go Back to Q1](#)

Q2.**Solution**

Concept — Concave vs Convex Mirrors: A **concave** mirror converges light rays and forms magnified images when the object is close. A **convex** mirror diverges light and gives a wider field of view but a smaller image. Rear-view mirrors in vehicles must show a wide field of view, so they use **convex** mirrors, not concave mirrors.

Uses of concave mirrors (B, C, D):

- Shaving/make-up mirror (B): Concave gives an enlarged upright image at close range. ✓
- Torch/headlight reflector (C): Concave reflects parallel beams of light outward. ✓
- Dentist’s mirror (D): Concave gives an enlarged image of the tooth surface. ✓

Final Answer: A rear-view mirror is convex (not concave). $\Rightarrow$ (A)



Answer: (A) [Go Back to Q2](#)

Q3.

Solution

Concept — Dispersion of White Light (Prism): When white light enters a glass prism, each colour is refracted (bent) by a different amount because the refractive index of glass depends on the wavelength. Shorter wavelengths are slowed more and bent more. The sequence of colours formed is **VIBGYOR** (Violet, Indigo, Blue, Green, Yellow, Orange, Red).

Deviation analysis:

- **Violet** has the *shortest wavelength* ($\approx 400 \text{ nm}$) $\Rightarrow$ highest refractive index $\Rightarrow$ **maximum deviation**.
- **Red** has the *longest wavelength* ($\approx 700 \text{ nm}$) $\Rightarrow$ lowest refractive index $\Rightarrow$ **minimum deviation**.

Final Answer: Violet deviates the most. $\Rightarrow$ (D)

Answer: (D) [Go Back to Q3](#)

Q4.

Solution

Concept — Pressure Formula: Pressure is defined as

$$P = \frac{F}{A}$$

where F is the applied force (in Newtons) and A is the area (in m^2). The SI unit of pressure is the **Pascal (Pa)**, where $1 \text{ Pa} = 1 \text{ N/m}^2$.

Calculation:

$$P = \frac{20 \text{ N}}{4 \text{ m}^2} = 5 \text{ Pa}$$

Why other options are wrong:

- 80 Pa (A): This is $F \times A = 20 \times 4$ — an incorrect multiplication.
- 24 Pa (C): This is $F + A = 20 + 4$ — arithmetic error.
- 16 Pa (D): This is $F - A = 20 - 4$ — arithmetic error.

Final Answer: $P = 5 \text{ Pa}$. $\Rightarrow$ (B)



Answer: (B) [Go Back to Q4](#)

Q5.

Solution

Concept — Atmospheric Pressure and Suction Cups: When a rubber suction cup is pressed against a smooth wall, the air inside the cup is expelled. The surrounding atmospheric pressure (approximately 10^5 Pa) then acts on the outside of the cup, pushing it firmly against the wall. The vacuum (low pressure region) inside prevents the cup from sliding off.

Why other options are wrong:

- Option A: Gravity acts downward, not toward the wall; gravity would cause the cup to slide down, not stick sideways.
- Option B: Rubber is not magnetic, nor are tiles.
- Option D: The wall surface is smooth (reducing friction), yet the cup still sticks — proving friction is not the primary cause.

Final Answer: Atmospheric pressure holds the suction cup against the wall. $\Rightarrow$ (C)

Answer: (C) [Go Back to Q5](#)

Q6.

Solution

Concept — Friction Converts Energy to Heat: Friction is a contact force that opposes relative motion between surfaces. When two surfaces slide against each other, the kinetic energy of the moving surfaces is converted into **thermal (heat) energy** due to friction. This principle is used in: (1) striking a matchstick against the rough side of a matchbox, and (2) prehistoric fire-making by rubbing stones.

Why other options are wrong:

- Option A: Stones do not contain water in a form that produces fire.
- Option B: Stones do not store chemical energy that spontaneously converts to heat on rubbing (the match-head contains chemicals, but the question is about the general principle of rubbing).
- Option C: Thermal conductivity describes how heat flows through a material, not how heat is generated.

Final Answer: Friction converts kinetic energy into heat energy. $\Rightarrow$ (D)



Answer: (D) [Go Back to Q6](#)

Q7.

Solution

Concept — Longitudinal Waves: In a **longitudinal wave**, the particles of the medium vibrate *in the same direction* as the propagation of the wave. This creates alternating regions of **compression** (particles are close together, high pressure) and **rarefaction** (particles are spread apart, low pressure). Sound waves in air are longitudinal.

Compare with **transverse waves** (e.g. waves on a string, light waves) where particles vibrate *perpendicular* to the direction of wave propagation.

Why other options are wrong:

- Option B: Perpendicular vibration describes a transverse wave, not a sound wave.
- Option C: Circular orbital motion describes water surface waves (partially), not sound.
- Option D: Random vibration would produce noise with no wave pattern.

Final Answer: Particles vibrate parallel to the direction of propagation. $\Rightarrow$ (A)

Answer: (A) [Go Back to Q7](#)

Q8.

Solution

Concept — SONAR (Echolocation in Water): SONAR uses the principle of **echo** (reflection of ultrasound). A transmitter sends out a pulse of ultrasonic waves into water; these waves reflect off underwater objects (ships, submarines, sea floor, fish) and the reflected echo is detected. By measuring the **time taken for the echo to return** and knowing the speed of sound in water (≈ 1500 m/s), the distance to the object is calculated:

$$\text{Distance} = \frac{\text{Speed} \times \text{Time}}{2}$$

Why other options are wrong:

- Option A: Measuring the speed of sound in air is done with different instruments.



- Option C: Hearing aids amplify sound using electronic amplifiers, not SONAR.
- Option D: Sterilisation using ultrasound is a different application (ultrasonic cleaning/sterilisation baths), not SONAR.

Final Answer: SONAR detects and locates underwater objects. $\Rightarrow$ (B)

Answer: (B) [Go Back to Q8](#)

Q9.

Solution

Concept — Electroplating: In electroplating, the object to be plated is connected to the **negative terminal** of the battery (making it the **cathode**), and the plating metal is connected to the **positive terminal** (making it the **anode**). The electrolyte is a salt solution of the plating metal (chromium salt solution for chrome plating).

Process: During electrolysis, the chromium anode oxidises and releases Cr^{3+} ions into the solution; these ions migrate to the steel cathode and are reduced (deposited) as a thin layer of metallic chromium on the steel surface.

Why other options are wrong:

- Option A: The anode and cathode are reversed — incorrect.
- Option B: Water alone does not provide chromium ions; a chromium salt solution is required.
- Option D: The solution actually becomes *less* concentrated over time as chromium ions are removed and deposited on the steel object.

Final Answer: Steel spoon = cathode (negative); chrome rod = anode (positive).
 $\Rightarrow$ (C)

Answer: (C) [Go Back to Q9](#)



Q10.

Solution

Concept — Charging by Friction (Triboelectric Effect): When two different materials are rubbed together, electrons are transferred from one material to the other. The material that *gains* electrons becomes **negatively charged**; the one that *loses* electrons becomes **positively charged**. Only electrons (never protons) are transferred because protons are bound tightly in the atomic nucleus.

Amber–Silk case: Silk has a greater tendency to lose electrons. When silk is rubbed on amber, electrons flow **from silk to amber**. Therefore, amber gains electrons $\Rightarrow$ amber becomes **negative**; silk loses electrons $\Rightarrow$ silk becomes **positive**.

Why other options are wrong:

- Option A: Positive charges (protons) never flow — they are fixed in the nucleus.
- Option B: Protons are not transferred during frictional charging.
- Option C: If silk gained electrons from amber, the amber would become positive, not negative — contradicts the question.

Final Answer: Electrons transfer from silk to amber, making amber negative. $\Rightarrow$

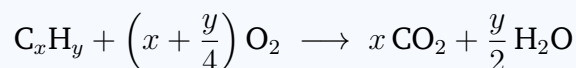
(D)

Answer: (D) [Go Back to Q10](#)

Q11.

Solution

Concept — Complete vs Incomplete Combustion: When a hydrocarbon burns with **sufficient oxygen** (complete combustion), all carbon atoms are fully oxidised to CO_2 and all hydrogen atoms are oxidised to H_2O :



Example for methane: $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

Why other options are wrong:

- Option B: CO is produced only in *incomplete* combustion (insufficient oxygen).
- Option C: Carbon soot is produced in incomplete combustion; H_2O is still formed.



- Option D: Complete combustion converts all carbon to CO_2 , not a mix of CO_2 and CO .

Final Answer: Complete combustion produces CO_2 and H_2O . $\Rightarrow$ (A)

Answer: (A) [Go Back to Q11](#)

Q12.

Solution

Concept — Exhaustible Natural Resources: Natural resources are classified as:

- **Exhaustible (Non-renewable):** Resources that took millions of years to form and will be completely used up if consumed at the present rate. Examples: coal, petroleum, natural gas, minerals.
- **Inexhaustible (Renewable):** Resources that are replenished naturally in a short time. Examples: sunlight, wind, water.

Fossil fuels formed from the remains of ancient organisms over millions of years under heat and pressure. Once consumed, they *cannot be replaced within a human timescale*.

Why other options are wrong:

- Option A: “Huge deposits” does not mean inexhaustible; they are finite.
- Option C: Fossil fuels are not renewable; they are the opposite.
- Option D: Not a recognised scientific classification.

Final Answer: Fossil fuels are exhaustible natural resources. $\Rightarrow$ (B)

Answer: (B) [Go Back to Q12](#)

Q13.

Solution

Concept — Graphite (Exceptional Non-Metal): Carbon exists in two common allotropes — **diamond** (insulator, hardest natural substance) and **graphite** (conductor, soft and slippery). In graphite, each carbon atom is bonded to three other carbon atoms in hexagonal layers, leaving one **delocalised (free) electron per atom** that can conduct electricity. This makes graphite the only non-metal that is a good electrical conductor.

Applications: Electrodes in electrolytic cells, dry cells (carbon rod), and as a



lubricant.

Why other options are wrong:

- Option A: Graphite has a dull lustre and is very soft (not hard).
- Option B: Ductility (drawn into wires) is a property of metals, not graphite.
- Option D: Graphite does not react vigorously with dilute acids.

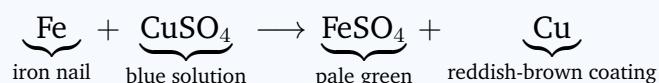
Final Answer: Graphite conducts electricity due to delocalised electrons. $\Rightarrow$ (C)

Answer: (C) [Go Back to Q13](#)

Q14.

Solution

Concept — Displacement Reaction (Reactivity Series): A more reactive metal can displace a less reactive metal from its salt solution. Iron (Fe) is above copper (Cu) in the reactivity series, so iron displaces copper from copper sulphate solution:



Observations:

- The blue colour of CuSO_4 fades as Cu^{2+} ions are replaced by Fe^{2+} ions (pale green FeSO_4).
- Reddish-brown copper metal is deposited on the iron nail surface.

Why other options are wrong:

- Option A: There is a chemical change — the colour change and copper deposit confirm it.
- Option B: CuSO_4 does not oxidise iron in this context; it is the iron that displaces copper.
- Option C: This is not an electrochemical cell; there is no external circuit.

Final Answer: Iron displaces copper from copper sulphate — a displacement reaction. $\Rightarrow$ (D)

Answer: (D) [Go Back to Q14](#)



Q15.

Solution

Concept — Biodegradable vs Non-biodegradable: **Biodegradable** materials (paper, wood, food waste, cotton) are broken down by soil microorganisms (bacteria, fungi) into harmless substances. **Non-biodegradable** plastics (polythene, PVC, nylon) have strong synthetic polymer chains that soil microorganisms *cannot digest*, so they persist in the environment for hundreds to thousands of years, causing:

- Soil pollution (landfill overflow)
- Water body pollution (plastic islands in oceans)
- Wildlife harm (animals ingesting plastic)
- Microplastic contamination of food chains

Why other options are wrong:

- Option B: Most plastics are *insoluble* in water.
- Option C: Plastics do not release gases on soil contact under normal conditions.
- Option D: Plastics do not absorb soil nutrients.

Final Answer: Non-biodegradable plastics persist for centuries because microbes cannot break them down. ⇒ (A)

Answer: (A) [Go Back to Q15](#)

Q16.

Solution

Concept — Golgi Apparatus (Cell Organelle): The Golgi apparatus (discovered by Camillo Golgi) is a stack of flattened membrane-bound sacs (cisternae) found near the endoplasmic reticulum. Its functions are:

- (a) **Receives** proteins and lipids from the rough endoplasmic reticulum.
- (b) **Modifies, packages, and labels** them for dispatch.
- (c) **Sends** them to their destinations: cell membrane, lysosomes, or outside the cell (secretion).

It is often called the “post office” or “packaging centre” of the cell.

Why other options are wrong:

- Option A: Energy production (ATP) is the role of **mitochondria**.



- Option C: Containing DNA and controlling cell activities is the role of the **nucleus**.
- Option D: Photosynthesis is carried out by **chloroplasts** in plant cells.

Final Answer: Golgi apparatus packages and dispatches cellular materials. $\Rightarrow$

(B)

Answer: (B) [Go Back to Q16](#)

Q17.

Solution

Concept — Mitosis vs Meiosis:

Feature	Mitosis	Meiosis
Daughter cells	2	4
Chromosome no.	Same as parent (2n)	Half of parent (n)
Genetic identity	Identical to parent	Genetically varied
Purpose	Growth, repair, asexual reproduction	Sexual reproduction (gamete formation)
Where it occurs	All body (somatic) cells	Gonads (testes, ovaries)

Why other options are wrong:

- Option A: Reverses the count — mitosis gives 2 cells, meiosis gives 4.
- Option B: Reverses the location — mitosis occurs in body cells, meiosis in reproductive organs.
- Option D: Meiosis halves the chromosome number; the daughter cells do *not* have the same number as the parent cell.

Final Answer: Mitosis $\rightarrow$ 2 identical cells (2n); Meiosis $\rightarrow$ 4 varied cells (n). $\Rightarrow$

(C)

Answer: (C) [Go Back to Q17](#)



Q18.

Solution

Concept — Reproduction in Fungi (Rhizopus): *Rhizopus* is a zygomycete fungus. It reproduces asexually by **spore formation**:

- (a) Hyphae grow and form upright structures called **sporangiophores**.
- (b) The rounded tip (sporangium) fills with thousands of tiny **spores**.
- (c) When mature, the sporangium bursts, releasing spores into the air.
- (d) Spores land on a suitable moist substrate and germinate into new *Rhizopus* colonies.

This is why mould spreads rapidly — a single bread slice can release millions of spores.

Why other options are wrong:

- Option A: Binary fission is characteristic of bacteria (prokaryotes), not fungi.
- Option B: Budding is characteristic of yeasts (e.g. *Saccharomyces*), not *Rhizopus*.
- Option C: Fragmentation occurs in algae and some filamentous organisms; it is not the primary mode for *Rhizopus*.

Final Answer: *Rhizopus* reproduces by spore formation. ⇒ (D)

Answer: (D) [Go Back to Q18](#)

Q19.

Solution

Concept — Discovery of Penicillin: In 1928, Scottish bacteriologist **Alexander Fleming** left a Petri dish of *Staphylococcus* bacteria uncovered. A blue-green mould (*Penicillium notatum*) accidentally contaminated the plate and created a clear zone where bacteria were killed. Fleming identified the mould's antibacterial substance and named it **penicillin**. Later, Howard Florey and Ernst Chain purified it for medical use (1940s). All three received the Nobel Prize in Physiology or Medicine in 1945.

Why other options are wrong:

- Option B: *Aspergillus niger* is used to produce citric acid and enzymes, not penicillin.
- Option C: *Mucor hiemalis* is a common soil mould not associated with penicillin.



- Option D: *Saccharomyces cerevisiae* is baker's yeast used for fermentation and baking.

Final Answer: Penicillin was derived from *Penicillium notatum*. $\Rightarrow$ (A)

Answer: (A) [Go Back to Q19](#)

Q20.

Solution

Concept — External Fertilization: In frogs, fertilization is **external** — it occurs *outside* the bodies of both parents, in water. During mating (**amplexus**), the female releases hundreds of eggs into water and the male simultaneously releases sperm over them. The sperm swim through water to fertilise the eggs, which develop into tadpoles that later metamorphose into adult frogs. External fertilization requires a watery environment to prevent the gametes from drying out.

Life cycle stages: Egg $\rightarrow$ Tadpole (aquatic, gills) $\rightarrow$ Froglet (develops legs, loses tail) $\rightarrow$ Adult frog (lungs + moist skin for breathing).

Why other options are wrong:

- Option A: Internal fertilization (e.g. in mammals, reptiles) occurs inside the female body.
- Option C & D: Frogs do not have brood pouches or internal fertilization in males.

Final Answer: Female lays eggs in water; sperm is shed over them; fertilization occurs in water. $\Rightarrow$ (B)

Answer: (B) [Go Back to Q20](#)

Q21.

Solution

Concept — Bird Migration: Migration is the seasonal movement of animals from one region to another in search of food, suitable climate, or breeding grounds. The **Siberian crane** (*Leucogeranus leucogeranus*) breeds in Siberia and migrates to warmer regions in winter. The **Keoladeo Ghana National Park** (also known as **Bharatpur Bird Sanctuary**) in Rajasthan was one of the world's most important wintering sites for Siberian cranes. It is a UNESCO World Heritage Site and attracts hundreds of migratory bird species annually.



Why other options are wrong:

- Option A: Kaziranga is famous for Indian one-horned rhinoceros, not Siberian cranes.
- Option B: Sundarbans is famous for Royal Bengal tigers and mangrove forests.
- Option D: Periyar is famous for elephants; it is in Kerala and not a primary destination for Siberian cranes.

Final Answer: Siberian cranes winter at Keoladeo Ghana National Park, Bharatpur, Rajasthan. ⇒ (C)

Answer: (C) [Go Back to Q21](#)

Q22.

Solution

Concept — Grain Storage and Pest Control: Harvested food grains are stored in **silos** and **granaries**. Traditional eco-friendly methods include:

- **Neem leaves:** *Azadirachta indica* leaves contain **azadirachtin**, a natural insecticide and insect repellent. Dried neem leaves mixed with grains keep weevils and other storage pests away without chemical residues.
- **Sun drying:** Reducing moisture content discourages fungal growth.
- **Airtight storage:** Reduces oxygen, preventing insect survival.

Why other options are wrong:

- Option B: DDT is a banned chemical pesticide; it is toxic, persistent, and not eco-friendly.
- Option C: Synthetic preservatives are chemical, not eco-friendly.
- Option D: Sunlight exposure alone for 48 hours is not sufficient pest control; it is used for drying only.

Final Answer: Dried neem leaves are a traditional eco-friendly grain protectant. ⇒ (A)

Answer: (A) [Go Back to Q22](#)



Q23.

Solution

Concept — Constellations (Orion): A **constellation** is a group of stars that appears to form a recognisable pattern when viewed from Earth. **Orion** (the Hunter) is one of the most prominent and recognisable constellations, visible from November to March in India. Key features of Orion:

- **7 prominent stars:** Betelgeuse (red giant, upper-left shoulder), Bellatrix (upper-right shoulder), Rigel (lower-right, brightest star in Orion), Saiph (lower-left), and three belt stars — Alnitak, Alnilam, Mintaka.
- The **three belt stars** in a straight diagonal line are the most recognisable feature.

Ursa Major (the Great Bear) is a different constellation, visible in the northern sky, famous for the Saptarishi (Big Dipper) asterism.

Why other options are wrong:

- Option A: Orion is visible from both hemispheres; and Ursa Major, not Orion, is called the Great Bear.
- Option B: Orion has 7 (not 3) prominent stars; 3 form just the belt.
- Option C: “Bear” and “northern sky” describe Ursa Major, not Orion.

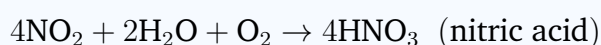
Final Answer: The constellation is Orion, identified by 7 stars including a three-star belt. $\Rightarrow$ (D)

Answer: (D) [Go Back to Q23](#)

Q24.

Solution

Concept — Acid Rain (Causes and Chemistry): Normal rainwater is slightly acidic ($\text{pH} \approx 5.6$) due to dissolved CO_2 forming weak carbonic acid. **Acid rain** (pH below 5.6, often 4–4.5) is caused mainly by:



Sources of SO_2 : coal-burning power plants, industries, volcanoes. Sources of NO_x : vehicle exhaust, thermal power plants.

Why other options are wrong:



- Option A: CO_2 causes the slight natural acidity of rain and contributes to ocean acidification, but it is *not* the primary cause of *acid* rain.
- Option C: Ozone is in the stratosphere; it does not react with rainwater to cause acid rain.
- Option D: Ammonia is alkaline ($\text{NH}_3 + \text{H}_2\text{O}$ forms NH_4OH), so it would make rain *less* acidic, not more.

Final Answer: Acid rain is caused by SO_2 and NO_x from industrial/vehicle emissions. $\Rightarrow$ (B)

Answer: (B) [Go Back to Q24](#)

Q25.

Solution

Concept — Endocrine Glands and Hormones: The endocrine system uses chemical messengers (hormones) secreted directly into the blood. Key glands and their hormones:

Gland	Hormone	Function
Pituitary	Growth hormone (GH)	Controls body growth; master gland
Thyroid	Thyroxine	Regulates metabolic rate
Adrenal	Adrenaline	“Fight or flight” emergency response
Pancreas (islets)	Insulin / Glucagon	Regulates blood glucose level

Why other options are wrong:

- Option A: Insulin is secreted by the *pancreas* (beta cells of islets of Langerhans), not the thyroid.
- Option B: Thyroxine is secreted by the *thyroid* gland, not the adrenal gland.
- Option D: Adrenaline is secreted by the *adrenal* gland, not the pancreas.

Final Answer: Pituitary gland secretes Growth hormone for body growth (master gland). $\Rightarrow$ (C)

Answer: (C) [Go Back to Q25](#)



Answer Key

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

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