# UHS MDCAT 2024, Paper A — Solved Past Paper

**Body:** University of Health Sciences (UHS), Lahore · **Post:** MDCAT (Medical & Dental College Admission Test), Paper A, Punjab · **Year:** 2024 · **Questions:** 200 in the original paper — **193 solved and verified**, 5 excluded as defective, 2 officially deleted · **Price:** Free

> **How to use this paper:** each question shows the stem, the four options, and the correct answer. Click “Why each option?” under a question to see all four options explained — one question teaches four topics. Answers are as of the 2024 sitting.

**Source note:** Primary source: mdcatpapers.com transcription of UHS MDCAT 2024 Paper A (accessed 31 Oct 2026), transcribed word for word, 172 questions; the tail (printed 179–200) was transcribed from the facsimile 8 Nov 2026 (educationinkarachi.net re-typeset reproduction, ReportLab, 10 Sep 2026). Every answer was checked by worked derivation or reference fact, independently of the transcription's marked answer. 5 questions are DEFECTIVE-excluded by the assistant's decision under the owner's 8 Nov 2026 delegation (37be precedent): Q6, Q10, Q170, Q179 (printed 185), Q193 (printed 199) — see the excluded list. 2 questions (printed 2, 18) are officially deleted by UHS. Gap-fills printed 106, 108, 112 were folded into the file at their printed positions 8 Nov 2026 and VERIFIED from independent reference facts; printed 110 was recovered from the facsimile (7 Nov 2026 addendum) and is NOT in the reviewed .md file. Numbering follows the file: transcription order Q1–Q194, printed numbers shown where the stem carries one; do NOT renumber.

## Question Q1 Biology

Example of viruses having a polyhedral capsid that is with 252 capsomeres is:

- A. Adenovirus ✓ **Correct answer**
- B. Tobacco Mosaic Virus

- D. Bacteriophage

**A.** Adenoviruses have a large icosahedral (polyhedral) capsid built from exactly 252 capsomeres (240 hexons + 12 pentons); correct.

**B.** TMV is a rod-shaped virus with a HELICAL capsid, not a polyhedral one.

**C.** Influenza is an enveloped virus with helical nucleocapsids inside the envelope, not a naked polyhedral capsid.

**D.** A typical phage has a head-and-tail structure (icosahedral head plus tail), not a simple 252-capsomere polyhedral capsid.

## Question Q2 Biology

The causative organism of measles is

- A. Poxivirus
- B. Parvovirus
- C. Picornovirus
- D. Paramyxovirus ✓ **Correct answer**

**A.** Poxviruses cause smallpox, cowpox and molluscum, not measles (and the family name is spelled Poxvirus).

**B.** Parvoviruses cause fifth disease (parvovirus B19) and animal diseases, not measles.

**C.** Picornaviruses include polio, rhino and hepatitis A viruses, not measles (spelled Picornavirus).

**D.** Measles virus is a morbillivirus in the paramyxovirus family; correct.

## Question Q3 Biology

In the life cycle of a bacteriophage, the lysozymes are required in which of the following

ection process?

- A. Genome injection
- B. Penetration ✓ **Correct answer**
- C. Replication
- D. Adsorption

**A.** Injection follows the weakening of the wall; the enzyme's work of breaching the wall belongs to the penetration step, not to injection itself.

**B.** Phage lysozyme (a lysin) digests the peptidoglycan wall so the phage nucleic acid can enter; correct. The stem prints "lysozymes" for the phage lysin/lysozyme.

**C.** Replication copies the phage genome inside the cell; no wall-digesting enzyme is needed for it.

**D.** Adsorption is the initial tail-fibre binding to the cell surface, before any wall digestion.

## Question Q4 Biology

_____ is transmitted through infected blood and hypodermic syringes.

- A. HIV ✓ **Correct answer**
- B. Influenza Virus
- C. Morbilli Virus (Measles)
- D. Vibrio Cholerae (Cholera)

**A.** A blood-borne virus, transmitted through infected blood and shared/contaminated needles and syringes; correct.

**B.** Spread mainly by respiratory droplets, not by blood or syringes.

**C.** Spread by respiratory droplets and airborne particles, not by blood.

**D.** A bacterium (not a virus) spread by the faecal–oral route through contaminated water/food, not by blood.

## Q5 Biology

In Calvin cycle CO2 reacts with RuBP to produce

- A. 3-PGA
- B. G3P
- C. 6-Carbon unstable intermediate ✓ **Correct answer**
- D. 1,3 bisphosphglycerate

**A.** 3-phosphoglycerate is what the unstable intermediate immediately splits into (two molecules of it); it is the first STABLE product, not the immediate product of fixation.

**B.** Glyceraldehyde-3-phosphate is produced later, after reduction of 1,3-bisphosphoglycerate; it is not the direct fixation product.

**C.** $CO_2$ + RuBP (5C) first forms a 6-carbon compound that is so unstable it splits at once; correct as the immediate product.

**D.** Formed later by phosphorylation of 3-PGA, using ATP; not the fixation product.

## Question Q7 Biology

In the journey of electrons from photosystem II to photosystem I plastocyanine is reduced by

- A. Plastoquinone
- B. Cytochrome complex ✓ **Correct answer**
- C. P700
- D. Primary electron acceptor of PSI

**A.** Plastoquinone carries electrons from PSII to the cytochrome $b_6f$ complex, earlier in the chain; it does not reduce plastocyanin directly.

**B.** The cytochrome $b_6f$ complex passes electrons to plastocyanin, reducing it (plastocyanin is oxidised again when it donates to P700); correct.

e PS I reaction centre that RECEIVES electrons from plastocyanin; it does not reduce it.

**D.** This acceptor takes electrons FROM excited P700, downstream of plastocyanin; it does not reduce plastocyanin.

## Question Q8 Biology

Enzyme NADP reductase is responsible for:

- A. Reducing NADP+ ✓ **Correct answer**
- B. Oxidizing NADP +
- C. Reducing Ferredoxin
- D. Reducing P700

**A.** Ferredoxin–$NADP^+$ reductase transfers electrons from reduced ferredoxin to $NADP^+$, forming NADPH; correct.

**B.** The opposite of what happens: $NADP^+$ gains electrons (is reduced), it is not oxidised.

**C.** Ferredoxin is reduced EARLIER, by PS I; the reductase uses already-reduced ferredoxin as its electron donor.

**D.** P700 is reduced by plastocyanin, not by NADP reductase.

## Question Q9 Biology

The PS II during light reactions receives electrons from splitting of

- A. Water ✓ **Correct answer**
- B. Plastoquinone
- C. Plastocyanin
- D. Ferridoxin

**A.** Photolysis splits water, releasing electrons that replace those lost by PS II, plus protons and oxygen; correct.

carrier that takes electrons AWAY from PS II toward the cytochrome complex; it does not supply them.

**C.** A carrier between the cytochrome complex and PS I, downstream of PS II.

**D.** Ferredoxin (spelled ferredoxin) acts at the PS I end of the chain, accepting electrons from PS I; it does not feed PS II.

## Question Q11 Biology

What is the percentage of H2O in bone cells?

- A. 70 %
- B. 20 % ✓ **Correct answer**
- C. 99 %
- D. 60 %

**A.** Roughly the water content of soft tissues and of the body as a whole, not of mineralised bone.

**B.** The textbook figure this paper uses for the water content of bone; the keyed answer, resting on that convention only (bone water varies with age, site and measurement, roughly 10–25%).

**C.** The order of water in body fluids such as plasma, not bone.

**D.** Closer to whole-body water content, far too high for heavily mineralised bone.

## Question Q12 Biology

When glycerol reacts with fatty acid, which type of chemical bond will form?

- A. Ester Bond ✓ **Correct answer**
- B. Ether Linkage
- C. Hydrogen Bond
- D. Ionic Bond

of glycerol and the –COOH of a fatty acid condense to an ester linkage (with loss of water), forming a triglyceride; correct.

**B.** An ether is a C–O–C link between two carbon groups without the carbonyl; not what forms here.

**C.** A weak attraction between molecules, not the covalent bond formed in esterification.

**D.** No ions are involved; glycerol and fatty acids form a covalent ester bond.

## Question Q13 Biology

Polysaccharides in plants are synthesized by the process of

- A. Hydrolysis
- B. Oxidation
- C. Condensation ✓ **Correct answer**
- D. Glycolysis

**A.** Hydrolysis BREAKS polysaccharides apart by adding water; it is the reverse of synthesis.

**B.** Oxidation removes electrons/hydrogen (as in respiration); it does not join sugar units.

**C.** Monosaccharides join by condensation (dehydration) reactions, losing water to form glycosidic bonds; correct.

**D.** The breakdown of glucose to pyruvate in respiration; it builds no polysaccharide.

## Question Q14 Biology

Which of the following process Is involved in breakdown of protein into Amino acids?

- A. Condensation
- B. Hydrolysis ✓ **Correct answer**
- C. Glycolysis
- D. Fixation

tion BUILDS peptide bonds (losing water); it is the reverse of breakdown.

**B.** Peptide bonds are cleaved by adding water, digesting protein to amino acids; correct.

**C.** Breaks down glucose, not protein.

**D.** Fixation (e.g. nitrogen or carbon fixation) incorporates a gas into a compound; it does not digest protein.

## Question Q15 Biology

The hydrophilic end of phospholplid molecule is polar because of the presence of

- A. Glycerol
- B. Amine group
- C. Fatty Acid
- D. Phosphate group ✓ **Correct answer**

**A.** Glycerol is the backbone joining head and tails; it is not what makes the head polar.

**B.** Some phospholipids carry a nitrogenous base (e.g. choline) attached to the phosphate, but the polar, water-attracting character is conferred principally by the phosphate itself.

**C.** The fatty-acid tails are the HYDROPHOBIC (non-polar) part of the molecule, the opposite of the hydrophilic end.

**D.** The charged phosphate in the head group is polar and hydrophilic; correct. The stem prints "phospholplid" for phospholipid.

## Question Q16 Biology

Which monosaccharide will from a gluco pyranose ring in solution?

- A. Fructose
- B. Glucose ✓ **Correct answer**
- C. Ribose

**A.** In solution fructose mainly forms a five-membered FURANOSE ring (fructofuranose), not a pyranose ring.

**B.** Glucose cyclises to a stable six-membered pyranose ring (glucopyranose) in solution; correct. The stem prints "will from a gluco pyranose ring" for "will form a glucopyranose ring".

**C.** A five-carbon sugar; it forms a five-membered furanose ring, not a six-membered pyranose.

**D.** Also a pentose, forming a furanose ring; it does not form a pyranose ring.

## Question Q17 Biology

Which of the following is the function of Golgi Complex?

- A. Intracellular digestion
- B. Autophagy
- C. Autolysis
- D. Processing of cell secretions ✓ **Correct answer**

**A.** Digestion inside the cell is the lysosomes' job, using acid hydrolases.

**B.** The cell's self-digestion of its own worn-out parts, carried out with lysosomes, not the Golgi's defining function.

**C.** Self-destruction of a cell by its own lysosomal enzymes; not a Golgi function.

**D.** The Golgi modifies, sorts, concentrates and packages proteins and lipids into vesicles for secretion; correct.

## Question Q18 Biology

The nucleus takes dyes due to the presence of

- chromatin ✓ **Correct answer**
- B. Lipid
- C. Metal ions
- D. Thylakoids

**A.** DNA and its associated proteins (chromatin) bind basic dyes strongly, which is why the nucleus stains darkly; correct.

**B.** Lipids stain with fat stains (e.g. Sudan), not the nuclear dyes, and the nucleus is not lipid-rich.

**C.** Metal ions are not the basis of nuclear staining.

**D.** Thylakoids are the photosynthetic membranes of chloroplasts; animal nuclei have none, and plant nuclei do not stain because of them.

## Question Q19 Biology

The organelles only found at seeding stage in oil seed plants are

- A. Peroxiosomes
- B. Glyoxisomes ✓ **Correct answer**
- C. Microbodies
- D. Vacuoles

**A.** Peroxisomes (spelled peroxisomes) occur widely in plant and animal cells at all stages, not only in germinating oil seeds.

**B.** Specialised peroxisomes (glyoxysomes) that appear in germinating oil-storing seeds and convert stored fats into sugars via the glyoxylate cycle; correct.

**C.** The general family name covering both peroxisomes and glyoxysomes; it is not the specific seed-stage organelle asked for.

**D.** Present in plant cells generally, at all stages, not only in germinating seeds.

# Q20 Biology

Posterior lobe of pituitary produce

- A. Antidiuretic Hormone (ADH) ✓ **Correct answer**
- B. Thyroid Stimulating Hormone (TSH)
- C. Adreno Corticufrotic Hormone (ACH)
- D. Follicle Stimulating Hormone (FSH)

**A.** ADH (vasopressin) is released by the posterior pituitary; correct among the options. Defect flagged: the posterior lobe does not "produce" ADH — it is synthesised in the hypothalamus and stored/released by the posterior lobe.

**B.** An ANTERIOR pituitary hormone.

**C.** A misspelling of adrenocorticotropic hormone (ACTH), also an anterior pituitary hormone.

**D.** An anterior pituitary gonadotropin, not posterior.

# Question Q21 Biology

In human myelinated fibers nerve impulse travels at _____ meters per second.

- A. 100-120 ✓ **Correct answer**
- B. 130-150
- C. 160-180
- D. 190-210

**A.** The standard textbook maximum for large myelinated human fibres (saltatory conduction), up to about 120 m/s; correct.

**B.** Above the fastest recorded human conduction velocities.

**C.** Far above human nerve conduction speeds.

**D.** No human nerve fibre conducts this fast.

# Q22 Biology

Nissl's granules are groups of

- A. Mesosomes
- B. Lysosomes
- C. Ribosomes ✓ **Correct answer**
- D. Chromosome

**A.** Bacterial membrane folds (and now regarded as preparation artifacts); they do not occur in neurons.

**B.** Digestive sacs scattered in the cytoplasm; they are not what Nissl bodies are.

**C.** Nissl bodies are clumps of rough endoplasmic reticulum studded with ribosomes in the neuron cell body; "ribosomes" is the keyed component; correct.

**D.** Chromosomes are nuclear structures; Nissl granules are cytoplasmic.

# Question Q23 Biology

During non-conducting state, the neuron membrane is permeable to efflux of

- A. K+ ✓ **Correct answer**
- B. Na+
- C. Ca+
- D. Cl-

**A.** At rest, potassium leak channels are open, so the membrane is most permeable to $K^+$ leaving the cell, setting the resting potential; correct.

**B.** Resting $Na^+$ permeability is very low; $Na^+$ rushes IN only when voltage-gated channels open during depolarisation.

**C.** Calcium ($Ca^{2+}$) permeability at rest is negligible; $Ca^{2+}$ entry matters at the presynaptic terminal during transmission.

contributes little to the resting efflux; it is not the ion whose efflux defines the resting state.

## Question Q24 Biology

Which of the following neurotransmitters is lying outside the central nervous system?

- A. Acetylcholine ✓ **Correct answer**
- B. Endorphins
- C. Dopamine
- D. Gamma - aminobutyric acid

**A.** The classic PERIPHERAL transmitter: released at neuromuscular junctions and by parasympathetic endings; the keyed answer, resting on that textbook convention.

**B.** Opioid peptides acting mainly in the brain and spinal cord (central), though also present peripherally.

**C.** A central transmitter of the brain's reward and motor pathways; also used peripherally, but its defining role here is central.

**D.** GABA, the brain's main inhibitory transmitter; overwhelmingly central. Flagged: the wording is loose — all four transmitters occur both centrally and peripherally; acetylcholine is keyed because it is THE peripheral transmitter of the somatic/parasympathetic systems.

## Question Q25 Biology

Depolarization during conduction of nerve impulse is due to

- A. Inward movement of Na+ ✓ **Correct answer**
- B. Inward movement of K+
- C. Outward movement of K+
- D. Outward movement of Na+

ated $Na^+$ channels open and $Na^+$ floods in, making the inside less negative; correct.

**B.** $K^+$ does not move inward during depolarisation; it moves OUT during repolarisation.

**C.** Outward $K^+$ flow restores the resting potential (repolarisation), the opposite phase.

**D.** $Na^+$ is pumped out AFTER the impulse ($Na^+/K^+$ pump); outward $Na^+$ movement does not cause depolarisation.

## Question Q26 Biology

Which of the following is NOT a feature of Autonomic Nervous System?

- A. Regulate response of visceral organs
- B. Regulate response of skeletal muscles ✓ **Correct answer**
- C. Regulate response of glands
- D. Regulate response of smooth muscles

**A.** The ANS does regulate the heart, gut and other viscera; a true feature.

**B.** Skeletal muscle is under the SOMATIC nervous system (voluntary control); this is not an ANS feature, which is what the question asks; correct.

**C.** The ANS controls salivary, sweat and other glands; a true feature.

**D.** Smooth muscle of blood vessels, gut and airways is ANS-controlled; a true feature.

## Question Q27 Biology

Taste receptor is an example of

- A. Mechano receptors
- B. Nociceptors
- C. Photo receptors
- D. Chemo receptors ✓ **Correct answer**

echanical stimuli (touch, pressure, vibration); taste is chemical, not mechanical.

**B.** Pain receptors; they detect harmful stimuli, not flavours.

**C.** Detect light (rods and cones of the eye); unrelated to taste.

**D.** Detect dissolved chemicals in food; taste buds are chemoreceptors; correct.

## Question Q28 Biology

Which of the following belongs to chordates

- A. Spider
- B. Earthworm
- C. Trout Fish ✓ **Correct answer**
- D. Star Fish

**A.** An arachnid arthropod with an exoskeleton and no notochord; not a chordate.

**B.** An annelid worm; no notochord, dorsal nerve cord or pharyngeal slits.

**C.** A vertebrate fish, possessing a notochord (in development), dorsal nerve cord and vertebral column; a chordate; correct.

**D.** A starfish (echinoderm); radially symmetrical as an adult with no chordate features.

## Question Q29 Biology

Which of the following statement is incorrect regarding rate of enzymatic action

- A. Increase in enzyme concentration increases the rate
- B. Increase in enzyme concentration reduces the rate ✓ **Correct answer**
- C. All enzymes work at their maximum rate at optimum temperature
- D. All enzymes work at their maximum rate at optimum pH

**A.** True (with substrate in excess): more enzyme means more active sites and a faster rate.

ing enzyme concentration does not slow the reaction; this is the INCORRECT statement the question asks for; correct.

**C.** True as a generalisation: each enzyme has an optimum temperature at which its rate peaks.

**D.** True as a generalisation: each enzyme has an optimum pH at which its rate peaks.

## Question Q30 Biology

Induced fit model of enzyme activity suggests that an enzyme

- A. Cannot modify its active sites
- B. Can bind to a single substrate
- C. Can catalyze related reaction ✓ **Correct answer**
- D. Usually belongs to non-regulatory enzyme

**A.** The opposite of induced fit: the active site FLEXES and moulds itself around the substrate.

**B.** Binding only one substrate is the rigid lock-and-key picture, not the point of induced fit.

**C.** Because the flexible site can adjust to closely related substrates, the enzyme can act on a family of similar substrates/reactions; correct.

**D.** Induced fit says nothing about whether an enzyme is regulatory; regulatory/allosteric behaviour is a separate property.

## Question Q31 Biology

Chromosomal abnormality in Turner syndrome is represented by?

- A. XXX
- B. XYY
- C. XO ✓ **Correct answer**
- D. XXY

yndrome (47,XXX), a different condition in females with an extra X.

**B.** Jacobs (XYY) syndrome in males, an extra Y chromosome, not Turner syndrome.

**C.** A single X chromosome with no second sex chromosome (45,X); the Turner karyotype; correct.

**D.** Klinefelter syndrome (47,XXY) in males, not Turner syndrome.

## Question Q32 Biology

The change in frequency of alleles at a locus that occurs by chance is known as:

- A. Mutation
- B. Genetic Drift ✓ **Correct answer**
- C. Non Random mating
- D. Speciation

**A.** Mutation CREATES new alleles; it is not the chance change in the frequency of alleles already present.

**B.** Random sampling of alleles from one generation to the next, changing allele frequencies by chance alone, strongest in small populations; correct.

**C.** Mating preferences change GENOTYPE frequencies, but not allele frequencies, and the change is not by chance.

**D.** The formation of a new species, an outcome of accumulated evolutionary change, not the chance frequency change itself.

## Question Q33 Biology

Identify the correct pair of vestigial organs:

- A. Ear Muscles & Vermiform appendix ✓ **Correct answer**
- B. Heart & Liver

Muscles & Liver

- D. Vermiform appendix & Heart

**A.** Both are classic human vestigial structures: the ear muscles that once moved the ears, and the appendix, remnant of a larger caecum; correct.

**B.** Both are large, fully functional, essential organs; neither is vestigial.

**C.** The ear muscles are vestigial but the liver is fully functional, so the pair fails.

**D.** The appendix is vestigial but the heart is fully functional, so the pair fails.

## Question Q34 Biology

Which of the following increases variation within a gene pool?

- A. Chromosome inversion
- B. Crossing over
- C. Gene mutation ✓ **Correct answer**
- D. Random fusion of gametes

**A.** An inversion rearranges the order of existing genes on a chromosome; it creates no new alleles.

**B.** Crossing over reshuffles existing alleles into new COMBINATIONS, increasing variation among individuals, but it creates no new allele in the gene pool.

**C.** Mutation creates entirely NEW alleles, the ultimate source of new variation in a gene pool; the keyed answer, resting on that textbook distinction.

**D.** Random fertilisation reshuffles existing alleles into new genotypes; like crossing over, it adds no new allele. Flagged: B and D do increase variation in the offspring; C is keyed because it is the only option that adds new genetic material to the pool.

# Q35 Biology

Which of the following statements about natural selection is not true?

- A. It affects variations that are heritable
- B. It is selected by a breeder ✓ **Correct answer**
- C. It can improve the adaptation of species
- D. It is regional in nature

**A.** True: only heritable variation can be passed on and accumulated by selection.

**B.** False for NATURAL selection: selection by a breeder is ARTIFICIAL selection; nature, not a breeder, does the selecting; correct as the untrue statement.

**C.** True: selection favours variants better fitted to their environment, improving adaptation over generations.

**D.** True: selective pressures differ from place to place, so selection acts differently in different regions.

# Question Q36 Biology

The formula calculating the frequency of genotypes and alleles in a population gene pool is known as:

- A. Hardy-Weinberg Equation ✓ **Correct answer**
- B. Lamarck Equation
- C. Darwin Equation
- D. James Hutton Equation

**A.** $p^2 + 2pq + q^2 = 1$ (genotypes) and $p + q = 1$ (alleles) give genotype and allele frequencies in a population; correct.

**B.** Lamarck proposed no population-genetics equation; his theory concerned use/disuse and inheritance of acquired characters.

oposed natural selection, not a frequency equation.

**D.** Hutton was a geologist (uniformitarianism); he proposed no genetics equation.

## Question Q37 Biology

The idea of inheritance of acquired characteristics was presented by:

- A. Jean Baptist Lamarck ✓ **Correct answer**
- B. Charles Darwin
- C. Thomas Malthus
- D. Alfred Wallace

**A.** Lamarck proposed that characteristics acquired during an organism's lifetime (by use or disuse) are inherited by its offspring; correct.

**B.** Darwin proposed natural selection acting on heritable variation, explicitly distinct from Lamarck's mechanism.

**C.** Malthus wrote on population growth outstripping food supply; his essay influenced Darwin but proposed no inheritance theory.

**D.** Wallace independently conceived natural selection alongside Darwin; he did not present Lamarck's acquired-characteristics idea.

## Question Q38 Biology

According to endosymbiosis theory, flagella may have derived by the ingestion of prokaryotes similar to

- A. Amoeboid prokaryote
- B. Aerobic bacterium
- C. Spirochete ✓ **Correct answer**
- D. Spirillum

**A.** Amoeboid movement (pseudopodia) is not the model for flagellar origin in the

**B.** In endosymbiosis, an engulfed aerobic bacterium is the proposed origin of the MITOCHONDRION, not of flagella.

**C.** Margulis's endosymbiotic hypothesis proposes that flagella/undulipodia arose from ingested spirochete-like bacteria, whose corkscrew motility suited a propulsive role; the keyed answer, resting on that hypothesis.

**D.** Spirilla are rigid spiral bacteria; the hypothesis names the flexible, motile spirochetes, not spirilla. Flagged: this is a hypothesis, not an established fact; modern evidence does not support a spirochete origin for eukaryotic flagella.

## Question Q39 Biology

Insulin converts glucose into

- A. Vitamins
- B. Minerals
- C. Lipids ✓ **Correct answer**
- D. Cortisone

**A.** Insulin does not synthesise vitamins; vitamins come from the diet or are made by other pathways.

**B.** Insulin does not convert glucose into minerals; minerals are inorganic elements, not made from glucose.

**C.** Insulin promotes lipogenesis: excess glucose is converted to fatty acids and stored as fat; correct among the options (insulin's other main storage route, glycogen synthesis, is not offered).

**D.** Cortisone is a steroid hormone made from cholesterol in the adrenal cortex, not from glucose under insulin's action.

# Q40 Biology

About 70% of the carbon dioxide is carried in blood as:

- A. Carbonate
- B. Bicarbonate ✓ **Correct answer**
- C. Tricarbonate
- D. Carbonic anhydrase

**A.** Carbonate ($CO_3^{2-}$) is not the transport form; at blood pH, $CO_2$ is carried as bicarbonate ($HCO_3^-$), not carbonate.

**B.** About 70% of blood $CO_2$ travels as bicarbonate ions dissolved in the plasma; correct (the textbook figure; the remainder travels as carbamino compounds and dissolved $CO_2$).

**C.** No such transport form exists in blood.

**D.** The ENZYME (in red cells) that catalyses $CO_2 + H_2O \rightleftharpoons$ carbonic acid; it is a catalyst, not a transport form of $CO_2$.

# Question Q41 Biology

Range of normal total lung capacity in humans is

- A. 5-6 liter ✓ **Correct answer**
- B. 8-9 liter
- C. 10-11 liter
- D. 12-13 liter

**A.** The normal total lung capacity of a healthy adult is about 5–6 litres; correct.

**B.** Well above the normal adult range.

**C.** Roughly double the normal capacity; no healthy human lung holds this much.

**D.** Far outside the human range.

# Q42 Biology

Respiration in Pseudomonas bacteria is

- A. Aerobic ✓ **Correct answer**
- B. Anaerobic
- C. Facultative
- D. Microaerophili

**A.** Pseudomonas species are classically obligate aerobes, requiring oxygen for respiration; correct as the textbook answer (P. aeruginosa can also respire anaerobically using nitrate as an electron acceptor, but it is not classified as anaerobic or facultative in the paper's convention).

**B.** Pseudomonas does not live by fermentation without oxygen as its normal mode.

**C.** Facultative organisms switch readily between aerobic and anaerobic life; Pseudomonas is not classed this way in the textbook.

**D.** Microaerophiles need LOW oxygen levels; Pseudomonas grows in normal air, not low oxygen.

# Question Q43 Biology

Autotrophic mode of nutrition in organism depends upon

- A. Saprotrophic mode
- B. Parasitic mode
- C. Photosynthesis mode ✓ **Correct answer**
- D. Obligate mode

**A.** Feeding on dead organic matter; a HETEROTROPHIC mode, the opposite of autotrophy.

**B.** Feeding on a living host; also heterotrophic.

**C.** Autotrophs make their own food using light energy (photosynthesis, or chemosynthesis

teria), the photosynthetic mode is the autotrophic mode offered; correct.

**D.** "Obligate" describes a requirement (e.g. obligate parasite/aerobe), not a mode of nutrition.

## Question Q44 Biology

Prokaryotic cells lack

- A. Mesosomes
- B. Ribosomes
- C. Storage bodies
- D. Membrane bound organelles ✓ **Correct answer**

**A.** Mesosome-like membrane folds are described in bacteria, so bacteria do not "lack" them in the textbook picture.

**B.** Prokaryotes HAVE ribosomes (70S); protein synthesis depends on them.

**C.** Bacteria commonly carry storage granules (glycogen, polyphosphate, PHB); they do not lack them.

**D.** Prokaryotes have no nucleus, mitochondria, endoplasmic reticulum or other membrane-bound organelles; correct.

## Question Q45 Biology

Bacterial genome becomes diploid:

- A. After fertilization of gametes
- B. Before spore formation
- C. During binary fission ✓ **Correct answer**
- D. After binary fission

**A.** Bacteria have no gametes and no fertilisation; this option cannot apply.

nation (sporulation) is not preceded by a diploid genome stage in the sense asked.

**C.** The keyed answer: while the chromosome replicates and before the cell divides, the cell transiently holds two chromosome copies; flagged because bacteria are normally described as HAPLOID, and "diploid" here means only this transient two-copy state during division, not a true diploid life stage.

**D.** After division each daughter cell holds one copy again (haploid); the two-copy state has ended.

## Question Q46 Biology

One of the following is CORRECT regarding flagella?

- A. Made up of macrofilaments
- B. Contains centriole
- C. Originates from basal bodies ✓ **Correct answer**
- D. They are immotile

**A.** "Macrofilaments" is not the standard description of flagellar structure (bacterial flagella are flagellin filaments; eukaryotic flagella are microtubule-based axonemes).

**B.** A flagellum does not contain a centriole; the basal body at its base is centriole-LIKE in structure but is not a centriole inside the flagellum.

**C.** Flagella grow from basal bodies (kinetosomes) at their base, in both bacterial and eukaryotic forms; correct.

**D.** Flagella are by definition motile organelles of propulsion; immotile is false.

## Question Q47 Biology

Which option is CORRECT about endospore?

- A. Has a short dormant period

tains moisture for survival

- C. Metabolically actively
- D. Endures extreme condition ✓ **Correct answer**

**A.** Endospores can remain dormant for very long periods (years, even centuries in the textbook account); dormancy is long, not short.

**B.** Endospores are highly DEHYDRATED; their low water content is part of what makes them resistant.

**C.** Endospores are metabolically dormant/inactive; activity resumes only on germination.

**D.** Endospores survive heat, desiccation, radiation and chemicals that kill vegetative cells; correct.

## Question Q48 Biology

Bacteria divide at exponential rate during which growth phase?

- A. Lag
- B. Log ✓ **Correct answer**
- C. Stationary
- D. Decline

**A.** In the lag phase cells adapt to the medium and grow in size but do not yet divide rapidly.

**B.** The logarithmic (exponential) phase: cells divide at a constant exponential rate, doubling at regular intervals; correct.

**C.** Growth rate equals death rate as nutrients run out; numbers stay roughly constant, not exponential.

**D.** The death phase: numbers fall as cells die faster than they divide.

# Q49 Biology

Mesosomes are the invagination of bacterial cell structure

- A. Cell wall
- B. Cell membrane ✓ **Correct answer**
- C. Plasmid
- D. Cysts

**A.** The rigid peptidoglycan wall outside the membrane does not invaginate to form mesosomes.

**B.** In the textbook picture, mesosomes are inward folds (invaginations) of the plasma membrane, said to aid respiration and division; correct as the paper's convention. Flagged in the explanation: modern electron microscopy regards classic mesosomes largely as preparation artifacts rather than real permanent structures, but the paper follows the textbook account.

**C.** A plasmid is a small circular DNA molecule, not a membrane fold.

**D.** Cysts are dormant resting forms of some organisms, unrelated to membrane invagination.

# Question Q50 Biology

Female reproductive system consists all of the following EXCEPT

- A. Ovaries
- B. Oviduct
- C. Cervix
- D. Seminiferous tubules ✓ **Correct answer**

**A.** The female gonads, producing eggs and hormones; part of the female system, so not the exception.

**B.** The fallopian tube carrying the egg from ovary to uterus; part of the female system.

of the uterus opening into the vagina; part of the female system.

**D.** The sperm-producing tubules of the TESTES, i.e. the male system; the exception; correct.

## Question Q51 Biology

Which one of the following hormone is responsible for the labor pains in human female at the time of birth of baby?

- A. Estrogen
- B. Progesterone
- C. Oxytocin ✓ **Correct answer**
- D. Corticosteroid

**A.** Oestrogen rises near term and sensitises the uterus, but it does not itself drive the contraction bursts of labour.

**B.** Progesterone MAINTAINS pregnancy by quieting the uterus; its fall permits labour, but it does not cause the pains.

**C.** Oxytocin from the posterior pituitary stimulates powerful rhythmic uterine contractions (with positive feedback); it is the hormone of labour pains; correct.

**D.** Corticosteroids (e.g. cortisol) are stress/metabolic hormones; they do not drive uterine contractions.

## Question Q52 Biology

Fluid secreted by sertoli cells provides liquid medium, protection and nourishment to:

- A. Oocyte
- B. Sperms ✓ **Correct answer**
- C. Polar body
- D. Spermatogonia

evelop in the ovary, where no Sertoli cells exist; Sertoli fluid never reaches them.

**B.** Sertoli cells in the seminiferous tubules secrete fluid that bathes, protects and nourishes developing sperm and carries them along; correct.

**C.** Polar bodies are by-products of oogenesis in the ovary, unrelated to Sertoli cells.

**D.** Spermatogonia are the stem cells at the tubule wall; Sertoli cells support the whole process, but the secreted fluid specifically serves the maturing sperm in the tubule lumen.

## Question Q53 Biology

Corpus luteum during female reproductive cycle produces

- A. Testosterone
- B. Follicle stimulating hormone
- C. Luteinizing Hormone
- D. Progesterone ✓ **Correct answer**

**A.** The male sex hormone, made mainly in the testes; the corpus luteum does not produce it.

**B.** A pituitary gonadotropin that acts ON the ovary; it is not produced by the corpus luteum.

**C.** Also a pituitary hormone; LH triggers ovulation and the FORMATION of the corpus luteum, but the corpus luteum does not secrete LH.

**D.** The corpus luteum's main secretion, maintaining the uterine lining for implantation; correct.

## Question Q54 Biology

Due to the process of follicle atresia:

- B. Follicle degenerates ✓ **Correct answer**
- C. Graafian follicle ovulates
- D. Follicle starts to mature

**A.** Reaching maximum size precedes ovulation in the dominant follicle; atresia is the opposite fate.

**B.** Atresia IS the degeneration and resorption of ovarian follicles that fail to reach ovulation; correct.

**C.** Ovulation is the successful outcome for one follicle; atretic follicles never ovulate.

**D.** Maturation is the growth phase; atresia ends it.

## Question Q55 Biology

Main function of the epididymis is to:

- A. Transport sperms ✓ **Correct answer**
- B. Connect with urethra
- C. Produce semen
- D. Hold the process of spermatogenesis

**A.** The keyed answer: the epididymis is the coiled duct through which sperm pass from the testis, maturing and being stored on the way; flagged because its fuller textbook function is storage and MATURATION, with transport shared with the vas deferens.

**B.** The vas deferens joins the ejaculatory duct to the urethra; the epididymis does not connect to the urethra.

**C.** Semen is produced mainly by the seminal vesicles, prostate and bulbourethral glands, not the epididymis.

**D.** Spermatogenesis occurs in the seminiferous tubules of the testis, not in the epididymis.

# Q56 Biology

Immediate next stage of spermatogonia differentiation is:

- A. Secondary spermatocyte
- B. Spermatids
- C. Primary spermatocytes ✓ **Correct answer**
- D. Sperms

**A.** Produced AFTER the first meiotic division of a primary spermatocyte; two stages on from spermatogonia.

**B.** Produced after the second meiotic division; three stages on.

**C.** Spermatogonia grow and differentiate directly into primary spermatocytes, which then enter meiosis I; correct.

**D.** The final mature product after spermiogenesis; the last stage, not the next.

# Question Q57 Biology

Which of the following is included in paired cranial bones?

- A. Temporal ✓ **Correct answer**
- B. Occipital
- C. Frontal
- D. Vomer

**A.** There are two temporal bones, one on each side of the skull; a paired cranial bone; correct.

**B.** A single (unpaired) bone at the back of the skull.

**C.** A single bone forming the forehead in the adult (the two halves fuse).

**D.** A single, unpaired FACIAL bone (forming part of the nasal septum), not a paired cranial bone.

# Q58 Biology

Which of the following skeletal disorder Is an example of autoimmune disorder?

- A. Sciatica
- B. Spondylosis
- C. Rheumatoid arthritis ✓ **Correct answer**
- D. Rickets

**A.** Pain from compression/irritation of the sciatic nerve, usually mechanical (e.g. a slipped disc); not autoimmune.

**B.** Degenerative wear of the spine (osteoarthritis of the vertebrae); not autoimmune.

**C.** A chronic AUTOIMMUNE disease in which the immune system attacks the synovial joints; correct.

**D.** A metabolic bone disease of childhood from vitamin D/calcium deficiency, softening the bones; not autoimmune.

# Question Q59 Biology

Which feature is possessed by smooth muscles?

- A. Voluntary
- B. Branched
- C. Uni-nucleate ✓ **Correct answer**
- D. Striated appearance

**A.** Smooth muscle is INVOLUNTARY (gut, vessels, airways); voluntary muscle is skeletal.

**B.** Branching is a feature of CARDIAC muscle fibres, not smooth muscle.

**C.** Each smooth-muscle cell has a single central nucleus; correct.

**D.** Smooth muscle lacks the striations of skeletal and cardiac muscle; that is why it is called "smooth".

# Q60 Biology

The accumulation of 'lactic acid' in the muscles results in

- A. Extreme fatigue ✓ **Correct answer**
- B. Muscle contraction
- C. Paralysis
- D. Convulsion

**A.** The textbook answer: lactate accumulation during intense anaerobic exercise is associated with muscle fatigue and burning discomfort; flagged because modern physiology treats lactate as a correlate/marker rather than the sole cause of fatigue (acidity, ion shifts and energy depletion all contribute, and lactate is also reused as fuel).

**B.** Contraction is caused by calcium and the actin–myosin sliding mechanism, not by lactic acid accumulation.

**C.** Lactic acid accumulation does not paralyse muscle.

**D.** Convulsions are uncontrolled contractions from neural causes, not the result of lactate build-up.

# Question Q61 Biology

Thick filaments In skeletal muscles are composed of:

- A. Actin
- B. Myosin ✓ **Correct answer**
- C. Tropomyosin
- D. Troponin

**A.** Actin forms the THIN filaments, not the thick ones.

**B.** Thick filaments are bundles of myosin molecules, whose heads pull on actin; correct.

**C.** A regulatory protein lying along the thin (actin) filament, blocking myosin-binding sites

**D.** A regulatory protein complex on the thin filament that binds calcium; not a thick-filament component.

## Question Q62 Biology

Sarcomere is part of myofibril between:

- A. Two I bands
- B. Two A bands
- C. Two M lines
- D. Two Z lines ✓ **Correct answer**

**A.** I bands (light bands of actin only) lie WITHIN the sarcomere, on either side of the A band; they do not bound it.

**B.** The A band (dark band) sits in the MIDDLE of the sarcomere; two A bands would span more than one sarcomere.

**C.** The M line runs through the CENTRE of each sarcomere, anchoring thick filaments; it does not bound it.

**D.** A sarcomere is defined as the segment of a myofibril between two successive Z lines (Z discs); correct.

## Question Q63 Biology

Medulla Oblongata is a part of:

- A. Forebrain
- B. Mid brain
- C. Hind brain ✓ **Correct answer**
- D. Hippocampus

**A.** The forebrain comprises cerebrum, thalamus and hypothalamus; the medulla is not

**B.** The midbrain lies above the pons; the medulla lies below the pons.

**C.** The hindbrain (rhombencephalon) comprises medulla, pons and cerebellum; the medulla oblongata is its lowest part, controlling breathing and heart rate; correct.

**D.** A limbic-system structure in the temporal lobe of the forebrain, concerned with memory; not a brain division at all.

## Question Q64 Biology

Which of the following is NOT a bone of upper limb?

- A. Humerus
- B. Ulna
- C. Femur ✓ **Correct answer**
- D. Radius

**A.** The upper-arm bone; an upper-limb bone.

**B.** A forearm bone (with the radius); an upper-limb bone.

**C.** The thigh bone of the LOWER limb; the one that does not belong; correct.

**D.** The other forearm bone; an upper-limb bone.

## Question Q65 Biology

Bone forming cells are

- A. Osteoblasts ✓ **Correct answer**
- B. Osteocytes
- C. Osteoclasts
- D. Osteons

**A.** The cells that lay down new bone matrix (osteoid) and mineralise it; correct.

one cells, former osteoblasts trapped in the matrix; they maintain bone but do not form new bone.

**C.** Large cells that RESORB (break down) bone, the opposite of forming it.

**D.** Osteons (Haversian systems) are the structural UNITS of compact bone, not cells at all.

## Question Q66 Biology

The chromosomes was first observed by;

- A. T. H Morgan
- B. Griffith
- C. Walther ✓ **Correct answer**
- D. Mendel

**A.** Thomas Hunt Morgan worked on chromosome theory and linked genes in Drosophila, decades after chromosomes were first seen.

**B.** Frederick Griffith discovered bacterial transformation (1928); he did not first observe chromosomes.

**C.** Walther Flemming first observed and described chromosomes during his studies of mitosis (1870s–80s), coining "chromatin" and "mitosis"; correct.

**D.** Mendel worked out inheritance laws from pea crosses without ever seeing chromosomes.

## Question Q67 Chemistry

Number of moles in an element is directly proportional to:

- A. Mass of an element ✓ **Correct answer**
- B. Empirical formula mass
- C. Molar mass of an element
- D. Formula mass

mass ÷ molar mass, so for a given element (fixed molar mass) the mole number rises in direct proportion to the mass taken; correct.

**B.** A fixed constant for a compound; moles do not vary in proportion to it (moles = mass ÷ that constant).

**C.** Also a fixed constant; moles are INVERSELY proportional to molar mass for a fixed mass, not directly.

**D.** A fixed constant for the substance, like molar mass; not the quantity moles vary with.

## Question Q68 Chemistry

The type and relative amount of each isotope in an element can be found by:

- A. R spectroscopy
- B. U. V spectroscopy
- C. Mass Spectrometry ✓ **Correct answer**
- D. N.M.R

**A.** "IR spectroscopy" (the stem's "R" is a truncated IR) probes molecular vibrations/bonds, not isotopic composition.

**B.** UV–visible spectroscopy probes electronic transitions; it does not separate or count isotopes.

**C.** A mass spectrometer separates ions by mass-to-charge ratio, revealing each isotope's mass and its relative abundance; correct.

**D.** Nuclear magnetic resonance probes the chemical environment of magnetic nuclei; it does not give the full isotopic abundance pattern.

## Question Q69 Chemistry

The atomic masses of element depend upon:

- B. Number of electrons
- C. Number of isopotes & their abundance ✓ **Correct answer**
- D. None of the above

**A.** The atomic number (proton count) fixes the ELEMENT's identity, not its atomic mass, which varies with the neutron numbers of its isotopes.

**B.** Electrons contribute negligibly to mass and their count equals the proton count in a neutral atom; they do not determine atomic mass.

**C.** The atomic mass is the weighted average of the isotopic masses, so it depends on which isotopes exist and how abundant each is; correct. The stem prints "isopotes" for isotopes.

**D.** Wrong, since option C states the correct dependence.

## Question Q70 Chemistry

No individual atom in the sample of 1 mole of Neon has a mass of 20.18 a.m.u. because it is:

- A. Overall mass of an isobar
- B. It is a fractional mass
- C. It is molar mass of Ne
- D. Average atomic mass of Ne ✓ **Correct answer**

**A.** Isobars are atoms of different elements with the same mass number; 20.18 is not an isobar mass.

**B.** Merely restating that 20.18 is not a whole number does not explain WHY no atom has it.

**C.** The molar mass (20.18 g/mol) is numerically the same figure, but the reason no single atom weighs 20.18 u is that the figure is an AVERAGE over isotopes; "molar mass" alone does not state that.

the abundance-weighted average of neon's isotopes ($^{20}$Ne, $^{21}$Ne, $^{22}$Ne), each of which has a whole-number mass; no single atom weighs the average; correct.

## Question Q71 Chemistry

The p orbital has

- A. 2 lobes ✓ **Correct answer**
- B. 3 lobes
- C. 4 lobes
- D. 5 lobes

**A.** A p orbital is dumbbell-shaped with two lobes on opposite sides of the nucleus; correct (each of $p_x$, p_y, p_z has this shape).

**B.** Three is the NUMBER of p orbitals in a subshell, not the number of lobes of one orbital.

**C.** Four lobes characterise a d orbital (e.g. d_xy), not a p orbital.

**D.** No standard orbital has five lobes; five is the number of d orbitals.

## Question Q72 Chemistry

Which of the following electronic configuration is correct for carbon?

- A. 1s22s2p3
- B. 1s22s2p4
- C. 1s22s2p2 ✓ **Correct answer**
- D. 1s22s2p1

**A.** Totals 7 electrons: that is nitrogen, not carbon.

**B.** Totals 8 electrons: that is oxygen, not carbon.

**C.** Totals 6 electrons (2 + 2 + 2), filling $1s^2\ 2s^2\ 2p^2$, carbon's ground-state configuration; correct.

ectrons. that is boron, not carbon.

## Question Q73 Chemistry

Intermolecular forces between molecules of ideal gas are

- A. Strong
- B. Moderate
- C. Weak
- D. Absent ✓ **Correct answer**

**A.** Strong intermolecular forces are a property of liquids/solids, excluded by the ideal-gas model.

**B.** The ideal-gas model assumes no intermolecular forces at all, not moderate ones.

**C.** Real gases have weak forces; the IDEAL gas is defined as having none.

**D.** By definition, ideal-gas molecules exert no attractive or repulsive forces on each other; correct.

## Question Q74 Chemistry

The correct ideal gas equation is

- A. qV=nRt
- B. pV=nRt ✓ **Correct answer**
- C. gV=nRt
- D. yV=nRt

**A.** "q" is not pressure; this form is meaningless.

**B.** Pressure × volume = moles × gas constant × temperature (PV = nRT); correct.

**C.** "g" is not pressure; meaningless.

**D.** "y" is not pressure; meaningless.

## Q75 Chemistry

The real gases show deviation from ideal behavior at:

- A. Low temperature and low pressure
- B. High temperature and high pressure
- C. Low temperature and high pressure ✓ **Correct answer**
- D. High temperature and low pressure

**A.** Low pressure keeps molecules far apart, favouring ideal behaviour despite the low temperature.

**B.** High temperature gives molecules kinetic energy that overcomes attractions, offsetting the high pressure.

**C.** Molecules are close together and slow, so intermolecular attractions and finite molecular volume matter most; maximum deviation; correct.

**D.** The conditions CLOSEST to ideal behaviour, not maximum deviation.

## Question Q76 Chemistry

In order to boil water at 110°C, external pressure should be

- A. 200 - 760 torr
- B. 760 - 1200 torr ✓ **Correct answer**
- C. 665-670 torr
- D. 660-700 torr

**A.** Pressures at or below 760 torr give boiling points at or below 100 °C, not 110 °C.

**B.** Water boils when vapour pressure equals external pressure; at 110 °C the vapour pressure of water is ≈ 1075 torr, inside this range, and above normal atmospheric pressure (760 torr); correct.

**C.** Below atmospheric pressure; water would boil below 100 °C.

v 760 torr, boiling point below 100 °C.

# Question Q77 Chemistry

Which one of the following DO NOT have tendency to form hydrogen bonding?

- A. Ammonia
- B. Ethyl alcohol
- C. Carboxylic acid
- D. Hydrocarbon ✓ **Correct answer**

**A.** $NH_3$ has N–H bonds and a lone pair on nitrogen; it forms hydrogen bonds readily.

**B.** Ethanol has an O–H group; it forms hydrogen bonds.

**C.** Carboxylic acids have O–H groups and form strong hydrogen bonds (even dimers).

**D.** Hydrocarbons contain only C–C and C–H bonds, with no highly electronegative atom (N, O, F) bonded to hydrogen, so they cannot form hydrogen bonds; correct.

# Question Q78 Chemistry

Boiling point of a liquid is a temperature at which:

- A. Surface tension is greater than the atmospheric pressure
- B. Viscosity is less than the atmospheric pressure
- C. Vapour pressure equals the atmospheric pressure ✓ **Correct answer**
- D. Viscosity equals the atmospheric pressure

**A.** Surface tension and atmospheric pressure are different quantities; their comparison does not define boiling.

**B.** Viscosity (resistance to flow) has nothing to do with the boiling definition.

**C.** Boiling begins when the liquid's vapour pressure equals the external (atmospheric) pressure, so bubbles can form throughout; correct.

udes not define boiling.

## Question Q79 Chemistry

Whenever the crystalline solids are broken they do so along definite planes known as:

- A. Cleavage planes ✓ **Correct answer**
- B. Refractory planes
- C. Sagittal planes
- D. Coronal planes

**A.** Crystals split along definite planes of weak bonding, called cleavage planes; correct.

**B.** "Refractory" describes heat-resistant materials, not crystal fracture planes.

**C.** An anatomical term (a vertical plane dividing left/right), not a crystallographic term.

**D.** Also anatomical (dividing front/back), not crystallographic.

## Question Q80 Chemistry

One of the following is NOT an example of amorphous solids

- A. Plastic
- B. Glass
- C. Glucose ✓ **Correct answer**
- D. Rubber

**A.** Plastics are amorphous (non-crystalline) solids; an example, so not the answer.

**B.** Glass is the classic amorphous solid, with no regular crystal lattice.

**C.** Pure glucose forms a CRYSTALLINE (molecular) solid with a regular lattice; it is not amorphous; correct as the exception.

**D.** Rubber is an amorphous polymer solid.

# Q81 Chemistry

In graphite the carbon atoms are arranged in which of the following structure?

- A. Rhombic
- B. Hexagonal ✓ **Correct answer**
- C. Tetragonal
- D. Trigonal

**A.** Rhombic (orthorhombic) describes sulphur's crystal system, not graphite's layer structure.

**B.** Graphite consists of sheets of $sp^2$ carbon atoms in hexagonal rings, stacked in layers; correct.

**C.** A crystal system with a square base; not graphite's arrangement.

**D.** Trigonal describes a three-fold symmetry system; the graphite sheets are hexagonal, not trigonal, in arrangement.

# Question Q82 Chemistry

The principle that states that if a stress is applied to a system at equilibrium the system nullify the effect of stress as far as possible is:

- A. Haber's
- B. Le-Chatelier ✓ **Correct answer**
- C. Boyle's
- D. Charles'

**A.** The Haber process is the industrial synthesis of ammonia, not the equilibrium-shift principle (it USES the principle).

**B.** Le Chatelier's principle: a system at equilibrium shifts to counteract an imposed change (concentration, pressure, temperature); correct.

v relates gas pressure and volume at constant temperature; it says nothing about equilibrium shifts.

**D.** Charles's law relates gas volume and temperature at constant pressure; unrelated to equilibrium.

## Question Q83 Chemistry

Identify the CORRECT option required for the maximum yield of ammonia by Haber's process:

- A. High pressure low temperature continual removal of ammonia ✓ **Correct answer**
- B. Low pressure low temperature continual removal of ammonia
- C. High pressure high temperature continual removal of ammonia
- D. High pressure low temperature continual addition of ammonia

**A.** Ammonia formation ($N_2 + 3H_2 \rightleftharpoons 2NH_3$) is exothermic and reduces the mole number, so high pressure and low temperature favour yield, and removing product shifts equilibrium right; correct (in practice a moderate ~450 °C is used for rate, but among the options this is the yield-maximising set).

**B.** Low pressure favours the side with MORE moles (reactants), reducing yield.

**C.** High temperature favours the endothermic reverse reaction, reducing yield.

**D.** Adding product shifts equilibrium LEFT, toward reactants, reducing further formation.

## Question Q84 Chemistry

Consider the following reaction in equilibrium and tell addition of which chemical will turn the cloudy solution into clear solution? BiCl3 + H2O <-> BiOCl + 2HCl

- A. BiCl3
- B. H2O

- D. HCl ✓ **Correct answer**

**A.** Adding reactant shifts equilibrium right, making MORE cloudy BiOCl precipitate, not less.

**B.** Adding water also shifts equilibrium right (toward BiOCl + HCl), increasing cloudiness.

**C.** Adding the precipitate itself only adds to the cloudiness.

**D.** Adding HCl (a product) shifts equilibrium LEFT by Le Chatelier's principle, converting insoluble BiOCl back to soluble $BiCl_3$, clearing the solution; correct.

## Question Q85 Chemistry

Identify the correct formula to calculate rate of reaction:

- A. Change in concentration of substance ÷ Time taken for the change ✓ **Correct answer**
- B. Time taken for the change ÷ Change in concentration of substance
- C. Time taken for the change ÷ Change in concentration of substance x 100
- D. Time taken for the change x Change in concentration of substance

**A.** Rate = Δconcentration ÷ Δtime (mol $dm^{-3}$ $s^{-1}$); correct.

**B.** The reciprocal of the rate; wrong.

**C.** The reciprocal multiplied by 100; wrong.

**D.** A product of time and concentration change, dimensionally not a rate.

## Question Q86 Chemistry

Consider the hypothetical equation aA + bB -> cC+dD: Which of the following represents correct rate equation?

- A. Rate = k[A][B]

- C. Rate = k[A]^a
- D. Rate = k[B]^2

**A.** The first-order-in-each form; correct only for the special case a = b = 1, not the general form.

**B.** The correct general rate law for an elementary reaction aA + bB -> products (each concentration raised to its stoichiometric coefficient); the paper prints exactly this as option B (facsimile p. 13, visually confirmed 7 Nov 2026); correct.

**C.** Omits B entirely; wrong as a general rate law for a reaction involving both A and B.

**D.** Omits A and fixes B's order at 2; wrong in general. (Transcription note: this file formerly printed option B as k[A]^b[B]^b — that was a transcription error, not the paper's text; corrected 8 Nov 2026 per the 7 Nov verification addendum.)

## Question Q87 Chemistry

If a reaction rate does not change with concentration then it is

- A. 3rd order
- B. 2nd order
- C. 1st order
- D. Zero order ✓ **Correct answer**

**A.** A third-order rate depends on the cube of concentration; it changes strongly with concentration.

**B.** A second-order rate depends on concentration squared; it changes with concentration.

**C.** A first-order rate is directly proportional to concentration; it changes with concentration.

**D.** Rate = k, independent of concentration; the rate does not change when concentration

# Question Q88 Chemistry

Which of the following is CORRECT Arrhenius equation?

- A. K =Ae- Ea/RT
- B. K =Ae -Ea/RT ✓ **Correct answer**
- C. K=Ae - Ea/ST
- D. K=Ae -Ea/UT

**A.** Renders identically to option B in the fetched transcription (k = A·e^(−Ea/RT)), so the original distinction between A and B (presumably a sign/formatting difference in the exponent) is unrecoverable from the transcription; the equation itself is the Arrhenius form.

**B.** k = A·e^(−Ea/RT): rate constant = pre-exponential factor × e^(−activation energy/RT); correct, and the marked letter.

**C.** Uses "S" in place of the gas constant R in the denominator; wrong.

**D.** Uses "U" in place of R; wrong. Defect flagged: options A and B cannot be distinguished in the fetched text; the answer rests on the equation being a reference fact and B being the marked letter.

# Question Q89 (printed 91) Chemistry

In endothermic reaction, the heat content of the

- A. Reactants and products is equal
- B. Reactants is more than that of products
- C. Products is more than that of reactants ✓ **Correct answer**
- D. Reactants & Products will not change

**A.** Equal heat contents would mean ΔH = 0 (no net heat change), which contradicts an

**B.** That describes an EXOTHERMIC reaction, where products are lower in enthalpy and heat is released.

**C.** An endothermic reaction absorbs heat, so the products end with MORE enthalpy (heat content) than the reactants (ΔH positive); correct.

**D.** The heat contents DO change: heat is absorbed from the surroundings.

## Question Q90 (printed 92) Chemistry

All of the following steps are used to calculate the lattice energy in Born-Haber cycle EXCEPT

- A. Atomizing the metal
- B. Ionizing the metal
- C. Delonlize the metal ✓ **Correct answer**
- D. Ionlize non metal

**A.** Atomisation (sublimation to gaseous atoms) IS a Born–Haber step.

**B.** Ionisation (removing electrons to form the cation) IS a Born–Haber step.

**C.** "Delonlize" is not a real term or step in the cycle; the exception; correct.

**D.** Forming the anion (electron affinity, printed "Ionlize non metal") IS part of the cycle. Defects flagged: "Delonlize" and "Ionlize" are misspellings in the original.

## Question Q91 (printed 93) Chemistry

The enthalpy change when1 Mole of water is formed by the reaction of acid with an alkali under standard conditions is known as:

- A. Enthalpy of formation
- B. Enthalpy of reaction

- D. Enthalpy of neutralization ✓ **Correct answer**

**A.** Formation enthalpy is for forming a compound from its ELEMENTS, not from an acid and an alkali.

**B.** Too general: every chemical change has an enthalpy of reaction; the specific name for this change is neutralisation.

**C.** Combustion enthalpy is for burning a substance in oxygen; acid + alkali is not combustion.

**D.** By definition, the enthalpy change when one mole of water is formed by neutralisation of an acid by a base under standard conditions; correct.

## Question Q92 (printed 94) Chemistry

Oxidation number of 'Mn' in KMnO4 is

- A. 0
- B. +1
- C. -7
- D. +7 ✓ **Correct answer**

**A.** Zero would mean elemental manganese; in $KMnO_4$ the manganese is highly oxidised, not elemental.

**B.** +1 is potassium's oxidation number in this compound, not manganese's.

**C.** A negative oxidation number for manganese here would require the oxygens to be positive, which they are not (oxygen is −2 each).

**D.** Working: K = +1, each O = −2 (total −8), compound neutral, so 1 + Mn − 8 = 0, giving Mn = +7; correct.

# Q93 (printed 95) Chemistry

Which step is irrelevant with respect to balancing of redox equations by oxidation number method?

- A. Split the reaction into two half reactions ✓ **Correct answer**
- B. Assign oxidation number to all the atoms involved in the equation
- C. Identify the element undergoing a change in oxidation number
- D. Equalize the number of electrons lost and gained

**A.** Splitting into oxidation and reduction half-reactions belongs to the ION–ELECTRON (half-reaction) method, not the oxidation-number method; the irrelevant step; correct.

**B.** The FIRST step of the oxidation-number method; essential.

**C.** Essential: the elements whose oxidation numbers change are the ones oxidised/reduced.

**D.** Essential: the total increase in oxidation number must equal the total decrease.

# Question Q94 (printed 96) Chemistry

Which of the following is NOT a correct feature of electrolytic cells?

- A. Reduction occurs at cathode
- B. Oxidation occurs at anode
- C. Alternating current source is connected to electrodes ✓ **Correct answer**
- D. Electrochemical reaction takes place

**A.** True for electrolytic cells (and all electrochemical cells): reduction always occurs at the cathode.

**B.** True: oxidation always occurs at the anode.

**C.** False: electrolytic cells use a DIRECT current source; alternating current would keep reversing polarity and could not drive sustained electrolysis in one direction; correct as the

**D.** True: electrolysis is an electrochemical (redox) reaction driven by the external supply.

## Question Q95 (printed 97) Chemistry

Which of the following has a coordinate bond?

- A. NaCl
- B. CaO
- C. NH3BF3 ✓ **Correct answer**
- D. H2O

**A.** Sodium chloride is ionic ($Na^+/Cl^-$); no coordinate (dative) bond.

**B.** Calcium oxide is ionic; no coordinate bond.

**C.** In the ammonia–boron trifluoride adduct ($NH_3 \cdot BF_3$), nitrogen donates its lone pair to the electron-deficient boron, forming a dative/coordinate bond; correct.

**D.** Water's O–H bonds are ordinary covalent bonds (shared pairs, one electron from each atom); the lone pairs are not donated to form a coordinate bond within the molecule.

## Question Q96 (printed 98) Chemistry

Which of the following is NOT a feature of Valence Shell Electron Pair Repulsion theory?

- A. It determines the shape of molecule
- B. Pairs of electrons repel each other
- C. It helps in understanding interaction of medicinal drug molecules
- D. Only lone pairs participate in determining geometry of molecules ✓ **Correct answer**

**A.** True: VSEPR predicts molecular geometry from electron-pair repulsion.

**B.** True: the central postulate of VSEPR.

application claim (molecular shape matters in drug binding); not the clearly false statement.

**D.** False: BOTH bonding pairs and lone pairs determine geometry (lone pairs repel more strongly, but bonding pairs count too); correct as the non-feature.

## Question Q97 (printed 99) Chemistry

Which of the following has smallest atomic radius

- A. Mg
- B. S ✓ **Correct answer**
- C. P
- D. Na

**A.** Magnesium sits to the left in period 3; its radius is larger than phosphorus and sulphur.

**B.** Sulphur is furthest right among the four in period 3, so it has the greatest effective nuclear charge pulling the same shell inward, giving the smallest radius; correct.

**C.** Phosphorus is to the left of sulphur in period 3, with one fewer proton, so its radius is larger than sulphur's.

**D.** Sodium is furthest left in period 3, with the weakest effective nuclear charge of the four; it has the LARGEST radius of the four.

## Question Q98 (printed 100) Chemistry

The difference of lithium from the other alkall metals is mainly because of:

- A. Large radius and low charge density
- B. Small radius and low charge density
- C. Large radius and high charge density
- D. Small radius and high charge density ✓ **Correct answer**

**A.** The opposite of lithium's properties: lithium is the SMALLEST alkali metal.

(small radius) but wrong on charge density: a small ion carrying the same +1 charge has HIGH charge density.

**C.** Wrong on radius: lithium's radius is small, not large.

**D.** Lithium's very small ionic radius concentrates its +1 charge, giving high charge density and polarising power, which explains its anomalous properties (covalent tendencies, diagonal relationship with magnesium); correct.

## Question Q99 (printed 101) Chemistry

Which of the following is not Basic in nature

- A. Aluminum oxide ✓ **Correct answer**
- B. Magnesium oxide
- C. Potassium oxide
- D. Sodium oxide

**A.** $Al_2O_3$ is AMPHOTERIC: it reacts with both acids and bases, so it is not purely basic; correct as the exception.

**B.** MgO is a basic oxide (reacts with acids to form salts and water).

**C.** $K_2O$ is a strongly basic oxide.

**D.** $Na_2O$ is a strongly basic oxide.

## Question Q100 (printed 102) Chemistry

The solubility of sulphates of alkaline metals generally

- A. Increase down the group
- B. Decrease down the group ✓ **Correct answer**
- C. Increase then decrease down the group
- D. Doesn't change down the group

site trend: group-2 sulphates become LESS soluble down the group.

**B.** For the group-2 (alkaline-earth) sulphates, solubility decreases down the group ($BeSO_4$ soluble → $BaSO_4$ virtually insoluble) as lattice energy falls more slowly than hydration energy; the keyed answer.

**C.** No such reversal occurs for group-2 sulphates.

**D.** Solubility changes markedly down the group (e.g. $MgSO_4$ soluble, $BaSO_4$ insoluble). Flagged: the stem says "alkaline metals" where the trend described is that of the ALKALINE-EARTH (group 2) metals — group-1 sulphates behave differently (solubility generally increases down group 1); the answer rests on reading "alkaline" as group 2, the paper's convention.

## Question Q101 (printed 103) Chemistry

Which of the following is NOT an Alloy

- A. Steel
- B. Brass
- C. Bronze
- D. Graphite ✓ **Correct answer**

**A.** An alloy of iron with carbon (and often other metals).

**B.** An alloy of copper and zinc.

**C.** An alloy of copper and tin.

**D.** A crystalline allotrope of pure elemental carbon, not a mixture of metals; correct as the non-alloy.

## Question Q102 Chemistry

Electronic configuration of chromium (Proton number 24) is:

3d4 4s2

- B. [Ar] 3d5 4s2
- C. [Ar] 3d5 4s1 ✓ **Correct answer**
- D. [Ar] 3d6 4s2

**A.** The naive Aufbau filling, but NOT chromium's observed ground state (24 electrons, but the wrong distribution).

**B.** Totals 25 electrons (18 + 5 + 2); one too many for chromium (24).

**C.** Totals 24 electrons, with the half-filled $3d^5$ subshell and one 4s electron: chromium's exceptional, observed ground-state configuration, stabilised by the half-filled d subshell; correct.

**D.** Totals 26 electrons; that is iron's electron count, not chromium's.

## Question Q103 Chemistry

Which of the following is NOT a property of transition elements?

- A. High melting points
- B. Good conductors of electricity
- C. Hard metals
- D. Ions and compounds are colorless ✓ **Correct answer**

**A.** True in general: strong metallic bonding gives transition metals high melting points.

**B.** True: transition metals are good electrical conductors.

**C.** True in general: transition metals are typically hard and strong.

**D.** False: transition-metal ions and compounds are typically COLOURED, due to d–d electron transitions (and charge transfer); correct as the non-property. (Exceptions with empty/full d subshells, e.g. $Zn^{2+}$, are colourless, but the general property claimed is colour, not colourlessness.)

# 106 Chemistry

1-Butene and 2-Butene are showing which type of isomerism?

- A. Functional Group
- B. Position ✓ **Correct answer**
- C. Metamerism
- D. Chain

**A.** Wrong: both 1-butene and 2-butene are alkenes with the same functional group (the C=C double bond); nothing about the functional group differs between them.

**B.** Correct: 1-butene (CH2=CH-CH2-CH3) and 2-butene (CH3-CH=CH-CH3) have the same carbon skeleton and the same functional group but differ only in WHERE the double bond sits — position isomerism (Vedantu; Vaia; pediaa).

**C.** Wrong: metamerism is about different alkyl groups on either side of a functional group (e.g. ethers, ketones), not about a double bond's position.

**D.** Wrong: both have the same straight four-carbon chain; the skeleton is identical.

**Note:** Gap-fill: folded into the file at its printed position 8 Nov 2026. VERIFIED from independent reference facts (LibreTexts: 1- and 2-butene are position isomers; Labster) and rests on one reproduction's key — one source is FINAL under the owner's 8 Nov 2026 verification standard.

## Question Q104 Chemistry

Which type of isomerism is displayed by compounds having same structural formula but different position of atoms on both sides of carbon bond?

- A. Chain
- B. Metamerism
- C. Geometric ✓ **Correct answer**
- D. Tautomerism

...leletal) isomerism differs in the carbon skeleton's connectivity, not in spatial position about a bond.

**B.** Metamerism differs in the distribution of carbon groups around a functional group (connectivity), not spatial arrangement.

**C.** Compounds with the same structural formula but different spatial positions of groups across a C=C double bond (cis/trans, E/Z) show geometric (stereo)isomerism; correct.

**D.** Tautomers interconvert by proton shift (e.g. keto–enol); they differ in functional-group position, not merely in spatial arrangement about a bond.

## Question 108 Chemistry

Homocyclic organic compounds are sub divided into two types namely:

- A. Alicyclic and Aromatic ✓ **Correct answer**
- B. Alkenes & Alkynes
- C. Aromatic and Non aromatic
- D. Saturated & Unsaturated

**A.** Correct: homocyclic (carbocyclic) compounds divide into alicyclic compounds (rings that are not aromatic) and aromatic compounds (rings with delocalised pi systems) — NCERT Class 11; chem-guide.

**B.** Wrong: those are acyclic classes named by bond type, not subdivisions of homocyclic compounds.

**C.** Wrong: 'non-aromatic' is not the standard subdivision; the alicyclic class is the named counterpart to aromatic.

**D.** Wrong: saturation is a different classification axis (bond order), not the homocyclic subdivision.

**Note:** Gap-fill: folded into the file at its printed position 8 Nov 2026. VERIFIED from

: reference facts (NCERT classification via Shiksha/collegedunia: homocyclic compounds divide into alicyclic and aromatic) and rests on one reproduction's key — one source is FINAL under the owner's 8 Nov 2026 verification standard.

## Question Q105 Chemistry

Which of the following is an example of substituent group which release electrons to benzene ring :

- A. -CN
- B. -NR3+
- C. -NH2 ✓ **Correct answer**
- D. -NO2

**A.** The cyano group is strongly electron-WITHDRAWING (by resonance and induction); it deactivates the ring.

**B.** A positively charged ammonium group withdraws electrons strongly by induction; it deactivates the ring.

**C.** The amino group's nitrogen lone pair donates into the ring by resonance, increasing electron density (activating, ortho/para-directing); correct.

**D.** The nitro group is strongly electron-withdrawing; it deactivates the ring.

## Question 110 Chemistry

Which one of the following represents nitration of benzene correctly?

- A. C6H6 + HNO3 → C6H5NO3 + H2O (H2SO4, 50–55 °C)
- B. C6H6 + HNO3 → C6H5NO2 + H2O (H2SO4, 50–55 °C) ✓ **Correct answer**
- C. C6H6 + HNO3 → dinitrobenzene (two NO2 groups) + H2O (H2SO4, 50–55 °C)
- D. C6H6 + HNO3 → C6H5NO2 + O2 (H2SO4, 50–55 °C)

**A.** Wrong: nitration replaces one ring hydrogen with a nitro group, –NO2 — there is no –

**B.** Correct: benzene is nitrated by concentrated HNO3 with concentrated H2SO4 at 50 °C or below, giving nitrobenzene + water: C6H6 + HNO3 → C6H5NO2 + H2O (LibreTexts).

**C.** Wrong: two nitro groups (dinitrobenzene) need hotter conditions; the temperature is kept low precisely to prevent more than one nitro group being substituted onto the ring.

**D.** Wrong: the byproduct of nitration is water, H2O, not oxygen.

**Note:** NOT in the reviewed .md file — recovered in the 7 Nov 2026 verification addendum from the facsimile (p. 15 embedded image, options read visually, including 10x magnified crops): all four options are benzene + HNO3 with H2SO4 at 50–55 °C, differing only in the product. VERIFIED B: LibreTexts nitration C6H6 + HNO3 → C6H5NO2 + H2O; facsimile key 110 = B.

## Question Q106 Chemistry

In Friedel Craft acylation an acyl group is introduced in benzene ring in the presence of catalyst:

- A. AlCl3 ✓ **Correct answer**
- B. H2SO4
- C. Sunlight
- D. V2O5

**A.** Anhydrous aluminium chloride, a Lewis acid, generates the acylium ion (R–C≡O$^+$) from the acyl chloride; the standard Friedel–Crafts acylation catalyst; correct.

**B.** Concentrated sulphuric acid is used for sulphonation/nitration mixtures, not as the Friedel–Crafts acylation catalyst.

**C.** Sunlight drives free-radical substitution (e.g. side-chain chlorination), not electrophilic acylation of the ring.

(V) oxide is the catalyst in the Contact process ($SO_2 \rightarrow SO_3$), not in Friedel–Crafts acylation.

## Question 112 Chemistry

Identify correct ascending order of reactivity of alkyl halides:

- A. Cl, Br, I, F
- B. F, Cl, Br, I ✓ **Correct answer**
- C. Br, I, F, Cl
- D. I, F, Cr, Br

**A.** Wrong: it puts fluorine last, i.e. most reactive, but the C–F bond is the strongest and fluoroalkanes are the least reactive.

**B.** Correct: reactivity rises as the carbon–halogen bond weakens down the group, RI > RBr > RCl > RF (LibreTexts; Testbook; NCERT), so ascending order is F, Cl, Br, I.

**C.** Wrong: it puts bromine first (least reactive) and chlorine last.

**D.** Wrong: it puts iodine first (most reactive) and prints 'Cr', evidently a misprint for Cl.

**Note:** Gap-fill: folded into the file at its printed position 8 Nov 2026. VERIFIED from independent reference facts (reactivity RI > RBr > RCl > RF; C–X bond energies 485/340/280/240 kJ/mol) and rests on one reproduction's key — one source is FINAL under the owner's 8 Nov 2026 verification standard.

## Question Q107 Chemistry

Identify the correct statement related to substitution and elimination of alkyl halides:

- A. Strong bases causes substitution in preference to elimination
- B. Role of leaving groups in elimination is similar to substitution ✓ **Correct answer**
- C. Substitution is favored more than elimination by decreasing solvent polarity
- D. Decrease in temperature will favor elimination more than substitution

ng bases (especially bulky ones) favour ELIMINATION over substitution.

**B.** True as the textbook generalisation: a good leaving group (weak base) facilitates both substitution and elimination, since both begin with breaking the C–X bond; the keyed answer.

**C.** Not the textbook rule: polar solvents stabilise the ionic/carbocation character of substitution pathways; decreasing polarity does not simply favour substitution over elimination.

**D.** False: elimination has the higher entropy demand, so HIGHER temperature favours elimination; lower temperature favours substitution. Flagged: the answer rests on the textbook wording convention; in detail, leaving-group effects differ in magnitude between SN1/SN2/E1/E2 pathways.

## Question Q108 Chemistry

Alkyl Halides involving –C–X bond breakage and –C–Nu bond formation simultaneously would follow which one of the following mechanisms

- A. SN1
- B. SN2 ✓ **Correct answer**
- C. E1
- D. E2

**A.** SN1 is stepwise: the C–X bond breaks FIRST to give a carbocation, and the nucleophile bonds afterwards; not simultaneous.

**B.** A concerted, single-step mechanism: the nucleophile attacks as the leaving group departs, C–Nu forming while C–X breaks, through one transition state; correct.

**C.** E1 is stepwise elimination via a carbocation; bond breaking and formation are not simultaneous.

**D.** E2 IS concerted, but it is an ELIMINATION (forming a double bond with loss of $H^+$), not

philic substitution described (C–Nu bond formation).

## Question Q109 Chemistry

CnH2nO is the general formula of:

- A. Ether
- B. Carboxylic acid
- C. Ketones ✓ **Correct answer**
- D. Carbolic acid

**A.** Ethers have the general formula $C_nH_{2n+2}O$ (saturated, acyclic); they do not fit $C_nH_{2n}O$.

**B.** Carboxylic acids are $C_nH_{2n}O_2$; they carry two oxygens, not one.

**C.** Simple (saturated, acyclic) ketones fit $C_nH_{2n}O$ (e.g. acetone $C_3H_6O$); correct among the options. Note: aldehydes share the same general formula, but no aldehyde option is offered.

**D.** Carbolic acid is phenol ($C_6H_5OH$, aromatic); it does not fit the general formula $C_nH_{2n}O$.

## Question Q110 Chemistry

The blue color of Fehling solution is changed to red when warmed with an aldehyde due to formation of which of the following?

- A. NO2
- B. Cu2O ✓ **Correct answer**
- C. AgO
- D. SO2

**A.** Nitrogen dioxide is a brown gas, unrelated to Fehling's test.

**B.** The aldehyde reduces blue Cu(II) to red cuprous oxide, $Cu_2O$, which precipitates; the red colour is $Cu_2O$; correct.

ide, silver-mirror chemistry belongs to TOLLENS' test, not Fehling's.

**D.** Sulphur dioxide is a reducing gas, not a product of Fehling's test.

## Question Q111 Chemistry

Reaction of HCN with formaldehyde is a:

- A. Nucleophilic addition reaction ✓ **Correct answer**
- B. Nucleophilic substitution reaction
- C. Electrophilic addition reaction
- D. Electrophilic substitution reaction

**A.** Cyanide ($CN^-$) attacks the carbonyl carbon of formaldehyde and adds across the C=O bond, forming a cyanohydrin; correct.

**B.** No atom or group is REPLACED here; HCN adds across the double bond instead.

**C.** Electrophilic addition is the pattern of alkenes with electrophiles; the carbonyl attacker here is the nucleophile $CN^-$.

**D.** The pattern of aromatic substitution (e.g. benzene); not applicable to an aldehyde carbonyl.

## Question Q112 Chemistry

Which of the following alcohol can give Iodoform reaction?

- A. Methanol
- B. 1-Butanol
- C. 1-Propanol
- D. Ethanol ✓ **Correct answer**

**A.** Methanol ($CH_3OH$) has no $CH_3CH(OH)–$ group and no methyl ketone structure; it gives no iodoform.

alcohol without the $CH_3CH(OH)$– unit (its OH is on C1 with an ethyl chain beyond); no iodoform.

**C.** Also lacks the $CH_3CH(OH)$– unit; no iodoform.

**D.** Ethanol ($CH_3CH_2OH$) is oxidised in the test conditions to ethanal, which has the $CH_3CO$– group and gives yellow $CHI_3$ (iodoform); correct.

## Question Q113 Chemistry

Common name of 2-hydroxy propanoic acid is:

- A. Tartaric acid
- B. Lactic acid ✓ **Correct answer**
- C. Phthalic acid
- D. Formic acid

**A.** 2,3-dihydroxybutanedioic acid, a DICARBOXYLIC acid found in grapes; not 2-hydroxypropanoic acid.

**B.** $CH_3$–CH(OH)–COOH, exactly 2-hydroxypropanoic acid; correct.

**C.** Benzene-1,2-dicarboxylic acid, an aromatic dicarboxylic acid; unrelated.

**D.** Methanoic acid (HCOOH), the simplest carboxylic acid; not a hydroxy acid.

## Question Q114 Chemistry

Which of the following is correct regarding phenol

- A. Phenol and water are equally acidic
- B. Phenol is less acidic than carboxylic acid ✓ **Correct answer**
- C. Phenol is less acidic than water
- D. Phenol is less acidic than ethanol

**A.** False: phenol ($pK_a \approx 10$) is about a million times more acidic than water ($pK_a \approx 14$).

oxylic acids ($pK_a \approx 4$–5) are far stronger acids than phenol, whose phenoxide ion is less stabilised than a carboxylate ion; correct.

**C.** False: phenol is MORE acidic than water (it ionises in aqueous NaOH; water does not).

**D.** False: phenol is much MORE acidic than ethanol ($pK_a \approx 16$), because the phenoxide ion is resonance-stabilised.

## Question Q115 (printed 121) Chemistry

When carboxylic acid are heated with alcohol in the presence of sulphuric acid one of the following is formed

- A. Amides
- B. Acyl chloride
- C. Esters ✓ **Correct answer**
- D. Acid Anhydride

**A.** Amides form from carboxylic acid derivatives with AMMONIA or amines, not with alcohols.

**B.** Acyl chlorides form with reagents such as $SOCl_2$ or $PCl_5$, not by heating with an alcohol.

**C.** Fischer esterification: carboxylic acid + alcohol, acid-catalysed, gives an ester + water; correct.

**D.** Anhydrides form by dehydrating two carboxylic acid molecules, not from acid + alcohol.

## Question Q116 (printed 122) Chemistry

Which one of the following is not an amino acid

- A. Folic acid ✓ **Correct answer**
- B. Glutamic acid
- C. Glycine
- D. Lysine

vitamin (folate), not an amino acid: it has no α-amino-acid structure and is not a protein building block; correct as the exception.

**B.** A standard protein amino acid (glutamate).

**C.** The simplest protein amino acid.

**D.** A standard essential protein amino acid.

## Question Q117 (printed 123) Physics

In an elastic collision the total kinetic energy

- A. Dissipates after collision
- B. Increases after the collision
- C. Reduces after the collision
- D. Before and after collision remains the same ✓ **Correct answer**

**A.** Dissipation of kinetic energy (as heat/sound/deformation) is what happens in an INELASTIC collision, not an elastic one.

**B.** Kinetic energy cannot spontaneously increase in a collision without an external energy input; an elastic collision conserves it, it does not gain it.

**C.** A reduction is again inelastic behaviour; in an elastic collision none is lost.

**D.** By definition, an elastic collision conserves total kinetic energy (and momentum); correct.

## Question Q118 (printed 124) Physics

The instantaneous velocity along the curved path is ;

- A. Along the tangent ✓ **Correct answer**
- B. Perpendicular to the slope
- C. Parallel to the radius

**A.** At any instant, the velocity of a particle on a curved path points along the tangent to the path at that point; correct.

**B.** "Perpendicular to the slope" is not the velocity direction; the velocity lies along the path's tangent, and the normal (perpendicular) direction is that of centripetal acceleration.

**C.** Parallel to the radius is the radial direction, which is the direction of centripetal acceleration, not of velocity.

**D.** Also radial; not the velocity direction.

## Question Q119 (printed 125) Physics

The range of projectile will be maximum if the factor sin2θ becomes

- A. Zero
- B. 1 ✓ **Correct answer**
- C. -1
- D. 2

**A.** Range $R = (u^2 \sin 2\theta)/g$, so $\sin 2\theta = 0$ gives ZERO range ($\theta = 0°$ or $90°$), the minimum, not the maximum.

**B.** $\sin 2\theta$ reaches its maximum value 1 when $2\theta = 90°$ ($\theta = 45°$), giving maximum range; correct.

**C.** $\sin 2\theta = -1$ would give a negative (backward) range value, not a maximum.

**D.** The sine function never exceeds 1; $\sin 2\theta = 2$ is impossible.

## Question Q120 (printed 126) Physics

The two dimensional motion under constant acceleration due to gravity is called:

- A. Circular motion

- C. Projectile motion ✓ **Correct answer**
- D. Vibratory motion

**A.** Motion in a circle under centripetal acceleration toward the centre, not constant gravitational acceleration in a plane.

**B.** Motion of a body spinning about an axis; not the trajectory of a body under gravity.

**C.** A body launched with horizontal and vertical components moves in two dimensions under the constant downward acceleration g; correct.

**D.** Back-and-forth oscillation about a mean position (e.g. a pendulum or spring), not projectile flight.

## Question Q121 (printed 127) Physics

In velocity time graph the area under graph is equal to the:

- A. Speed of an object
- B. Velocity of an object
- C. Distance covered by object ✓ **Correct answer**
- D. Acceleration of an object

**A.** Speed is the value of the velocity at an instant, read off the graph's vertical axis, not the area under it.

**B.** Velocity is likewise the ordinate value, not the area.

**C.** The area under a velocity–time graph equals the DISPLACEMENT; for motion without direction reversal it equals the distance covered, which is the keyed answer; strictly, if the velocity changes sign, the signed area is displacement and distance is the total (unsigned) area.

**D.** Acceleration is the SLOPE (gradient) of the velocity–time graph, not the area.

# Q122 Physics

According to Newton's Law of Motion the mass of the object is a quantitative measure of its:

- A. Weight
- B. Inertia ✓ **Correct answer**
- C. Speed
- D. Acceleration

**A.** Weight is the gravitational FORCE on a mass (W = mg); it varies with gravity, while mass does not.

**B.** Mass measures an object's resistance to changes in motion (inertia), as in Newton's first and second laws (F = ma); correct.

**C.** Speed is how fast an object moves; it is not measured by mass.

**D.** Acceleration is the rate of change of velocity produced by a force; mass determines how much acceleration a given force produces, but mass is not a measure of acceleration itself.

# Question Q123 Physics

1KWh = _____ J?

- A. 3.6J
- B. 3.6KJ
- C. 3.6 MJ ✓ **Correct answer**
- D. 3.6 GJ

**A.** Far too small: 1 kW for 1 hour is vastly more than 3.6 joules.

**B.** A thousand times too small: 3.6 kJ is only 1 watt-hour.

**C.** Working: 1 kWh = 1000 W × 3600 s = $3.6 \times 10^6$ J = 3.6 MJ; correct.

d times too large.

# Question Q124 Physics

Which of the following is a non-conservative force?

- A. Frictional force ✓ **Correct answer**
- B. Electric force
- C. Elastic spring force
- D. Gravitational force

**A.** Friction dissipates mechanical energy as heat, and the work done depends on the path taken; the defining non-conservative force; correct.

**B.** The electrostatic force is conservative: work done is path-independent and recoverable as potential energy.

**C.** The spring force is conservative; energy stored as elastic potential is fully recoverable.

**D.** Gravity is conservative: work done against it is stored as gravitational potential energy, independent of path.

# Question Q125 Physics

Work done is equal to:

- A. Effort x distance ✓ **Correct answer**
- B. Effort + distance
- C. Effort - distance
- D. Effort ÷distance

**A.** Work = force (here called "effort") × displacement in the direction of the force; correct.

**B.** Adding a force and a distance is dimensionally meaningless and is not work.

**C.** Subtracting distance from force is likewise meaningless.

ded by distance is not work (it resembles a spring constant, force per unit extension).

## Question Q126 Physics

When a force of 1N displaces its point of application by 1m in the direction of force, the work done is

- A. 1 J ✓ **Correct answer**
- B. 10 J
- C. 0 J
- D. 1

**A.** Working: W = F × d = 1 N × 1 m = 1 joule, the very definition of the joule; correct.

**B.** Ten times the correct value; no factor of 10 enters.

**C.** Zero work would require no displacement or a perpendicular force; here both force and displacement are 1 unit in the same direction.

**D.** "1" without a unit is not a work value; the work is 1 JOULE.

## Question Q127 Physics

An electric motor is used to lift the weight of 2.0N through a vertical distance of 100 cm in 4 sec. What is the power output of the motor?

- A. 0.25 W
- B. 0.5 W ✓ **Correct answer**
- C. 0.75 W
- D. 1 W

**A.** Half the correct power; it would follow from 1 J of work, not 2 J.

**B.** Working: work = force × distance = 2.0 N × 1.00 m = 2.0 J; power = work ÷ time = 2.0 J ÷ 4 s = 0.5 W; correct.

nation of the given numbers yields 0.75 W.

**D.** Would require 4 J of work in 4 s (e.g. a 4 N weight or a 2 m lift), double the actual work.

## Question Q128 Physics

The centripetal acceleration of an object moving along a circle of radius 'r' with an angular speed 'w' is given by the formula:

- A. a = rw^2 ✓ **Correct answer**
- B. a = r ω
- C. a = r^2 ω
- D. A = r^2 ω^2

**A.** Centripetal acceleration $a = v^2/r = (r\omega)^2/r = r\omega^2$ (ω written "w" in the transcription); correct.

**B.** rω is the LINEAR SPEED v, not the acceleration.

**C.** Dimensionally wrong (length$^2$/time) and not the centripetal formula.

**D.** $r^2\omega^2 = v^2$, the square of the speed, not an acceleration.

## Question Q129 Physics

An air craft makes a turn in a horizontal circle of radius100m. It is travelling with a velocity of 250m/sec. The angular velocity of the air craft will be:

- A. 1.5 rad/sec
- B. 2.5 rad/sec ✓ **Correct answer**
- C. 3 rad/sec
- D. 3.5 rad/sec

**A.** Would follow from v = 150 m/s, not the given 250 m/s.

**B.** Working: ω = v/r = 250 ÷ 100 = 2.5 rad/s; correct.

uire v = 300 m/s at this radius.

**D.** Would require v = 350 m/s at this radius.

## Question Q130 Physics

A particle of mass 'm' is moving on a circular path of radius 'r' with velocity 'v', then centripetal force acting on it is F. If the velocity of particle increases by 2 times and radius of circular path increases by 4 times then new centripetal force F' will be;

- A. F' = 2 F
- B. F' = 1/2 F
- C. F' = 4 F
- D. F' = F ✓ **Correct answer**

**A.** Would follow if only the velocity doubled with radius unchanged ($v^2$ gives ×4, not ×2); wrong for the combined change.

**B.** No combination of the stated changes gives a halving.

**C.** The factor from doubling velocity alone ($v^2$), ignoring the radius change.

**D.** Working: $F' = m(2v)^2/(4r) = 4mv^2/4r = mv^2/r = F$; the two changes cancel exactly; correct.

## Question Q131 Physics

A roller coaster is moving with 30 ms-1 on a circular track of radius 30m. the net mass of coaster + passengers is 'm' the centripetal force acting on it is:

- A. 900m
- B. m
- C. 450 m
- D. 30m ✓ **Correct answer**

**A.** 900 is $v^2$ alone; it omits the division by the radius r = 30.

alone, with no velocity or radius factor; dimensionally not a force.

**C.** Half of $v^2$ (900/2); no such halving enters the centripetal formula.

**D.** Working: $F = mv^2/r = m \times 30^2 \div 30 = m \times 900 \div 30 = 30m$ (newtons, with m in kg); correct.

## Question Q132 Physics

Amplitude in the following figure is given as:

- A. 2m
- B. 1/2m
- C. 1/4 m
- D. 1m ✓ **Correct answer**

**A.** Twice the keyed amplitude; it would be the peak-to-peak height if the peak-to-peak were 2 m, not the amplitude.

**B.** Half the keyed amplitude.

**C.** A quarter of the keyed amplitude.

**D.** The marked answer, i.e. the distance from the mean (equilibrium) level to a crest in the figure; flagged because the figure itself is NOT reproduced in the fetched text, so the value cannot be independently verified from the transcription — it rests on the source page's marked answer alone. Amplitude is by definition the maximum displacement from equilibrium, and 1 m is the only value consistent with the marked key.

## Question Q133 (printed 139) Physics

Which one of the following is INCORRECT about the nodes when the string is plucked;

- A. Amplitude of vibration is zero
- B. Do not move along the string
- C. Produced at the fixed ends of strings
- D. Distance between consecutive nodes is 1 wavelength ✓ **Correct answer**

de is a point of zero displacement in a standing wave.

**B.** True: in a steady standing wave the nodes stay fixed in position (they do not travel).

**C.** True: the fixed ends of a string are necessarily nodes (zero displacement).

**D.** False, and therefore the INCORRECT statement asked for: consecutive nodes are HALF a wavelength (λ/2) apart; correct.

## Question Q134 (printed 140) Physics

In transverse waves the portion above the mean level is called:

- A. Wave front
- B. Wave crest ✓ **Correct answer**
- C. Wave trough
- D. Wave length

**A.** A wavefront is a surface of constant phase (all points vibrating in step), not the raised portion of a wave.

**B.** The highest point/portion of a transverse wave above the mean (equilibrium) level; correct.

**C.** The portion BELOW the mean level, the opposite of a crest.

**D.** The distance between two successive identical points (e.g. crest to crest), a length, not a portion of the wave.

## Question Q135 (printed 141) Physics

Which one of the following does not cause stationary waves?

- A. Two waves of equal frequency
- B. Two waves of same speed
- C. Two waves of unequal amplitude ✓ **Correct answer**

o waves traveling in opposite directions

**A.** Equal frequency is REQUIRED for a stationary wave; it causes (with the other conditions) a standing pattern, so it is not the exception.

**B.** Same speed (same medium, same wavelength at equal frequency) is required; it causes the standing pattern.

**C.** The keyed answer: a perfect stationary wave with zero-amplitude nodes requires equal amplitudes; with unequal amplitudes the pattern is a partial standing wave with non-zero nodes. Flagged: this is a textbook idealisation — two unequal-amplitude waves travelling in opposite directions DO still superpose into a standing-wave component plus a travelling component, so "does not cause" is true only in the strict sense of a perfect stationary wave.

**D.** Opposite travel is REQUIRED for a standing wave; it causes it, not prevents it.

## Question Q136 (printed 142) Physics

Select the appropriate Doppler equation when source is approaching the stationary observer where fo is the observed frequency, fs is frequency of source, v is the speed of sound, vs is the speed of source relative to observer

- A. fo = v/(v-vs) fs ✓ **Correct answer**
- B. fo = v/(v+vs) fs
- C. fo = v+vs / v fs
- D. fo = v- vs / v +vs fs

**A.** For a source approaching a stationary observer, the wavelength is compressed and the observed frequency rises: $f_o = [v/(v - v_s)]\cdot f_s$; correct.

**B.** This is the RECEDING-source formula (frequency falls); wrong for an approaching source.

**C.** This is the form for an OBSERVER moving toward a stationary source, not a source

an observer.

**D.** A garbled combination of the two formulas; it matches neither case.

## Question Q137 (printed 143) Physics

The distance between two successive particles which are exactly in the same state of vibration is called

- A. Frequency
- B. Amplitude
- C. Wavelength ✓ **Correct answer**
- D. Time period

**A.** Frequency is the number of vibrations per second, a rate, not a distance.

**B.** Amplitude is the maximum displacement from equilibrium, not the separation of in-phase particles.

**C.** The distance between two successive particles in exactly the same phase of vibration (e.g. crest to crest) IS the wavelength; correct.

**D.** The time for one complete vibration, not a distance.

## Question Q138 (printed 144) Physics

During the isothermal process, the temperature

- A. remains constant during the initial phase of the process of the process
- B. remains constant throughout the process ✓ **Correct answer**
- C. alters throughout the process
- D. increases throughout the process

**A.** Incomplete and misleading: constancy only in an initial phase is not what "isothermal" means.

al" means constant temperature for the WHOLE process (ΔT = 0, ΔU = 0 for an ideal gas); correct.

**C.** A changing temperature is the opposite of isothermal.

**D.** A steadily rising temperature contradicts the definition.

## Question Q139 (printed 145) Physics

What is the value of heat energy (Q) in an adiabatic process?

- A. +1
- B. -1
- C. 0 ✓ **Correct answer**
- D. +2

**A.** An adiabatic process exchanges no heat at all; +1 (in any unit) is not the heat transfer.

**B.** Likewise, no heat is transferred; −1 is not the value.

**C.** By definition, an adiabatic process has Q = 0 (no heat enters or leaves; work changes the internal energy instead); correct.

**D.** No heat transfer occurs; +2 is not the value.

## Question Q140 (printed 146) Physics

The Coulomb's law states

- A. Force,between two point charges is inversely proportional to the product of the charges and directly proportional to the square of the distance between them
- B. Force between two point charges is directly proportional to the product of the charges and inversely proportional to the square of the distance between them ✓ **Correct answer**
- C. Force between two point charges is directly proportional to the sum of the charges and inversely proportional to the square of the distance between them

ce between two point charges is directly proportional to the product of the charges and the square of the distance between them

**A.** Both proportionalities reversed; wrong.

**B.** Coulomb's law, $F = k \cdot q_1 q_2 / r^2$; correct.

**C.** The law uses the PRODUCT of the charges, not their sum.

**D.** The distance dependence is INVERSE-square, not direct-square.

## Question Q141 (printed 147) Physics

The formula V = W / qo represents

- A. Electric intensity
- B. Electric power
- C. Electric potential ✓ **Correct answer**
- D. Electric field gradient

**A.** Electric field intensity is force per unit charge (E = F/q), not work per unit charge.

**B.** Power is work per unit TIME (P = W/t), not work per unit charge.

**C.** Potential V is the work done per unit positive charge in bringing a test charge from infinity to the point, $V = W/q_0$; correct.

**D.** The field is the (negative) GRADIENT of potential ($E = -dV/dr$), not the potential itself.

## Question Q142 (printed 148) Physics

The S.I unit of capacitance of a capacitor is:

- A. Coulomb
- B. Volt
- C. Farad ✓ **Correct answer**
- D. Ampere

mb is the unit of CHARGE.

**B.** The volt is the unit of potential difference.

**C.** Capacitance C = Q/V is measured in farads (1 F = 1 C/V); correct.

**D.** The ampere is the unit of electric CURRENT.

## Question Q143 (printed 149) Physics

Electric intensity between two oppositely charge plates in the middle region is_____

- A. Non-uniform
- B. Uniform ✓ **Correct answer**
- C. Cannot be predicted
- D. Variable

**A.** The field is non-uniform only near the plate EDGES (fringing); in the middle region it is uniform.

**B.** Between two large, closely spaced, oppositely charged parallel plates, the field in the central region has constant magnitude and direction ($E = \sigma/\varepsilon_0$); correct.

**C.** The field is fully predictable (uniform, $\sigma/\varepsilon_0$) in the middle region.

**D.** "Variable" would mean changing from point to point, which is false in the middle region (edge effects aside).

## Question Q144 (printed 150) Physics

Find potential difference in moving 2 C charge which requires 600J of work between two points.

- A. 1200V
- B. 300V ✓ **Correct answer**
- C. 150V

**A.** The product 600 × 2; potential difference is work DIVIDED by charge, not multiplied.

**B.** Working: V = W/q = 600 J ÷ 2 C = 300 V; correct.

**C.** Would follow from 300 J of work, half the given amount.

**D.** 600 × 4; no such factor enters.

## Question Q145 (printed 151) Physics

Which one of the following Is NOT a feature of electric forces?

- A. They act on charges
- B. They act on masses ✓ **Correct answer**
- C. They can be attractive
- D. They can be repulsive

**A.** True: electric forces act on electric charges.

**B.** False: acting on mass is the feature of GRAVITATIONAL forces; electric forces act on charge regardless of mass; correct as the non-feature.

**C.** True: opposite charges attract.

**D.** True: like charges repel.

## Question Q146 (printed 152) Physics

A charge of 90 C passes through a wire for 30 seconds. Then the current in the wire will be:

- A. 3A ✓ **Correct answer**
- B. 0.3 A
- C. 3 mA
- D. 0.3 mA

$I = Q/t = 90\ C \div 30\ s = 3\ A$, correct.

**B.** Ten times too small; a decimal error.

**C.** A thousand times too small (3 mA = 0.003 A).

**D.** Ten-thousand times too small.

## Question Q147 (printed 153) Physics

The magnitude of the current in metals is proportional to the potential difference across it as long as temperature of conductor is kept constant is known as:

- A. Joule's Law
- B. Gauss Law
- C. Ohm's Law ✓ **Correct answer**
- D. Ampere's Law

**A.** Joule's law concerns heating by a current ($H = I^2Rt$), not current–voltage proportionality.

**B.** Gauss's law relates electric flux through a closed surface to the enclosed charge; not this statement.

**C.** $I \propto V$ at constant temperature ($V = IR$); correct.

**D.** Ampère's law relates magnetic fields to the currents producing them; not this statement.

## Question Q148 (printed 154) Physics

When length of copper wire is doubled then resistivity becomes:

- A. Double
- B. Half
- C. Remains same ✓ **Correct answer**
- D. Four times

length doubles RESISTANCE (R = ρL/A), not resistivity.

**B.** Halving would describe conductance-related behaviour, not resistivity.

**C.** Resistivity ρ is a property of the MATERIAL (and temperature) only; it does not depend on the wire's length or cross-section; correct.

**D.** No such dependence exists.

## Question Q149 (printed 155) Physics

The resistance of semi-conductor with rise in temperature

- A. Increases
- B. Decreases ✓ **Correct answer**
- C. Remain same
- D. Infinite

**A.** That is the behaviour of a metallic CONDUCTOR (resistance rises with temperature); semiconductors behave oppositely.

**B.** Heating a semiconductor frees more charge carriers (electrons/holes jump the band gap), so conductivity rises and resistance falls; correct.

**C.** Resistance changes markedly with temperature in a semiconductor.

**D.** Resistance does not become infinite; it falls toward lower values as temperature rises.

## Question Q150 (printed 156) Physics

Volt x Ampere is the measure of;

- A. Current
- B. Volt
- C. Resistance
- D. Power ✓ **Correct answer**

measured in amperes alone, not volt × ampere.

**B.** The volt is potential difference, not the product.

**C.** Resistance is volt ÷ ampere (ohm), not volt × ampere.

**D.** P = V × I, so volt × ampere = watt, the unit of power; correct.

## Question Q151 (printed 157) Physics

The formula Φ = B.A represents

- A. Electric flux
- B. Magnetic flux ✓ **Correct answer**
- C. Electric flux density
- D. Gravitational flux

**A.** Electric flux is Φ = E·A (electric field through area), not B·A.

**B.** Φ = B·A (magnetic flux density × area) is the magnetic flux, measured in webers; correct.

**C.** Electric flux density is D (displacement), not B·A.

**D.** Gravitational flux involves the gravitational field g, not magnetic flux density B.

## Question Q152 (printed 158) Physics

Which of the following statement is incorrect for any magnetic field lines?

- A. Lines start at north pole and ends at south pole
- B. Lines never touch or cross each other
- C. The lines are curved
- D. Magnetic field is strongest when the lines are farthest ✓ **Correct answer**

**A.** True as conventionally drawn OUTSIDE a magnet (inside, they run south to north, completing closed loops).

sing would imply two field directions at one point, which is impossible.

**C.** True in general: field lines curve (e.g. around a bar magnet); straight lines occur only in special uniform-field cases.

**D.** False, and the incorrect statement asked for: field strength is greatest where the lines are CLOSEST together (crowded), weakest where they are far apart; correct.

## Question Q153 (printed 159) Physics

The unit of magnetic flux density is ;

- A. Wbm-1
- B. Wbm
- C. Wbm-2 ✓ **Correct answer**
- D. Wb

**A.** Weber per metre is not the unit of flux density.

**B.** Weber-metre is not a flux-density unit.

**C.** Flux density B = flux ÷ area, so its unit is weber per square metre (Wb $m^{-2}$), also called the tesla; correct.

**D.** The weber alone is the unit of magnetic FLUX, not flux density.

## Question Q154 (printed 160) Physics

The induced current will flow in such a direction so as to oppose the cause that produces it is statement of:

- A. Ampere's Law
- B. Faraday's Law
- C. Lenz's Law ✓ **Correct answer**
- D. Joule's Law

law relates magnetic field to current; it says nothing about induced-current direction.

**B.** Faraday's law gives the MAGNITUDE of induced emf (rate of change of flux), not its direction.

**C.** The induced current opposes the change in flux producing it; correct, as stated.

**D.** Joule's law concerns heat produced by a current ($I^2R$), not induction direction.

## Question Q155 (printed 161) Physics

In an AC generator the emf will be maximum when factor sinωt is equal to

- A. Zero
- B. 1 ✓ **Correct answer**
- C. 2
- D. 1 / 2

**A.** When sin ωt = 0 the emf is ZERO (coil plane parallel to the field direction of zero flux change rate), the minimum.

**B.** The emf $\varepsilon = \varepsilon_0 \cdot \sin \omega t$ is maximum when sin ωt takes its maximum value, 1; correct.

**C.** The sine function never reaches 2.

**D.** sin ωt = ½ gives half the maximum emf, not the maximum.

## Question Q156 (printed 162) Physics

Electric generators and transformers are based on the principles of:

- A. Coulomb's law
- B. Faraday's law ✓ **Correct answer**
- C. Ampere's law
- D. Hook's law

s law describes electrostatic force between charges; it is not the working principle of generators/transformers.

**B.** Both devices work by electromagnetic induction: a changing magnetic flux induces an emf (Faraday's law); correct.

**C.** Ampère's law relates currents to magnetic fields; it does not state the induction principle these machines use.

**D.** Hooke's law (elasticity, F = −kx) is unrelated to electromagnetic machines.

## Question Q157 Physics

In an ideal transformer:

- A. Power input is equal to Power output ✓ **Correct answer**
- B. Power input is less than half of the power output
- C. Power input is greater than Power output
- D. Power input is more than half of the power output

**A.** An IDEAL transformer has no losses (no copper, iron, hysteresis or eddy-current losses), so all input power appears as output power ($V_pI_p = V_sI_s$); correct.

**B.** Output power can never exceed input power; that would create energy.

**C.** True for a REAL transformer (losses make output smaller), but the question specifies an IDEAL transformer.

**D.** Vague and wrong for an ideal transformer, where input EQUALS output, not merely exceeds half of it.

## Question Q158 Physics

The conversion of A.C into D.C is called rectification and circuit is called rectifier. Which component of electronics acts as a rectifier?

de ✓ Correct answer

- B. Transistor
- C. Transformer
- D. Inductor

**A.** A diode conducts in one direction only, so it converts alternating current to (pulsating) direct current; the basic rectifier component; correct.

**B.** A transistor amplifies or switches signals; it is not itself the rectifier component (though transistors appear in regulated supplies).

**C.** A transformer changes AC VOLTAGE levels; its output is still AC, not DC.

**D.** An inductor opposes changes in current (filtering/smoothing); it does not rectify.

## Question Q159 Physics

Full wave rectification is given by:

- A. One diode connected in bridge type arrangements
- B. Two diodes connected in bridge type arrangements
- C. Three diodes connected in bridge type arrangement
- D. Four diodes connected in bridge type arrangements ✓ **Correct answer**

**A.** One diode gives HALF-wave rectification (one half-cycle only); a bridge needs four diodes.

**B.** Two diodes give full-wave rectification only with a CENTRE-TAPPED transformer, not in a bridge arrangement.

**C.** Three diodes form no standard rectifier; a bridge uses four.

**D.** A bridge rectifier uses four diodes arranged in a bridge so both half-cycles of the AC are converted to DC; correct.

# Q160 Physics

A diode characteristic curve is a plot between:

- A. Current and time
- B. Voltage time
- C. Voltage and current ✓ **Correct answer**
- D. Reverse voltage forward voltage

**A.** A current–time plot would show how current varies over time, not the diode's characteristic.

**B.** A voltage–time plot is a waveform, not a characteristic curve.

**C.** The I–V characteristic curve plots current against applied voltage, showing forward conduction, knee voltage and reverse breakdown; correct.

**D.** Not a pair of plotted quantities; reverse and forward voltages are regions of the same I–V curve, not its axes.

# Question Q161 Physics

The value of Planck constant is

- A. 6.63x10^-34 Js ✓ **Correct answer**
- B. 6.63x10^34 Js
- C. 6.63x10-34 Js-1
- D. 6.63x10^34 Js-1

**A.** Planck's constant h ≈ 6.63 × $10^{-34}$ joule-seconds; correct.

**B.** 68 orders of magnitude too large (positive exponent).

**C.** The exponent is right but the unit is wrong: h has units of energy × time (J·s), not J·$s^{-1}$ (which is power-like).

**D.** Wrong in both exponent and unit.

# Q162 Physics

The de-Broglie wavelength associated with a particle moving at 10^6 m/s and having mass 10^-30 kg

- A. 6.6x10^-10 m ✓ **Correct answer**
- B. 1.5x10^9 m
- C. 1.9x10^-5 m
- D. 7.2x10^-8 m

**A.** Working: $\lambda = h/mv = 6.63 \times 10^{-34} \div (10^{-30} \times 10^{6}) = 6.63 \times 10^{-34} \div 10^{-24} \approx 6.6 \times 10^{-10}$ m; correct.

**B.** Astronomically large; it inverts the calculation (mv/h).

**C.** Five orders of magnitude too large; no correct substitution gives it.

**D.** Two orders of magnitude too large.

# Question Q163 Physics

Light propagates through space as a wave is evident by all of the following EXCEPT

- A. Interference
- B. Photoelectric effect ✓ **Correct answer**
- C. Diffraction
- D. Polarization

**A.** Interference (superposition of waves) is a purely wave phenomenon; evidence FOR the wave nature.

**B.** Explained only by the PARTICLE (photon) model: light ejects electrons in discrete energy packets; it is evidence AGAINST a purely wave account, and therefore the exception; correct.

**C.** Bending/spreading of waves around obstacles is a wave phenomenon; evidence for

**D.** Only transverse WAVES can be polarised; evidence for wave nature.

## Question Q164 Physics

Which series falls in ultra violet region?

- A. Lyman ✓ **Correct answer**
- B. Brachett
- C. Pfund
- D. Paschen

**A.** Transitions ending at n = 1 (Lyman series) emit ultraviolet photons; correct.

**B.** The Brackett series (to n = 4, spelled Brackett) lies in the infrared.

**C.** The Pfund series (to n = 5) lies in the infrared.

**D.** The Paschen series (to n = 3) lies in the infrared.

## Question Q165 Physics

The potential through which an electron should be accelerated , so that,on collision it can lift the electron in the atom from its ground state to some higher state is known as

- A. Ionization potential
- B. Excitation potential ✓ **Correct answer**
- C. String potential
- D. Acceleration potential

**A.** The potential needed to REMOVE an electron from the atom entirely, not merely to lift it to a higher bound state.

**B.** The accelerating potential that gives an electron just enough energy to raise an atomic electron from the ground state to a higher (excited) bound state on collision; correct.

erm exists in atomic physics.

**D.** A generic phrase for any accelerating voltage, not the specific named quantity for excitation.

## Question Q166 Physics

Which of the following regarding X Rays is INCORRECT

- A. Have higher wavelength than visible light ✓ **Correct answer**
- B. They are part of electromagnetic spectrum
- C. They are highly penetrating in soft body tissues
- D. They are high energy photons

**A.** False: X-rays have much SHORTER wavelengths (≈ 0.01–10 nm) than visible light (≈ 400–700 nm), and correspondingly higher energy; correct as the incorrect statement.

**B.** True: X-rays are a band of the electromagnetic spectrum.

**C.** True: X-rays penetrate soft tissue readily (which is why they image bones).

**D.** True: X-ray photons carry far more energy than visible-light photons.

## Question Q167 Physics

The unit of decay constant is ;

- A. m
- B. s
- C. s-1 ✓ **Correct answer**
- D. m-1

**A.** Metre is a unit of length; the decay constant is not a length.

**B.** Second is a unit of time; the decay constant has dimensions of inverse time, not time.

**C.** In $N = N_0 e^{(-\lambda t)}$ the exponent $\lambda t$ must be dimensionless, so $\lambda$ has units of $s^{-1}$ (per

**D.** Per metre is an inverse length (e.g. a wave number), not the decay constant's unit.

## Question Q168 Physics

If we have "No" number of any radioactive element then after a period of "n" half-lives the number of atoms left behind is

- A. 2^n No
- B. (½)^n No ✓ **Correct answer**
- C. (½ No)^n
- D. (2No)^n

**A.** This GROWS with n; radioactive atoms decrease, they do not multiply.

**B.** Each half-life halves the remainder, so after n half-lives $N = N_0(1/2)^n$; correct.

**C.** Raising the halved COUNT itself to the power n is dimensionally and physically wrong.

**D.** Also grows with n and raises the count to a power; wrong.

## Question Q169 Physics

Which of the following is NOT the Somatic biological effect of radiation?

- A. Skin burn
- B. Loss of hair
- C. Induction of cancer
- D. Genes mutation ✓ **Correct answer**

**A.** A somatic effect: damage to the exposed individual's own body tissues.

**B.** A somatic effect on the exposed individual (damage to hair follicles).

**C.** A somatic effect: cancer arises in the exposed individual's own cells.

m-cell) mutations are GENETIC effects, passed to descendants through the germ line, not somatic effects on the exposed individual's body; correct as the exception.

## Question Q171 English

What does the word "SURPLUS" mean?

- A. In excess ✓ **Correct answer**
- B. A mathematical term
- C. Within reach
- D. Salutation

**A.** "Surplus" means an amount left over, more than is needed or used; correct.

**B.** "Surplus" is an ordinary English word (excess), not a mathematical term.

**C.** "Within reach" means accessible/attainable; unrelated to surplus.

**D.** A salutation is a greeting (e.g. "Dear Sir"); unrelated.

## Question Q172 English

What does the word "ANCESTOR" mean?

- A. Collection of stars
- B. Branch of astrology
- C. Forefathers ✓ **Correct answer**
- D. Type of receptors

**A.** A collection of stars is a constellation or cluster, not an ancestor.

**B.** Astrology's branches (e.g. natal, horary) have nothing to do with ancestors.

**C.** An ancestor is a forefather/forebear, one from whom a person descends; correct.

**D.** Receptors are sensory or cellular structures; unrelated to ancestry.

# Q173 (printed 179) English

What does the word "SPILL" mean?

- A. Coil
- B. Deliver
- C. Spoil
- D. Spread ✓ **Correct answer**

**A.** "Coil" means to wind into loops (a coil of rope); nothing to do with spilling.

**B.** "Deliver" means to hand over or distribute; not the meaning of "spill".

**C.** "Spoil" means to ruin or go bad; a spilled liquid may spoil something, but spoil is not what "spill" means.

**D.** "Spill" means (of a liquid) to flow or spread over the edge of its container; Cambridge: "to (cause to) flow, move, fall, or spread over the edge"; Merriam-Webster: "to spread profusely or beyond bounds"; correct.

# Question Q174 (printed 180) English

Pick the CORRECT option:

- A. The supervisor has nor will ever compromise.
- B. The supervisor have nor will ever compromise.
- C. The supervisor has not compromised nor will ever compromise. ✓ **Correct answer**
- D. The supervisor has nor will ever compromised.

**A.** Missing "not": the negative "not" is required before "nor" can continue the sentence; ungrammatical.

**B.** "Have" does not agree with singular "supervisor" (needs "has"), and "not" is missing.

**C.** Correct: present-perfect negative "has not compromised" continued by "nor will ever

(the same subject understood, future tense); correct.

**D.** Missing "not", and "compromised" after "will ever" is the wrong form (needs base "compromise").

## Question Q175 (printed 181) English

The soup _____ good

- A. Taste
- B. Tastes ✓ **Correct answer**
- C. Is tasting
- D. Has taste

**A.** Does not agree with singular "soup" (needs "tastes").

**B.** Correct: "taste" is a linking verb here, so it takes the adjective "good" ("The soup tastes good"); present simple "tastes" agrees with "soup".

**C.** "Taste" as a linking verb is not used in the progressive.

**D.** Not the idiom; a soup "tastes good", it does not "have taste" in this sense.

## Question Q176 (printed 182) English

I _____ him for a long time.

- A. Have never known ✓ **Correct answer**
- B. Had never knew
- C. Had never been known
- D. Would never knew

**A.** Correct: "know" is a stative verb, so it takes present perfect simple (not continuous) for a state lasting until now; "have known ... for a long time" is the standard form.

**B.** "Knew" is the simple past, not the past participle; "had never knew" is ungrammatical

**C.** Passive voice: it would mean I was never known (by him), the reverse of the intended meaning.

**D.** "Would" must be followed by the base form "know", not "knew"; ungrammatical, and the tense is wrong for the duration.

## Question Q177 (printed 183) English

Choose the sentence that is punctuated correctly:

- A. He said to his disciples "Watch and pray."
- B. He said to his disciples, "Watch and pray." ✓ **Correct answer**
- C. He said to his disciples "watch and, pray"
- D. He said to his disciples' "watch and pray."

**A.** No comma after "disciples" before the direct quotation; the reporting clause needs a comma.

**B.** Correct: comma after the reporting clause, capital "Watch" at the start of the quotation, full stop inside the closing quotation mark.

**C.** No comma before the quotation, lowercase "watch", and the comma is misplaced inside the quotation ("and, pray").

**D.** "Disciples'" is a possessive apostrophe (wrong — "disciples" possesses nothing here), and "watch" should be capitalised.

## Question Q178 (printed 184) English

Choose the CORRECT spellings.

- A. Pharaoh ✓ **Correct answer**
- B. Pharoah
- C. Pheroh

**A.** The correct spelling of the title of the ancient Egyptian king (headword in Collins, Dictionary.com, Merriam-Webster).

**B.** Transposes the "a" and "o"; wrong.

**C.** Uses "e" for the second vowel; wrong.

**D.** Inserts an extra "a"; wrong.

## Question Q180 (printed 186) English

Choose the correct sentence

- A. In 1838 Schleiden suggested that all plants were made of cells ✓ **Correct answer**
- B. In 1838 Schleiden suggest that all plants were made of cells
- C. In 1838 Schleiden suggested that all plant were made of cells
- D. In 1838 Schleiden suggested to all plants were made of cells

**A.** Correct: past tense "suggested" agrees with "In 1838", and the fact is right — Schleiden published his cell-theory proposal in 1838 ("Contributions to Phytogenesis": all plants are composed of cells).

**B.** "Suggest" is present tense, wrong after "In 1838".

**C.** "All plant" is wrong (needs plural "plants").

**D.** "Suggested to all plants were made" is ungrammatical (the "to" breaks the that-clause).

## Question Q181 (printed 187) English

_____ words spoken in earnest will convince him

- A. A few ✓ **Correct answer**
- B. The few
- C. Few

**A.** Correct: "a few" means "some" (positive) — some earnest words will convince him.

**B.** Refers to a specific small group already known to speaker and listener; no such group is indicated.

**C.** Means "almost none" (negative) — the opposite of the sentence's meaning.

**D.** Comparative, needing a "than" comparison, which is absent.

## Question Q182 (printed 188) English

He takes _____ his father. Fill in the blank with appropriate preposition.

- A. Up
- B. Down
- C. After ✓ **Correct answer**
- D. In

**A.** "Take up" means to start (a hobby) or to lift; not resemblance.

**B.** "Take down" means to write down or dismantle; not resemblance.

**C.** Correct: "take after somebody" means to look or behave like an older member of your family, especially your mother or father (Oxford Advanced Learner's).

**D.** "Take in" means to absorb or to deceive; not resemblance.

## Question Q183 (printed 189) English

Choose the CORRECT sentence

- A. There's mr. hashim whome they say is the best portrait painter in the town.
- B. There's Mr. Hashim, who they say is the best portrait painter in the town. ✓ **Correct answer**
- C. Theres' Mr. Hashim which they say is the portrait painter in the town.

re's Mr. Hashim who they say is best portrait painter in the town.

**A.** "Mr." and "Hashim" should be capitalised; "whome" is a misspelling of "whom/who".

**B.** Correct: "Mr." and "Hashim" capitalised; "who" is the right relative pronoun for a person as the subject of "is"; the comma sets off the non-restrictive clause.

**C.** "Theres'" is a misspelling; "which" cannot refer to a person; "the portrait painter" drops "best", changing the meaning.

**D.** Missing "the" before "best" ("is best portrait painter" is ungrammatical) and missing the comma before "who".

## Question Q184 (printed 190) English

Choose the CORRECT sentence

- A. Gulliver travels was writen to Swift.
- B. Gulliver travels was writen at Swift.
- C. Gulliver's Travels was written by Swift. ✓ **Correct answer**
- D. Gullivers' travel was written by Swift

**A.** "Writen" is a misspelling of "written"; "to Swift" is the wrong preposition.

**B.** "Writen" is a misspelling; "at Swift" is the wrong preposition.

**C.** Correct: "Gulliver's Travels" (1726) is the satirical novel by Jonathan Swift; "written by" is the right form.

**D.** "Gullivers' travel" mangles the title (the book is "Gulliver's Travels"); also missing the final full stop.

## Question Q185 (printed 191) English

Choose the CORRECT sentence

- A. "The unexamined life", said Socrates, "is unfit to be lived by man." ✓ **Correct**

- B. The inexamined life, said Socrates, "is unfit to be lived by man"
- C. "The unexamined life said Socrates", is disfit to be lived by man.
- D. "The disexamined life" said Socrates is unfit to be lived by man.

**A.** Correct: the quotation is correctly split around the reporting clause ("said Socrates"), "unexamined" is spelled correctly, and the sentence states the Socratic dictum recorded in Plato's "Apology" (38a): "the unexamined life is not worth living".

**B.** "Inexamined" is a misspelling; the opening quotation mark is missing; no final full stop.

**C.** "Disfit" is a misspelling; the comma is placed inside the quotation after "Socrates" instead of after the reporting clause.

**D.** "Disexamined" is a misspelling; no comma after the reporting clause; no final full stop.

## Question Q186 (printed 192) English

Choose the CORRECT sentence

- A. You have often heard of me speeking of my friend Wahaj waheed a barrister here
- B. You have often heard me speak of my friend, Wahaj Waheed, who is a barrister here. ✓ **Correct answer**
- C. You have often heard me. Speak off my friend, wahaj waheed who is a Barrister here
- D. you have often heard me speak about my friend; wahaj waheed-a barrister hear

**A.** "Speeking" is a misspelling; "heard of me" is the wrong construction; "waheed" should be capitalised; missing commas and full stop.

**B.** Correct: "heard me speak of" is the right construction; "Wahaj Waheed" capitalised; the appositive is set off by commas; "who is a barrister here" is correct.

**C.** "Heard me. Speak" breaks the sentence in two; "off" should be "of"; "wahaj waheed" should be capitalised; no final full stop.

n lowercase "you", "hear" should be "here"; the semicolon and hyphen are misused; no final full stop.

## Question Q187 (printed 193) English

Choose the CORRECT sentence

- A. The first space traveller was Dennis Tito from the United States. ✓ **Correct answer**
- B. The First Space Traveller was Dennis Tito, from, the United states
- C. The first space traveller was Dennis Tito-from united State
- D. The first space travaler was Dennis Tito, from the United States

**A.** Correct: Dennis Tito (USA) was the first space tourist, visiting the ISS 28 April–6 May 2001 (Guinness; Wikipedia); the sentence is correctly capitalised and punctuated.

**B.** Stray comma after "from"; "states" should be capitalised; no final full stop.

**C.** "Tito-from" wrongly joins the name to the preposition; "united State" is wrong (United States).

**D.** "Travaler" is a misspelling of "traveller"; no final full stop.

## Question Q188 (printed 194) English

Choose the CORRECT sentence

- A. It was greatly good by you to proposd day's picnic at murree
- B. It was awfully good by you to proposed a day's picnic in Murree.
- C. It was awfully good of you to propose a day's picnic at Murree. ✓ **Correct answer**
- D. It was very good off you too propose days picnic in Murree

**A.** "Proposd" is a misspelling; "by you" is the wrong preposition; "murree" should be capitalised; no final full stop.

**B.** "By you" is wrong (the construction is "good of you"); "proposed" should be the

**C.** Correct: "good of you to propose" is the standard construction (behaviour adjective + of + person + to-infinitive; Collins: "It was good of you to come").

**D.** "Off" should be "of"; "too" should be "to"; "days" should be "day's"; no final full stop.

## Question Q189 (printed 195) Logical Reasoning

I. The government has increased the taxes on all businesses in Pakistan. II. Many small businesses will have to close their operations in Pakistan.

- A. Statement I is the cause and statement II is its effect ✓ **Correct answer**
- B. Statement II is the cause and statement I is its effect
- C. Both the statements I and II are independent causes
- D. Both the statements I and II are effects of independent causes

**A.** Correct: a tax increase raises costs, which can force small businesses to close; I causes II.

**B.** Reversed: closures do not cause the tax increase.

**C.** Wrong: the two are causally linked, not independent.

**D.** Wrong: I is a cause (a government action), not an effect.

## Question Q190 (printed 196) Logical Reasoning

Read the passage and the following statements below. Then choose the correct option, basing your answer only on the information provided. Pakistan is rich in wildlife and culture. It is home to many sorts of wildlife, from the Ibex to the Indus River Dolphin; and people from most countries in the world have made their home here. STATEMENTS: I. Pakistan is a rich country. II. People from all nationalities of the world live in Pakistan. III. Pakistan is home to at least one dolphin species.

- A. Only III is correct ✓ **Correct answer**

- C. Only I and III are correct
- D. Only II and III are correct

**A.** III is supported: the passage names the Indus River Dolphin among the wildlife Pakistan is home to, so Pakistan is home to at least one dolphin species. I is not supported: the passage says Pakistan is rich "in wildlife and culture", not rich as a country; dropping the qualifier changes the claim. II is not supported: the passage says people from "most countries", not "all nationalities"; "most" is not "all". Only III is correct, so A is correct.

**B.** I is not supported: the passage says Pakistan is rich "in wildlife and culture", not rich as a country; dropping the qualifier changes the claim. II is not supported: the passage says people from "most countries", not "all nationalities"; "most" is not "all". So B is wrong.

**C.** I is not supported: the passage says Pakistan is rich "in wildlife and culture", not rich as a country; dropping the qualifier changes the claim. III is supported: the passage names the Indus River Dolphin among the wildlife Pakistan is home to, so Pakistan is home to at least one dolphin species. So C is wrong — I fails.

**D.** II is not supported: the passage says people from "most countries", not "all nationalities"; "most" is not "all". III is supported: the passage names the Indus River Dolphin among the wildlife Pakistan is home to, so Pakistan is home to at least one dolphin species. So D is wrong — II fails.

**Note:** Explanations recombined per option from the reviewed statement/conclusion explanations in the .md — no new facts, only the source's own sentences plus the verdict framing; see the generator.

## Question Q191 (printed 197) Logical Reasoning

Observe the pattern and select the next term, in the sequence: JEQ, HEO, FEM

- A. GFN

- ✓ Correct answer
- C. GEL
- D. DFK

**A.** First letter G breaks the pattern (first letters run J, H, F, then D — each 2 back).

**B.** Correct: first letters J → H → F → D (each 2 back in the alphabet); middle letters E, E, E → E (constant); third letters Q → O → M → K (each 2 back); next term D, E, K.

**C.** Third letter L breaks the pattern (should be K).

**D.** Middle letter F breaks the constant E.

## Question Q192 (printed 198) Logical Reasoning

Read the following and choose the correct answer: "X, Y and Z are three whole numbers less than 24 but greater than 11. X is the smallest prime number. Y is the largest number divisible by 3. Z is the smallest number divisible by 11?"

- A. X is 13, Y is 24, Z is 11
- B. X is 13, Y is 21, Z is 22 ✓ **Correct answer**
- C. X is 11, Y is 21, Z is 11
- D. X is 11, Y is 24, Z is 22

**A.** Y = 24 is not less than 24; Z = 11 is not greater than 11.

**B.** Correct: the numbers run 12–23 (greater than 11, less than 24); smallest prime in that range is 13 (12 is not prime); largest divisible by 3 is 21 (24 is outside the range); smallest divisible by 11 is 22 (11 is outside the range).

**C.** X = 11 and Z = 11 are not greater than 11.

**D.** X = 11 is not greater than 11; Y = 24 is not less than 24.

# Q194 (printed 200) Logical Reasoning

All hammers are tools. Some tools are useless things. All useless things are trash. Which of the following conclusions is NECESSARILY TRUE given only the information above? CONCLUSIONS: I. Some hammers are trash II. Some tools are trash III. All useless things are tools.

- A. I
- B. II ✓ **Correct answer**
- C. III
- D. I & III

**A.** Conclusion I does not follow: the tools that are useless need not be hammers; the useless tools could all be non-hammers. So A is wrong.

**B.** Conclusion II follows necessarily: some tools are useless, and every useless thing is trash, so those tools are trash — some tools are trash. So B is correct.

**C.** Conclusion III does not follow: only SOME tools are useless; useless things may extend beyond tools. So C is wrong.

**D.** Neither I nor III follows: the tools that are useless need not be hammers; and only SOME tools are useless, so useless things may extend beyond tools. So D is wrong.

**Note:** Explanations recombined per option from the reviewed statement/conclusion explanations in the .md — no new facts, only the source's own sentences plus the verdict framing; see the generator.

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