NUMS MDCAT 2023 (National — separate test) · Solved Past Paper

Body: National University of Medical Sciences (NUMS), for the Pakistan Medical & Dental Council (PMDC) · **Exam:** MDCAT (Medical & Dental College Admission Test), national (separate test) · **Year:** 2023 · **Questions:** 150 in the original paper — **146 solved and verified** · **4 excluded** (3 defective, 1 unrecoverable — figure question) · **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. Excluded questions are shown as excluded sections, with no answer taught.

Excluded questions: Q88, Q109 and Q113 are defective as printed (two correct options each) and are excluded — no answer is taught for them. Original Q37 (a wavelength question) depends entirely on a figure that is not readable in any text copy, so it is excluded as unrecoverable until the figure is read. 146 + 3 + 1 = 150.

Source note: Fold-in 8 Nov 2026 per fold-in-37o.py, decided by assistant under the owner's 8 Nov 2026 delegation (all papers judgment calls) and the owner's verification standard of 8 Nov 2026 15:44 (an answer confirmed by TWO sources OR EVEN ONE source is FINAL). Two full second reproductions with complete answer keys, matched BY STEM and fetched 8 Nov 2026: ilmkidunya NUMS (MDCAT) 2023 (https://ikddata.ilmkidunya.com/images/nums-mdcat-answer-key-2023.pdf) and educationinkarachi NUMS MDCAT 2023 (https://educationinkarachi.net/wp-content/uploads/2026/09/NUMS-MDCAT-2023.pdf). Both state 150 MCQs (Physics 40, Biology 55, English 15, Chemistry 40). The original total is 150: this file holds 149 (Q1–Q149, file numbering) plus original Q37, a figure question excluded as unrecoverable. File numbering runs one behind original numbering from original Q37 (file Q37 = original Q38 … file Q149 = original Q150). Answer corrections on

ld, all recorded on the questions: Q7 option B '36 × 10^{5}' → '36 × 10^{6}' per the ilmkidunya clean print; Q18 D → B; Q28 C → A; Q89 C → B (option B 'Corner Proteins' → 'Carrier proteins' per the clean educationinkarachi print). Where one reproduction key disagrees with a filed VERIFIED answer, the derivation stands and the key is recorded as wrong in the file's fold record (Q47, Q70, Q78, Q108, Q129, Q134). The primary source is the mdcatpapers.com transcription, accessed 31 Oct 2026; its Q7/Q28/Q89 garbling is disclosed, not hidden.

Question 1 Physics

In isochoric process:

- A. Pressure is kept constant
- B. Exchange of heat is zero
- C. Volume is kept constant ✓ **Correct answer**
- D. Temperature is kept constant

A. That defines an isobaric process, not an isochoric one.

B. That defines an adiabatic process, not an isochoric one.

C. "Isochoric" means constant volume (Greek *choros*, place/volume); with no volume change no PV work is done; correct.

D. That defines an isothermal process, not an isochoric one.

Question 2 Physics

If 42 J heat is transferred to the system during expansion, what is the change in internal energy when work done is 32 J?

- A. 74 J
- B. 10 J ✓ **Correct answer**
- C. 116 J
- D. 106 J

+ 32: adds the work instead of subtracting it; work done BY the system during expansion leaves the system, so it is subtracted.

B. First law, ΔU = Q − W = 42 − 32 = 10 J; correct.

C. No combination of 42 and 32 gives 116; a distractor with no derivation.

D. No combination of 42 and 32 gives 106; a distractor with no derivation.

Question 3 Physics

The 1st law of thermodynamics is the generalization of the law of conservation of:

- A. Mass
- B. Charge
- C. Energy ✓ **Correct answer**
- D. Momentum

A. Mass conservation is a separate classical principle (and mass–energy equivalence belongs to relativity); the first law is not its generalisation.

B. Charge conservation governs electromagnetism, not thermodynamics.

C. The first law states energy can be neither created nor destroyed, only transferred as heat and work; it is conservation of energy applied to thermal systems; correct.

D. Momentum conservation follows from Newton's laws, not from the first law of thermodynamics.

Question 4 Physics

While studying charging and discharging of a capacitor, Rc = Resistance × Capacitance is known as:

- A. Electrostatic constant
- B. Time constant ✓ **Correct answer**

- C. Dielectric constant
- D. Proportionality constant

A. Coulomb's constant in electrostatics; it is not RC.

B. τ = RC sets the timescale of exponential charging/discharging (after time τ the capacitor reaches ~63% of full charge); correct.

C. The relative permittivity of the insulating material; a property of the dielectric, not of RC.

D. A generic term for any constant of proportionality; it does not name RC.

Question 5 Physics

In parallel combination of two capacitors, their equivalent capacitance is equal to:

- A. C1 + C2 ✓ **Correct answer**
- B. 1/C1 + 1/C2
- C. C1C2 / C1 + C2
- D. 2C1C2 / C1 + C2

A. In parallel both capacitors share the same potential difference, so their charges add (Q = Q1 + Q2 = C1V + C2V) and Ceq = C1 + C2; correct.

B. This is the reciprocal-sum form for capacitors in SERIES (1/Ceq = 1/C1 + 1/C2), not parallel.

C. This is the series equivalent capacitance itself, not the parallel one.

D. Twice the series value; no such combination rule exists.

Question 6 Physics

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

- A. Coulomb
- B. Volt

C. Farad ✓ **Correct answer**

- D. Ampere

A. The unit of charge; capacitance is charge PER volt, not charge itself.

B. The unit of potential difference; capacitance is charge per unit potential.

C. 1 farad = 1 coulomb per volt, the SI unit of capacitance; correct.

D. The unit of electric current; unrelated to capacitance.

Question 7 Physics

1 kWh =

- A. 0.36 × 106 J
- B. 36 × 106 J
- C. 3.6 × 106 J ✓ **Correct answer**
- D. 0.036 × 105 J

A. $0.36 \times 10^6 = 3.6 \times 10^5$ J, ten times too small; not the value of 1 kWh.

B. $36 \times 10^6 = 3.6 \times 10^7$ J, ten times too large; not the value of 1 kWh.

C. 3.6×10^6 J, the value of 1 kWh in standard scientific notation; correct.

D. $0.036 \times 10^5 = 3.6 \times 10^3$ J, far too small. FOLD 8 Nov 2026: VERIFIED — 1 kWh = 1000 W × 3600 s = 3.6×10^6 J, uniquely C in the clean option set (ilmkidunya Q7 prints B as 36×10^6 J and keys C; educationinkarachi keys Q7 = C). The mdcatpapers transcription prints B as "36×10^5", which would duplicate C; that is a transcription-exponent error, corrected here to 36×10^6 and disclosed. Decided by assistant under owner's 8 Nov delegation. (The options print "106"/"105" for $10^6/10^5$ — a formatting defect, preserved in sense.)

Note: FILE CORRECTION: the filed mdcatpapers rendering printed option B as '36×10^5', which would duplicate C; corrected to '36×10^6' per the ilmkidunya clean print (Q7: B = 36×10^6 J, key C). See the Q7 note in the reviewed file and fold-in-37o.py.

Question 8 Physics

Volt × Ampere is the unit of:

- A. Current
- B. Volt
- C. Resistance
- D. Power ✓ **Correct answer**

A. Current alone is measured in amperes, not volt × ampere.

B. A volt is joules per coulomb, not volt × ampere.

C. Resistance is volt per ampere (ohm), not volt times ampere.

D. P = V × I, so volt × ampere = watt, the unit of power; correct.

Question 9 Physics

If length of the wire becomes two times to its original value and area becomes one half to its original value, then resistance of the wire becomes:

- A. Double
- B. Four times ✓ **Correct answer**
- C. One half
- D. One forth

A. Accounts for the doubled length only and ignores the halved area.

B. R = ρL/A, so R ∝ L/A; ×2 length and ×1/2 area give a factor 2 ÷ (1/2) = 4; correct.

C. The effect of halving the area alone, reversed; halving area INCREASES resistance.

D. The reciprocal of the correct factor; resistance rises, it does not fall to a quarter. (Option D prints "forth" for "fourth".)

Question 10 Physics

When a charged particle enters the magnetic field parallel, it will:

- A. Deflect toward north
- B. Deflect toward south
- C. Move straight ✓ **Correct answer**
- D. Move in circular path

A. Magnetic deflection has no compass direction; the force depends on the velocity–field geometry, and here it is zero.

B. Same error as A; there is no force to deflect it at all.

C. Magnetic force F = q(v × B); with v parallel to B the cross product is zero, so no force acts and the particle continues undeflected; correct.

D. That is the motion when velocity is PERPENDICULAR to the field, not parallel to it.

Question 11 Physics

The dimension of magnetic field strength is same as that of:

- A. Magnetic flux
- B. Magnetic induction ✓ **Correct answer**
- C. Work done
- D. Magnetic force

A. Flux is B × area (weber); its dimensions include an extra area factor, so it does not match field strength.

B. In the textbook usage this paper follows, magnetic induction (B) and magnetic field strength are used for the same quantity B, so this is the keyed answer. Flagged: in strict SI, field strength H (A/m) and induction B (tesla) have DIFFERENT dimensions; the answer rests on the paper's loose terminology, not on strict SI dimensional analysis.

rk has dimensions of energy (ML^2T^{-2}), unrelated to any magnetic quantity here.

D. Force has dimensions MLT^{-2}; it is what the field exerts on a charge, not the field itself.

Question 12 Physics

The weber is unit of measure of:

- A. Conductance
- B. Electric current
- C. Magnetic flux ✓ **Correct answer**
- D. Electric flux

A. Measured in siemens, the reciprocal of resistance; not the weber.

B. Measured in amperes; not the weber.

C. 1 weber = 1 tesla·m^2, the SI unit of magnetic flux; correct.

D. Measured in volt·metres (or newton·m^2/C); the weber belongs to magnetic flux, not electric flux.

Question 13 Physics

The Lenz's law is also statement of law of conservation of:

- A. Charge
- B. Mass
- C. Energy ✓ **Correct answer**
- D. Pressure

A. Charge conservation is a separate law; Lenz's law does not state it.

B. Mass conservation is unrelated to induced emf direction.

C. Lenz's law (induced current opposes the change producing it) ensures no energy is created from nothing; a current aiding the change would feed itself and violate energy

rvation; correct.

D. Pressure conservation is not a physical law and has nothing to do with induction.

Question 14 Physics

In Fleming's right hand rule, the second finger indicates:

- A. Force
- B. Magnetic field
- C. Induced current ✓ **Correct answer**
- D. Motion

A. Force is not one of the three quantities in Fleming's right-hand (generator) rule.

B. The field is shown by the FIRST (fore/index) finger in this rule, not the second.

C. Counting thumb (motion), forefinger (field), middle finger (current), the "second finger" after the forefinger is the middle finger, which shows the induced current; correct on that counting. Flagged: "second finger" is ambiguous — anatomically the index finger is the second finger, which would make B the answer; the key rests on the textbook counting (forefinger = first, middle = second).

D. Motion (of the conductor) is shown by the thumb, not by any finger.

Question 15 Physics

A current generator is a device that converts:

- A. Mechanical energy into electrical energy ✓ **Correct answer**
- B. Chemical energy into mechanical energy
- C. Sound energy into mechanical energy
- D. Electrical energy into mechanical energy

A. A generator rotates a coil in a magnetic field (electromagnetic induction) and turns mechanical work into electrical energy; correct.

It describes a heat engine burning fuel; a generator does not run on a chemical-to-mechanical step.

C. That describes a microphone diaphragm, not a generator.

D. That is a MOTOR, the reverse of a generator.

Question 16 Physics

A device that converts AC into DC is called:

- A. Diode ✓ **Correct answer**
- B. Transistor
- C. Capacitor
- D. Inductor

A. A diode conducts in one direction only, so it rectifies AC into pulsating DC; it is the rectifying element of the device (a rectifier); correct as the only rectifying option.

B. Used for amplification and switching; it does not itself convert AC to DC.

C. Smooths (filters) pulsating DC after rectification; it does not rectify.

D. Opposes changes in current and is used in filters; it does not rectify AC to DC.

Question 17 Physics

The conversion of alternating current into direct current is called:

- A. Amplification
- B. Rectification ✓ **Correct answer**
- C. Magnification
- D. Resolution

A. Increasing the size of a signal; not AC-to-DC conversion.

B. The standard technical term for converting AC into DC; correct.

arging an image; an optics term, irrelevant here.

D. Separating close objects or detail; an optics/instrumentation term, irrelevant here.

Question 18 Physics

In full wave rectification, _____ diodes are used.

- A. 1
- B. 2 ✓ **Correct answer**
- C. 3
- D. 4

A. One diode gives HALF-wave rectification only; it cannot rectify both half-cycles.

B. Two diodes form the centre-tapped full-wave rectifier, the standard full-wave circuit the stem asks about (the stem does not say "bridge"); correct.

C. No standard full-wave rectifier uses three diodes.

D. Four diodes form the BRIDGE full-wave rectifier; correct only if the stem had said "bridge", which it does not. FOLD 8 Nov 2026: answer corrected D → B — both full second reproductions key B (ilmkidunya Q18 = B; educationinkarachi Q18 = B), and the centre-tapped circuit is the default full-wave reading. Decided by assistant under owner's 8 Nov delegation.

Note: ANSWER CORRECTED D → B on the 8 Nov 2026 fold: both full second reproductions key B (ilmkidunya Q18 = B; educationinkarachi Q18 = B); the centre-tapped circuit is the default full-wave reading. Decided by assistant under owner's 8 Nov delegation.

Question 19 Physics

The time taken for half the number of atoms of radioactive isotopes to disintegrate is called:

- A. Average life

- B. Mean life
- C. Total life
- D. Half life ✓ **Correct answer**

A. The average lifetime of a nucleus (mean life, 1/λ); it is longer than the half-life by a factor 1/ln 2, not the half-decay time.

B. Same as average life (τ = 1/λ ≈ 1.44 × half-life); not the half-decay time.

C. Not a defined quantity for a decaying sample; the number of atoms approaches zero asymptotically and never all decay at one "total" time.

D. By definition, the time for half the original nuclei to decay; correct.

Question 20 Physics

A 32g radioactive element decays and remains 2g after 60 days. What is half-life of this radioactive element?

- A. 2 days
- B. 6 days
- C. 10 days
- D. 15 days ✓ **Correct answer**

A. No halving count gives this: 60 days at 2 days per half-life would leave an immeasurably small fraction, not 2 g.

B. 60/6 = 10 half-lives would reduce 32 g by 2^{10}, far below 2 g.

C. 6 half-lives would reduce 32 g to 0.5 g, not 2 g.

D. 32 g → 16 → 8 → 4 → 2 g is 4 half-lives; 60 ÷ 4 = 15 days per half-life; correct.

Question 21 Physics

If the car is slowing down along negative x axis then acceleration will be along:

A. Positive x Axis ✓ **Correct answer**

- B. Negative x Axis
- C. Positive y Axis
- D. Negative y Axis

A. Slowing down means acceleration opposes velocity; velocity is along −x, so acceleration points along +x; correct.

B. Acceleration in the same direction as velocity would SPEED the car up, not slow it down.

C. No y-motion is involved; a y-acceleration would change direction, not speed along x.

D. Same error as C, in the opposite y-direction.

Question 22 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
- D. Anti-parallel to the radius

A. Velocity is the time derivative of position, so at each instant it points along the direction of motion, tangent to the path; correct.

B. Perpendicular to the tangent would be the normal direction (acceleration's direction in circular motion), not velocity.

C. The radius points toward the centre (normal direction); velocity is perpendicular to it.

D. Also along the normal line, away from the centre; velocity never points along the radius.

Question 23 Physics

In perfectly elastic collision:

- A. Only momentum is conserved
- B. Only total energy is conserved
- C. Only kinetic energy is conserved
- D. Momentum, kinetic energy and total energy, all are conserved ✓ **Correct answer**

A. Too narrow: in a perfectly elastic collision kinetic energy is conserved as well.

B. Total energy is conserved in ALL collisions (including inelastic ones), so this understates the elastic case.

C. Too narrow: momentum is conserved in every collision, elastic or not.

D. The definition of a perfectly elastic collision is conservation of both momentum and kinetic energy, and total energy is conserved throughout; correct.

Question 24 Physics

The slope of a displacement-time graph is equal to:

- A. Velocity ✓ **Correct answer**
- B. Displacement
- C. Acceleration
- D. Distance

A. Slope = change in displacement ÷ change in time = velocity; correct.

B. Displacement is the VALUE plotted on the vertical axis, not its slope.

C. Acceleration is the slope of a VELOCITY–time graph, not a displacement–time graph.

D. Distance is the total path length; it is not read from the slope of this graph.

Question 25 Physics

Range of a projectile on a horizontal plane is same for the following pair of angle:

- A. 15 & 30
- B. 60 & 20
- C. 75 & 15 ✓ **Correct answer**
- D. 50 & 25

A. 15 + 30 = 45°, not 90°, so sin 2θ differs and the ranges differ.

B. 60 + 20 = 80°, not 90°; the ranges differ.

C. Range ∝ sin 2θ; 75 + 15 = 90° (complementary angles), so sin 150° = sin 30° and the ranges are equal; correct.

D. 50 + 25 = 75°, not 90°; the ranges differ.

Question 26 Physics

The product of force and time is equal to:

- A. Angular momentum
- B. Force
- C. Change in momentum ✓ **Correct answer**
- D. Velocity

A. Angular momentum is r × p (moment of momentum), not F × t.

B. Force is one factor of the product, not the product itself.

C. Impulse J = F × Δt = Δp by Newton's second law in impulse form; correct.

D. Velocity is momentum divided by mass; F × t has the units of momentum, not velocity.

Question 27 Physics

At what point during the motion of projectile its vertical component of velocity is zero?

- A. Point of projection
- B. Landing point
- C. Highest point ✓ **Correct answer**
- D. Just before landing

A. The vertical component is at its maximum (upward) at launch, not zero.

B. The vertical component is large and downward at landing, equal in magnitude to the launch value.

C. Gravity steadily reduces the upward component to zero at maximum height, where it momentarily vanishes before reversing; correct.

D. The vertical component is near its maximum downward value just before landing, not zero.

Question 28 Physics

An object has 1 J of PE. What is the work done in terms of height?

- A. 1 J ✓ **Correct answer**
- B. 10 J
- C. 0 J
- D. 0.1 J

A. The work done against gravity in raising the object to a height where its gravitational potential energy is 1 J equals the gain in potential energy, $W = \Delta PE = 1$ J; correct.

B. No quantity in the stem yields 10 J; it is an unsupported distractor.

C. Zero work would follow only if the height did not change ($\Delta h = 0$), which the stem never states; not the answer.

quantity in the stem yields 0.1 J; it is an unsupported distractor. FOLD 8 Nov 2026: answer corrected C → A — both full second reproductions key A (ilmkidunya Q28 = A; educationinkarachi Q28 = A), and W = ΔPE = 1 J is the only derivation the given 1 J supports. The stem is loosely worded ("in terms of height"); the reading is work done against gravity = gain in PE. The mdcatpapers transcription says "A projectile"; both reproductions say "An object" — the stem follows the reproductions. Decided by assistant under owner's 8 Nov delegation.

Note: ANSWER CORRECTED C → A on the 8 Nov 2026 fold: both full second reproductions key A (ilmkidunya Q28 = A; educationinkarachi Q28 = A); W = ΔPE = 1 J. The stem follows the reproductions ('An object'); mdcatpapers says 'A projectile'. Decided by assistant under owner's 8 Nov delegation.

Question 29 Physics

Power is dot product of:

- A. Force and displacement
- B. Force and velocity ✓ **Correct answer**
- C. Force and time
- D. Work and time

A. The dot product F · s is WORK, not power.

B. Instantaneous power P = F · v (work rate, F · ds/dt); correct.

C. F × t is impulse (change in momentum), not power.

D. Power is work DIVIDED by time, not the dot product of work and time (and work and time are scalars, so a dot product does not apply).

Question 30 Physics

The area under force-displacement graph gives:

A. Displacement

- B. Power
- C. Work ✓ **Correct answer**
- D. Acceleration

A. Displacement is the horizontal axis itself, not the area under the curve.

B. Power is work per unit time; the F–s area has units of energy, not power.

C. Work = ∫F ds, the area under the force–displacement curve; correct.

D. Acceleration comes from force ÷ mass, not from the area under this graph.

Question 31 Physics

A body of mass 'm' is moving with velocity 'v'. After a short interval of time its velocity becomes double. How many times its K.E will increase or decrease?

- A. 2 time increased
- B. 2 time decreased
- C. 4 time increased ✓ **Correct answer**
- D. 4 time decreased

A. Assumes kinetic energy scales linearly with velocity; it scales with velocity SQUARED.

B. Wrong in both factor and direction: kinetic energy cannot decrease when speed increases.

C. KE = ½mv^2; doubling v multiplies KE by $2^2 = 4$; correct.

D. Right factor, wrong direction: faster motion means MORE kinetic energy, not less.

Question 32 Physics

The relation between radian and degree is:

- A. 1 rad = 57.3° ✓ **Correct answer**

B. 1° = 57.3 rad

- C. 1 rad = 1°
- D. 1° = π rad

A. 1 rad = 180/π ≈ 57.2958°, conventionally 57.3°; correct.

B. Reversed: one degree is a small angle, π/180 ≈ 0.0175 rad, not 57.3 rad.

C. False: a radian is nearly sixty times larger than a degree.

D. False: π rad = 180°, so one degree is π/180 rad, not π rad.

Question 33 Physics

In case of centripetal force the value of instantaneous acceleration is given by:

- A. ac = v/r
- B. ac = v2/r ✓ **Correct answer**
- C. ac = vr
- D. ac = v2r

A. v/r is the angular speed ω, not an acceleration (wrong dimensions).

B. Printed "v2/r" for v^2/r: centripetal acceleration a = v^2/r, directed toward the centre; correct.

C. Has dimensions of (length^2/time), not acceleration; no such formula exists.

D. v^2r grows with radius, the opposite of the true 1/r dependence; wrong.

Question 34 Physics

An electric motor turns at 400 revolutions per minute. Its angular velocity in rad/s will be:

- A. 20π/3
- B. 30π/3

C. 40π/3 ✓ **Correct answer**

- D. 30π/4

A. Half the correct value: uses π instead of 2π per revolution.

B. Equals 10π; no correct conversion of 400 rpm gives this.

C. ω = 400 rev/min × 2π rad/rev ÷ 60 s/min = (400 × 2π)/60 = 40π/3 rad/s; correct.

D. No correct conversion of 400 rpm gives this; a distractor.

Question 35 Physics

A disc, a hoop and a sphere are rolling down from an inclined plane simultaneously. Which object will reach at the bottom first?

- A. Hoop
- B. Disc
- C. Sphere ✓ **Correct answer**
- D. All at the same time

A. A hoop has $I = MR^2$, the LARGEST fraction of its mass at the rim, so the least energy goes to translation and it is the slowest.

B. A solid disc has $I = \frac{1}{2}MR^2$, faster than the hoop but slower than the sphere.

C. A solid sphere has $I = \frac{2}{5}MR^2$, the smallest rotational inertia of the three, so the greatest share of energy goes to translation and it accelerates fastest; correct.

D. True only for SLIDING (frictionless) objects; for rolling objects the moment of inertia decides, so they arrive at different times.

Question 36 Physics

The centripetal force formula is:

- A. Fc = mω2

B. Fc = mrω

- C. Fc = mrω2 ✓ **Correct answer**
- D. Fc = mr2ω

A. Omits the radius r; dimensionally wrong (no length).

B. Omits one power of ω; equals mv, a momentum, not a force.

C. Printed "mrω2" for $mr\omega^2$: since v = rω, $Fc = mv^2/r = m(r\omega)^2/r = mr\omega^2$; correct.

D. Has r^2 and only one ω; dimensionally wrong and gives the wrong dependence on both.

Question 37 (original numbering) — Excluded (unrecoverable: figure not read)

ORIGINAL Q37 (numbering offset: this question sits between file Q36 and file Q37; the file's Q37 is original Q38). In the following figure the wavelength is:

- A. 2 m
- B. 1.5 m
- C. 1 m
- D. 0.5 m

No answer is given for this question, and none is taught. FIGURE-DEPENDENT AND UNRECOVERABLE IN TEXT: the wavelength is read from the figure, which is carried as an image in both full second reproductions (ilmkidunya Q37; educationinkarachi Q37) and is not readable in any text fetch. Both reproduction keys agree on C (1 m) — recorded here openly — but no answer is taught without the figure: the wavelength cannot be derived, and the four options cannot honestly be explained, from the text alone. What would reinstate it: a live-browser / PDF-image read of the figure (the figure, not the key, is the missing evidence). Excluded as unrecoverable, decided by assistant under owner's 8 Nov delegation, 8 Nov 2026. This question must never be taught as having an answer until the figure is read.

— cannot be confirmed or ruled out from the text alone; the wavelength is the distance between two successive crests in the figure, which is not available in text fetch.

B. 1.5 m — cannot be confirmed or ruled out from the text alone; the wavelength is read from the figure, which is not available in text fetch. (Both reproduction keys agree on C, 1 m — recorded, not taught.)

C. 1 m — the value both reproduction keys agree on (ilmkidunya Q37 = C; educationinkarachi Q37 = C), recorded here openly; NOT taught as the answer, because the figure that would derive it has not been read.

D. 0.5 m — cannot be confirmed or ruled out from the text alone; the wavelength is read from the figure, which is not available in text fetch.

Question 37 Physics

With increase in pressure, the speed of sound will:

- A. Increase
- B. Decrease
- C. First increase then decrease
- D. Remain the same ✓ **Correct answer**

A. At fixed temperature, raising pressure raises density in the same proportion, so the ratio (elasticity/density) that sets sound speed does not change.

B. Same error in reverse; pressure alone does not lower sound speed at fixed temperature.

C. No such non-monotonic pressure effect exists for sound speed in an ideal gas.

D. For an ideal gas $v = \sqrt{(\gamma RT/M)}$, which depends on temperature, not on pressure at fixed temperature; correct (the statement assumes temperature is held fixed, the standard textbook condition).

Question 38 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. The surface over which a wave has the same phase (e.g. the leading surface of a spreading wave); not the raised portion.

B. The point/portion of maximum displacement ABOVE the mean (equilibrium) level; correct.

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

D. The distance between two successive crests (or troughs); a length, not a portion of the wave.

Question 39 Physics

The maximum displacement of particles of a medium, on either side of the mean position of a wave, is called:

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

A. The distance between repeating points of a wave; it is a length along the wave, not a displacement from equilibrium.

B. The number of oscillations per second; a rate, not a displacement.

C. By definition, the maximum displacement from the mean position on either side;

D. The crest is the LOCATION of maximum upward displacement, not the measure of that displacement.

Question 40 Biology

Na+ (sodium ions) are nearly _____ times greater in fluid outside the cell than inside:

- A. 10 ✓ **Correct answer**
- B. 30
- C. 2
- D. 3

A. Extracellular Na^+ (~145 mmol/L) is roughly an order of magnitude above intracellular Na^+ (~10–15 mmol/L), maintained by the Na^+/K^+ pump; "nearly 10 times" is the textbook figure and the keyed answer. Flagged: the measured ratio is about 10–14 (roughly 12:1), so the answer rests on the textbook "10 times" convention and on 10 being the nearest option.

B. Far above the real gradient; no cell maintains a 30-fold Na^+ ratio.

C. Far too small a gradient to drive the Na^+-dependent transport and excitability the gradient serves.

D. Also far too small; the real gradient is an order of magnitude, not threefold.

Question 41 Biology

Which hormone induces labour pains?

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

rogen rises before labour and increases uterine sensitivity to oxytocin, but it does not itself trigger the contractions.

B. Released from the posterior pituitary, it stimulates strong uterine contractions and induces/strengthens labour pains (positive feedback); correct.

C. Progesterone MAINTAINS pregnancy and relaxes the uterus; its fall permits labour, but it does not induce contractions.

D. Luteinising hormone drives ovulation and corpus luteum function; it has no role in inducing labour.

Question 42 Biology

Hormone secreted in bulk due to decreased water content of blood is:

- A. Anti-Diuretic Hormone (ADH) ✓ **Correct answer**
- B. Oxytocin
- C. Glucagon
- D. Thyroxin

A. Falling blood water (rising osmolarity) is sensed by osmoreceptors, triggering ADH release; ADH increases water reabsorption in the kidney; correct.

B. A posterior-pituitary hormone for uterine contraction and milk ejection; it is not the water-balance hormone.

C. Raises blood glucose in response to low glucose, not low water.

D. Regulates metabolic rate; it does not respond to blood water content.

Question 43 Biology

The site of production of neurotransmitters is:

- A. Postsynaptic neuron

B. Presynaptic neuron ✓ **Correct answer**

- C. Synaptic cleft
- D. Dendrite

A. The postsynaptic cell RECEIVES the transmitter at its receptors; it does not produce it.

B. Transmitters are synthesised in the presynaptic neuron (in the cell body and/or the terminal) and packaged into synaptic vesicles for release; correct.

C. The gap across which transmitter DIFFUSES; nothing is produced in the gap itself.

D. Dendrites receive signals; transmitter production is a presynaptic (usually axon-terminal) function, not a dendritic one.

Question 44 Biology

Endorphins are produced in:

- A. Brain ✓ **Correct answer**
- B. Adrenal gland
- C. Stomach
- D. Thymus

A. Endorphins (endogenous opioid peptides) are produced principally in the central nervous system — hypothalamus/pituitary and brain — where they modulate pain and reward; correct.

B. The adrenal medulla produces adrenaline/noradrenaline and the cortex produces steroid hormones; endorphins are not an adrenal product.

C. The stomach produces gastrin, HCl and pepsinogen; not endorphins.

D. The thymus matures T-lymphocytes and produces thymosins; not endorphins.

Question 45 Biology

The hormone responsible for production of sperm cells and male secondary sexual characteristics is:

- A. Estrogen
- B. Progesterone
- C. Testosterone ✓ **Correct answer**
- D. Thyroxin

A. The principal female sex hormone; in males it is present only in small amounts and does not drive spermatogenesis or male characteristics.

B. A female hormone of pregnancy; it does not produce sperm or male secondary characteristics.

C. Produced by Leydig cells, it drives spermatogenesis (with FSH) and the development and maintenance of male secondary sexual characteristics; correct.

D. Regulates metabolic rate generally; it has no specific role in sperm production or male characteristics.

Question 46 Biology

Leydig cells are responsible for:

- A. Testosterone production ✓ **Correct answer**
- B. FSH production
- C. Sperm production
- D. Testosterone inhibition

A. Leydig (interstitial) cells of the testis synthesise and secrete testosterone under LH stimulation; correct.

B. FSH is produced by the anterior pituitary, not by Leydig cells.

rm are produced by germ cells in the seminiferous tubules (supported by Sertoli cells), not by Leydig cells.

D. Leydig cells produce testosterone; they do not inhibit it (inhibin, from Sertoli cells, inhibits FSH, not testosterone production by Leydig cells).

Question 47 Biology

The estrogen hormone secretion during the oogenesis is stimulated by:

- A. Leutinizing Hormone
- B. Inhibin Hormone
- C. Follicle Stimulating Hormone ✓ **Correct answer**
- D. Testosterone Hormone

A. LH triggers ovulation and corpus luteum formation; the follicular-phase estrogen rise is driven by FSH, not LH (option prints "Leutinizing" for Luteinizing).

B. Inhibin SUPPRESSES FSH secretion (negative feedback); it does not stimulate estrogen secretion.

C. FSH stimulates the ovarian follicle's granulosa cells to secrete estrogen as the follicle matures during oogenesis; correct.

D. Testosterone is the male androgen; it does not stimulate ovarian estrogen secretion (ovarian androgens are precursors converted to estrogen, but the stimulus is FSH).

Question 48 Biology

Which of the following hormones of the pituitary gland regulate the menstrual cycle?

- A. Follicle Stimulating Hormone and estrogen
- B. Luteinizing hormone and estrogen
- C. Follicle Stimulating Hormone and Luteinizing hormone ✓ **Correct answer**
- D. Estrogen and progesterone

y FSH here is pituitary; estrogen is an OVARIAN hormone, so the pair is not both pituitary.

B. Same error: estrogen is ovarian, not pituitary.

C. Both are anterior-pituitary gonadotropins that together regulate follicle development, ovulation and the corpus luteum, i.e. the menstrual cycle; correct.

D. Both are ovarian hormones; neither is secreted by the pituitary.

Question 49 Biology

Which of the following traits is transmitted directly from an affected father to only his son?

- A. Autosomal
- B. X-linked
- C. Y-linked ✓ **Correct answer**
- D. X-Y linked

A. Autosomal traits pass from either parent to sons AND daughters; they do not show father-to-son-only transmission.

B. A father gives his X chromosome to his DAUGHTERS, never to his sons (sons get his Y), so an X-linked trait cannot pass father → son.

C. The Y chromosome passes only from father to son, so a Y-linked trait is transmitted directly from an affected father to all his sons and to no daughter; correct.

D. Not a standard inheritance category; traits are not jointly "X-Y linked" in this sense (pseudoautosomal regions behave differently and do not give father-to-son-only transmission).

Question 50 Biology

When both the alleles of a gene pair are same, the organism is said to be:

- A. Heterozygous
- B. Genotype
- C. Homozygous ✓ **Correct answer**
- D. Phenotype

A. Means the two alleles DIFFER (one dominant, one recessive); the opposite of the stem.

B. The organism's genetic constitution generally, not the state of having identical alleles.

C. Both alleles of a gene pair identical (both dominant or both recessive); correct.

D. The observable trait produced by the genotype, not the allele state itself.

Question 51 Biology

This theory says that 'mitochondria and chloroplasts are, in effect, ancient bacteria which now live inside the larger cells'?

- A. Darwin's theory of evolution
- B. Lamarckism
- C. Neo-darwinism
- D. Endosymbiotic theory ✓ **Correct answer**

A. Natural selection explains adaptation and speciation; it does not propose that organelles were once free-living bacteria.

B. Inheritance of acquired characteristics; it says nothing about the bacterial origin of organelles.

C. The modern synthesis (Darwin + genetics); it does not address the origin of mitochondria/chloroplasts as endosymbionts.

D. Proposes mitochondria and chloroplasts originated as free-living prokaryotes engulfed

ancestral cell, supported by their double membranes, circular DNA and bacterial-type ribosomes; correct.

Question 52 Biology

The organs which are similar in function but differ in structure are called:

- A. Analogous organs ✓ **Correct answer**
- B. Homologous organs
- C. Convergent organs
- D. Divergent organs

A. Same function, different structural origin (e.g. wings of insects and birds), arising by convergent evolution; correct.

B. The reverse: similar STRUCTURE from a common ancestor, even if functions differ (e.g. forelimbs of whale, bat and human).

C. "Convergent evolution" is the PROCESS producing analogous organs; "convergent organs" is not the name for the organs themselves.

D. Not a standard term; divergent evolution produces homologous structures with different functions, not this definition.

Question 53 Biology

Which may NOT be a mode of action of an antibody?

- A. Neutralizing an antigen
- B. Precipitating an antigen
- C. Secretion of cytokines ✓ **Correct answer**
- D. Enhancing phagocytosis

A. Antibodies block toxins and viruses by binding them; a standard antibody action.

B. Antibodies cross-link soluble antigens into insoluble complexes

pitation/agglutination); a standard antibody action.

C. Antibodies are protein molecules, not cells; they cannot secrete anything. Cytokines are secreted by immune CELLS (T cells, macrophages); correct as the NOT.

D. Opsonisation: antibody coating marks a pathogen for phagocytes; a standard antibody action.

Question 54 Biology

Pepsinogen is converted into its active form pepsin by:

- A. Proteolytic enzyme action
- B. Dissolving in mucus
- C. Hormonal action
- D. Hydrochloric acid ✓ **Correct answer**

A. Pepsin, once formed, does autocatalytically activate more pepsinogen, but the INITIAL activation in the stomach is by acid; the paper's keyed trigger is HCl.

B. Mucus PROTECTS the stomach lining from acid and pepsin; it does not activate pepsinogen.

C. Hormones (e.g. gastrin) stimulate SECRETION of pepsinogen and HCl; no hormone converts pepsinogen to pepsin.

D. HCl from parietal cells provides the acid pH that cleaves pepsinogen into active pepsin; correct.

Question 55 Biology

Intrinsic factor is secreted by:

- A. Pancreas
- B. Liver
- C. Stomach ✓ **Correct answer**

D. Duodenum

A. Secretes digestive enzymes and bicarbonate into the duodenum, not intrinsic factor.

B. Secretes bile; it does not produce intrinsic factor.

C. Intrinsic factor is secreted by the parietal cells of the stomach and is essential for vitamin B_{12} absorption in the ileum; correct.

D. Secretes hormones (e.g. secretin) and receives bile/pancreatic juice; intrinsic factor comes from the stomach, upstream of it.

Question 56 Biology

The cells which play very important role in developing immunity are:

- A. Monocytes
- B. Neutrophils
- C. Lymphocytes ✓ **Correct answer**
- D. Thrombocytes

A. Phagocytic cells of innate immunity (becoming macrophages); important, but specific adaptive immunity is lymphocyte-driven.

B. First-responder phagocytes of innate immunity; they do not produce antibodies or immunological memory.

C. B cells produce antibodies and T cells mediate cell-mediated immunity and memory — the cells of specific, adaptive immunity; correct.

D. Platelets; they clot blood and do not develop immunity.

Question 57 Biology

Digestion of which food component starts from oral cavity?

- A. Proteins

B. Fats

- C. Carbohydrates ✓ **Correct answer**
- D. Vitamins

A. Protein digestion begins in the stomach (pepsin); saliva has no protease of consequence.

B. Fat digestion begins effectively in the small intestine (bile + lipase); lingual lipase plays only a minor role.

C. Salivary amylase (ptyalin) in the mouth begins starch digestion; correct.

D. Vitamins are absorbed, not digested; no digestion of vitamins starts in the mouth.

Question 58 Biology

Vaccination is an example of:

- A. Natural passive immunity
- B. Natural active immunity
- C. Acquired/Artificial active immunity ✓ **Correct answer**
- D. Acquired/Artificial passive immunity

A. Antibodies acquired NATURALLY without effort, e.g. maternal antibodies across the placenta or in milk; vaccination is neither natural nor passive.

B. Immunity from NATURALLY catching the disease and recovering; vaccination is a deliberate, artificial exposure.

C. Vaccination deliberately exposes the body to antigen so the person's OWN immune system responds and forms memory — artificial (man-made) and active (host-produced); correct.

D. Ready-made antibodies INJECTED (e.g. antiserum/antitoxin); the recipient makes no response of their own, unlike vaccination.

Question 59 Biology

The heart chamber from where aorta originates:

- A. Left ventricle ✓ **Correct answer**
- B. Right ventricle
- C. Left atrium
- D. Right atrium

A. The aorta arises from the left ventricle, which pumps oxygenated blood into the systemic circulation; correct.

B. Gives rise to the pulmonary trunk/artery, carrying deoxygenated blood to the lungs.

C. Receives oxygenated blood from the pulmonary veins; no great vessel originates from it.

D. Receives deoxygenated blood from the venae cavae; no great vessel originates from it.

Question 60 Biology

Pubic symphysis and inter vertebral disc are the example of:

- A. Fibrous joints
- B. Synovial joints
- C. Cartilaginous joints ✓ **Correct answer**
- D. Gliding joints

A. Bones joined by fibrous tissue with essentially no movement (e.g. skull sutures); the pubic symphysis and discs allow slight movement and are cartilage-joined.

B. Freely movable joints with a fluid-filled cavity (e.g. knee, shoulder); neither example has a synovial cavity.

C. Bones joined by cartilage (fibrocartilage in both examples), permitting limited movement and cushioning; correct.

YPE of synovial joint (flat bones sliding, e.g. wrist); neither example is synovial at all.

Question 61 Biology

Cartilage is more difficult to heal than bone because cartilage:

- A. Lacks vascular supply ✓ **Correct answer**
- B. Lacks mineral deposits in matrix
- C. Has less number of cells deep down
- D. Lacks protein in matrix

A. Cartilage is avascular: without blood vessels, nutrients and repair cells reach it only slowly by diffusion, so healing is poor; bone is richly vascularised and heals well; correct.

B. True of cartilage (its matrix is unmineralised), but mineral content is not what limits healing; avascularity is.

C. Chondrocyte numbers are not the limiting factor; even well-populated cartilage heals poorly without a blood supply.

D. False: the cartilage matrix is rich in protein (collagen and proteoglycans); it does not lack protein.

Question 62 Biology

Which feature is absent from cardiac muscles?

- A. Intercalated disc
- B. Multinucleate cells ✓ **Correct answer**
- C. Light and dark bands
- D. Contractile sarcomeres

A. Present in cardiac muscle: the specialised junctions coupling adjacent cardiac cells; its presence is diagnostic.

B. Multinucleate fibres are the hallmark of SKELETAL muscle; cardiac muscle cells are

lly uninucleate (one central nucleus, occasionally two), so multinucleate cells as a feature are absent; correct.

C. Present: cardiac muscle is striated, showing light (I) and dark (A) bands like skeletal muscle.

D. Present: sarcomeres are the contractile units of all striated muscle, cardiac included.

Question 63 Biology

Sarcoplasmic reticulum of muscle fibers is mainly responsible for:

- A. Calcium storage ✓ **Correct answer**
- B. Protein synthesis
- C. Lipid metabolism
- D. Storing cell wastes

A. The sarcoplasmic reticulum is a specialised endoplasmic reticulum that stores Ca^{2+} and releases it to trigger contraction, then re-sequesters it for relaxation; correct.

B. The job of ribosomes and the ROUGH endoplasmic reticulum, not the sarcoplasmic reticulum.

C. A function of the SMOOTH endoplasmic reticulum in liver and steroid-secreting cells, not the sarcoplasmic reticulum's main role.

D. Wastes are handled by vacuoles/lysosomes and excretion; the sarcoplasmic reticulum stores no wastes.

Question 64 Biology

The junction between two neurons is:

- A. Impulse
- B. Synapse ✓ **Correct answer**
- C. Axon

D. Cleft

A. The nerve impulse is the SIGNAL that travels, not the junction it crosses.

B. The specialised junction between two neurons (or a neuron and an effector) where transmission occurs; correct.

C. The conducting fibre of a neuron; a part of the neuron, not the junction between two neurons.

D. The synaptic cleft is only the GAP within the synapse, not the junction as a whole.

Question 65 Biology

Which hormone is chemically a steroid?

- A. ADH
- B. Thyroxin
- C. Cortisone ✓ **Correct answer**
- D. Insulin

A. Antidiuretic hormone (vasopressin) is a peptide hormone (9 amino acids), not a steroid.

B. An iodinated amino-acid derivative (tyrosine-based), not a steroid.

C. A glucocorticoid steroid hormone derived from cholesterol, with the four-ring steroid structure; correct.

D. A protein (polypeptide) hormone from the pancreas, not a steroid.

Question 66 Biology

Under activity of parathyroid glands causes a drop in blood of:

- A. Mg2+
- B. Na+
- C. K+

D. Ca2+ ✓ **Correct answer**

A. Parathyroid hormone has only minor effects on magnesium; hypoparathyroidism does not characteristically drop blood Mg^{2+}.

B. Sodium balance is controlled mainly by aldosterone/ADH, not by the parathyroids.

C. Potassium balance is controlled mainly by aldosterone and the kidneys, not by the parathyroids.

D. Parathyroid hormone raises blood calcium (bone resorption, renal reabsorption, vitamin D activation); underactivity therefore causes hypocalcaemia — a drop in blood Ca^{2+}; correct.

Question 67 Biology

Which of the following protein establishes the matrix of bone and cartilage?

- A. Elastin
- B. Keratin
- C. Collagen ✓ **Correct answer**
- D. Histone

A. The elastic protein of ligaments, artery walls and skin; it gives stretch, not the bone/cartilage matrix framework.

B. The structural protein of hair, nails, horns and the outer skin; it does not form bone or cartilage matrix.

C. The main fibrous protein of the organic matrix of bone and cartilage, providing tensile strength and the framework for mineral deposition in bone; correct.

D. Nuclear proteins that package DNA into chromatin; they have no extracellular matrix role.

Question 68 Biology

Non-competitive inhibitors react with enzymes at:

- A. Allosteric site ✓ **Correct answer**
- B. Active site
- C. Passive site
- D. Regulatory site

A. The textbook site for non-competitive inhibitors: a site distinct from the active site, where binding changes the enzyme's shape and lowers activity regardless of substrate concentration; the keyed answer.

B. The site of COMPETITIVE inhibitors, which resemble the substrate and compete for it; non-competitive inhibitors do not bind here.

C. Not a recognised enzyme site; a distractor term.

D. Flagged: "regulatory site" is in many texts near-synonymous with the allosteric site, so D overlaps A heavily; the key rests on the paper's convention of naming the site "allosteric" for non-competitive inhibition, and D is not asserted as wrong in substance — only as the less specific textbook label.

Question 69 Biology

Most enzymes work the best at the following temperature:

- A. 30°C
- B. 40°C ✓ **Correct answer**
- C. 50°C
- D. 20°C

A. Below body temperature; enzyme activity is lower than at the optimum, though enzymes still function.

B. The keyed answer: the nearest option to human body temperature, at which most

n enzymes are near their optimum. Flagged: the true optimum for most human enzymes is about 37°C, which is NOT among the options; 40°C is the closest listed value and the answer rests on that nearest-option convention, not on 40°C being the exact optimum.

C. Above the optimum for most human enzymes; activity falls as denaturation begins.

D. Well below the optimum; reaction rates are much reduced at room temperature.

Question 70 Biology

In term of enzyme action, 'maximum temperature' refers to a temperature at which:

- A. Enzymes start to denature ✓ **Correct answer**
- B. Enzymes start to re-nature
- C. Enzymes work best
- D. Enzymes are reactivated

A. Above the optimum, rising temperature breaks the weak bonds holding the enzyme's shape and activity collapses; "maximum temperature" in this paper's usage marks the onset of denaturation; the keyed answer. Flagged: the phrase is a textbook wording convention, not a standard physical constant — the denaturation point varies by enzyme.

B. Denatured enzymes generally do NOT spontaneously re-nature on heating further; heat drives denaturation, not renaturation.

C. Working best defines the OPTIMUM temperature, below the maximum; confusing the two loses the distinction the question tests.

D. Heating past the maximum inactivates enzymes; it does not reactivate them.

Question 71 Biology

_____ reduce the enzymes productivity by blocking the substrate from entering into the active site due to similar shapes:

A. Competitive inhibitors ✓ **Correct answer**

- B. Non-competitive inhibitors
- C. Co-enzymes
- D. Activators

A. They resemble the substrate, compete for the active site and block substrate entry; raising substrate concentration can overcome them; correct.

B. Bind elsewhere (the allosteric site) and do not block the active site by shape similarity; substrate concentration cannot outcompete them.

C. Non-protein helpers (often vitamins/vitamin derivatives) that ASSIST enzymes; they do not block the active site.

D. Molecules that INCREASE enzyme activity; the opposite of inhibitors.

Question 72 Biology

When light falls on P-700, which event is likely to occur?

- A. It induces photolysis
- B. Gains Hydrogen
- C. Accept electrons
- D. It is oxidised ✓ **Correct answer**

A. Photolysis (splitting of water) occurs at photosystem II (P680), not at P700 of photosystem I.

B. P700 gains no hydrogen; it LOSES an electron on excitation and is later re-reduced by electrons arriving via plastocyanin.

C. On absorbing light P700 DONATES an electron to the acceptor chain; accepting electrons is what the downstream acceptors do.

D. Excited P700 ejects an electron (photooxidation) and becomes $P700^{+}$, oxidised until an

on from plastocyanin restores it; correct.

Question 73 Biology

Which of the following molecules are released after completion of light reaction and then utilized in the dark reaction of photosynthesis?

- A. ATP and NADP+
- B. ADP and NADP+
- C. ADP and NADPM
- D. ATP and NADPH ✓ **Correct answer**

A. $NADP^+$ is the OXIDISED form present BEFORE the light reactions reduce it; the light reactions do not release $NADP^+$ for the Calvin cycle.

B. Both are the spent/oxidised forms that RETURN to the light reactions to be recharged; they are inputs, not the released products.

C. ADP is a spent form, and "NADPM" is a misprint (for NADPH) in the option as printed; the pair is wrong in any reading.

D. The light reactions produce ATP (photophosphorylation) and NADPH (reduction of $NADP^+$), which the Calvin cycle (dark reaction) then consumes for energy and reducing power; correct.

Question 74 Biology

Which are the end products of light reactions of photosynthesis?

- A. ATP and NADPH ✓ **Correct answer**
- B. ATP and glucose
- C. Glucose and NADP
- D. ATP and water

A. The chemical energy products of the light-dependent reactions, made for use in the

cycle; correct as the keyed pair (oxygen, the other product, is not among the options).

B. Glucose is made LATER, in the dark reactions (Calvin cycle), not as an end product of the light reactions.

C. Glucose belongs to the dark reactions and NADP ($NADP^+$) is the oxidised starting material, not a product.

D. Water is CONSUMED by photolysis in the light reactions; it is a raw material, not an end product.

Question 75 Biology

Synthesis of ATP during photosynthesis takes place at the region:

- A. Stroma
- B. Thylakoid ✓ **Correct answer**
- C. Matrix
- D. Cisternae

A. The stroma is where the Calvin cycle runs, using ATP; ATP itself is synthesised across the thylakoid membrane, not in the stroma fluid.

B. Photophosphorylation: protons accumulate in the thylakoid lumen and flow through ATP synthase in the thylakoid membrane, making ATP; correct.

C. The mitochondrial matrix is the site of the Krebs cycle, not photosynthetic ATP synthesis.

D. The flattened sacs of the Golgi/ER; they play no role in photophosphorylation.

Question 76 Biology

The complete, mature and infectious virus particle is known as:

- A. Venome
- B. Genome
- C. Virion ✓ **Correct answer**
- D. Capsid

A. Not a standard virology term (venom is an animal toxin; "venome" names nothing here).

B. The viral nucleic acid alone (DNA or RNA); a component, not the complete particle.

C. The complete, fully assembled, infectious virus particle: genome enclosed in its capsid (plus envelope where present); correct.

D. The protein shell alone; a component of the virion, not the whole infectious particle.

Question 77 Biology

All viruses are:

- A. Autotrophs
- B. Heterotrophs
- C. Parasites ✓ **Correct answer**
- D. Predators

A. Autotrophs make their own food by photosynthesis/chemosynthesis; viruses have no metabolism and make nothing themselves.

B. Heterotrophs ingest or absorb organic food; viruses do not feed — they replicate only inside host cells, which is parasitism rather than heterotrophy in the usual sense.

C. Viruses are obligate intracellular parasites: they cannot reproduce or carry out metabolism without hijacking a host cell's machinery; correct.

D. Predators hunt and kill prey; viruses infect cells rather than preying on organisms.

Question 78 Biology

_____ increases the pathogenecity of bacteria:

- A. Capsule ✓ **Correct answer**
- B. Cell wall
- C. Slime
- D. Cell membrane

A. The polysaccharide capsule is the classic virulence factor: it resists phagocytosis and desiccation and aids adhesion, increasing pathogenicity; correct. (The stem prints "pathogenecity" for pathogenicity.)

B. Present in (nearly) all bacteria, pathogenic or not; it is not the factor that specifically increases pathogenicity.

C. The loose slime layer aids adhesion and biofilms, but the defined capsule is the stronger, classic virulence factor the paper keys.

D. Present in all cells; it is not a virulence factor.

Question 79 Biology

The smallest known bacteria belong to the genus:

- A. Mycoplasma ✓ **Correct answer**
- B. Streptococcus
- C. Escherichia
- D. Bacillus

A. Among the smallest free-living bacteria (about 0.2–0.3 μm), characteristically lacking a cell wall; correct.

B. Ordinary-sized cocci in chains, much larger than Mycoplasma and walled.

C. Ordinary-sized rods (e.g. E. coli, ~1–2 μm), much larger than Mycoplasma.

dinary-sized (often large) rods, much larger than Mycoplasma.

Question 80 Biology

Mesenteric veins drain the blood from:

- A. Liver
- B. Large intestine ✓ **Correct answer**
- C. Stomach
- D. Gall bladder

A. The liver is drained by the HEPATIC veins into the inferior vena cava; the portal vein brings blood TO the liver, and mesenteric veins do not drain the liver.

B. The inferior mesenteric vein drains the descending colon, sigmoid and rectum (large intestine) into the portal system, and the superior mesenteric vein drains part of the colon too; the keyed answer. Flagged: the mesenteric system collectively drains the SMALL intestine as well (superior mesenteric vein), which is not an option, so B is the best listed option rather than a complete statement of mesenteric drainage.

C. The stomach is drained mainly by gastric and gastroepiploic veins; it is not the mesenteric veins' territory.

D. Drained by the cystic vein into the portal system; it is not drained by mesenteric veins.

Question 81 Biology

Secondary cell wall in plants is present:

- A. Outer to primary cell wall
- B. In between two primary cell walls
- C. Between the primary cell wall and plasma membrane ✓ **Correct answer**
- D. Inner to plasma membrane

A. Nothing lies outside the primary wall except the middle lamella (shared between cells);

condary wall is deposited INSIDE it.

B. The region between two primary walls is the middle lamella, not a secondary wall.

C. The secondary wall is laid down on the inner face of the primary wall, directly outside the plasma membrane, after cell expansion stops; correct.

D. Inside the plasma membrane is the cytoplasm; no cell wall is deposited there.

Question 82 Biology

What distinguishes Prokaryotic cell wall from Fungal cell wall?

- A. Prokaryotic cell wall contains cellulose
- B. Prokaryotic cell wall contains peptidoglycan ✓ **Correct answer**
- C. Prokaryotic cell wall contains cutin
- D. Prokaryotic cell wall contains silica

A. Cellulose is the PLANT cell-wall polymer; bacterial walls do not contain it.

B. Bacterial walls are built of peptidoglycan (murein), while fungal walls are built of chitin and glucans; this is the distinguishing feature; correct.

C. Cutin is the waxy waterproofing polymer of plant cuticles, not a bacterial wall component.

D. Silica walls belong to diatoms (and some plant phytoliths), not to ordinary prokaryotes.

Question 83 Biology

Pollination is facilitated by:

- A. Chloroplast
- B. Chromoplast ✓ **Correct answer**
- C. Leucoplast
- D. Amyloplast

ries out photosynthesis with green chlorophyll; it does not colour flowers to attract pollinators.

B. Synthesises and stores coloured pigments (carotenoids) that give flowers and fruits their colours, attracting pollinators and so facilitating pollination; correct.

C. Colourless plastids for storage (starch, oils, proteins) in non-green tissues; they produce no attracting colour.

D. A type of leucoplast specialised for starch storage (e.g. in roots); it has no role in pollinator attraction.

Question 84 Biology

Tonoplast is the membrane separating:

- A. Vacuole and Nucleoplasm
- B. Cytoplasm and Nucleoplasm
- C. Vacuole and Stroma
- D. Vacuole and Cytoplasm ✓ **Correct answer**

A. The vacuole never borders the nucleoplasm; the nucleus is bounded by its own envelope.

B. That boundary is the nuclear envelope, not the tonoplast.

C. The stroma is chloroplast fluid; the tonoplast does not border it.

D. The tonoplast is the membrane bounding the central vacuole, separating the vacuolar sap from the surrounding cytoplasm; correct.

Question 85 Biology

Each centriole is composed of _____ of Microtubules:

- A. Seven Triplets

- B. Eleven Triplets
- C. Nine Triplets ✓ **Correct answer**
- D. Five Triplets

A. No standard centriole has seven triplets; the arrangement is ninefold.

B. No standard centriole has eleven triplets.

C. Each centriole is a cylinder of nine microtubule triplets (the 9+0 arrangement); correct.

D. No standard centriole has five triplets.

Question 86 Biology

The folds of Inner Membrane of mitochondria are called:

- A. Cisternae
- B. Cristae ✓ **Correct answer**
- C. Mesosome
- D. Infolds

A. The flattened sacs of the Golgi apparatus and endoplasmic reticulum; not mitochondrial folds.

B. The infoldings of the inner mitochondrial membrane, greatly increasing the surface for oxidative phosphorylation; correct.

C. An outdated term for bacterial membrane invaginations (now regarded as preparation artefacts); not a mitochondrial structure.

D. A generic descriptive word, not the anatomical name; "cristae" is the term.

Question 87 Biology

According to the fluid mosaic model of cell membrane, which zone is embedded inside?

- A. Hydrophobic ✓ **Correct answer**

- B. Hydrophilic
- C. Globular
- D. Filamentous

A. The bilayer's interior core is formed by the hydrophobic fatty-acid tails, embedded between the two layers of hydrophilic heads; correct.

B. The hydrophilic phosphate heads face OUTWARD to the aqueous surroundings on both sides; they are not the embedded interior.

C. Describes the shape of some (globular) proteins, not a membrane zone.

D. Describes thread-like proteins (e.g. cytoskeletal filaments), not a membrane zone.

Question 88 — Excluded (defective)

Select the one which is NOT a function of Smooth Endoplasmic Reticulum (SER)?

- A. Metabolism of lipids
- B. Transmission of impulses
- C. Transport of materials
- D. Processing of glycoproteins

No answer is given for this question, and none is taught. Both B (Transmission of impulses) and D (Processing of glycoproteins) are correct answers to 'which is NOT a function of SER', so no single answer can be asserted. Excluded as DEFECTIVE, decided by assistant under owner's 8 Nov delegation. This question must never be taught as having an answer.

A. A genuine SER function: the smooth ER synthesises lipids and steroids and metabolises them; it is a function of SER, so A is not the NOT.

B. Transmission of impulses is a function of NEURONS (action potentials along axons), not of the smooth ER; B is therefore ALSO a correct answer to "which is NOT a function of SER".

SER (like the ER generally) forms transport vesicles and moves materials within the cell; a genuine ER function, so C is not the NOT.

D. Glycoprotein processing/folding is a function of the ROUGH ER and Golgi apparatus, not the SER; D is the textbook-intended answer (and the key in both second reproductions: ilmkidunya Q89 = D; educationinkarachi Q89 = D), but key agreement does not remove the second correct option B. DEFECTIVE: both B and D are defensible NOT-functions, so the stem has two correct answers and neither is asserted here.

Question 89 Biology

Cell membrane also contains _____ through which the movement of materials takes place by active and passive transport:

- A. Lipids
- B. Carrier proteins ✓ **Correct answer**
- C. Charged pores
- D. Carbohydrates

A. Lipids form the bilayer itself, but the stem asks about the structures through which materials move by active and passive transport, not the bilayer fabric.

B. Carrier proteins bind a substance on one side, change shape, and release it on the other; they mediate BOTH facilitated diffusion (passive) and active transport (pumps use ATP to move substances against their gradient) — the only option covering both mechanisms named in the stem; correct.

C. Pores/channels let ions cross by passive diffusion down their gradient only; they never use energy and cannot perform active transport, so they cannot cover the "active" half of the stem.

D. Membrane carbohydrates form the glycocalyx (cell recognition/identity); they are not transport structures. FOLD 8 Nov 2026: answer corrected C → B — the clean educationinkarachi print reads option B as "Carrier proteins" and gives the stem in its

form (the mdcatpapers/ilmkidunya "Corner Proteins" and garbled stem are a shared-transcription garble, corrected here and disclosed); carrier proteins mediate both active and passive transport while channel proteins mediate passive transport only (Vaia; Fiveable; Brainscape — "Carrier proteins can mediate both active and passive transport, while channel proteins can mediate only passive transport"). Both reproduction keys print C, but C is factually wrong for "active and passive" — channels never use ATP — so the key is corrected, not followed (wrong-printed-key precedent, sprint §5A). Decided by assistant under owner's 8 Nov delegation.

Note: ANSWER CORRECTED C → B on the 8 Nov 2026 fold: the clean educationinkarachi print reads option B as 'Carrier proteins' (the mdcatpapers/ilmkidunya 'Corner Proteins' is a shared-transcription garble) and gives the stem in its clean form; carrier proteins mediate both active and passive transport while channels mediate passive only. Both reproduction keys print C, but C is factually wrong for 'active and passive', so the key is corrected, not followed. Decided by assistant under owner's 8 Nov delegation.

Question 90 Biology

_____ are spherical sacs, surrounded by a single membrane and contain hydrolytic enzymes:

- A. Mitochondria
- B. Golgi Bodies
- C. Lysosomes ✓ **Correct answer**
- D. Chloroplast

A. Double-membraned, rod-shaped energy organelles with cristae; they contain no hydrolytic digestive sac.

B. Stacks of flattened cisternae (not spherical sacs) that modify and package; they do not contain the hydrolytic enzyme battery.

C. Single-membrane spherical sacs filled with acid hydrolases for intracellular digestion; correct.

uble-membraned, green, photosynthetic organelles; not digestive sacs.

Question 91 Biology

Most abundant organic compound in mammalian cells are:

- A. Water
- B. Lipids
- C. Carbohydrates
- D. Proteins ✓ **Correct answer**

A. Water is the most abundant compound overall in cells, but it is INORGANIC, so it cannot answer a question about the most abundant ORGANIC compound.

B. Abundant (membranes, stores) but less abundant by mass than proteins in mammalian cells.

C. Present in smaller amounts (glycogen stores, glycoproteins) than proteins.

D. The most abundant ORGANIC compounds in mammalian cells by mass, serving structural, enzymatic and regulatory roles; correct.

Question 92 Biology

Thermal stability of organisms in the environment is because of which characteristic of water?

- A. Solvent property
- B. Heat capacity ✓ **Correct answer**
- C. Ionization
- D. Protection

A. Water's solvent power matters for transport and reactions, not for resisting temperature change.

B. Water's high specific heat capacity means it absorbs or releases large amounts of heat

ttle temperature change, buffering organisms and environments thermally; correct.

C. Water's slight ionisation (H^+/OH^-) matters for pH, not for thermal stability.

D. Not a defined physical characteristic of water; a vague distractor.

Question 93 Biology

C-H bonds in lipids are important:

- A. As insulating material
- B. Providing more energy ✓ **Correct answer**
- C. As exoskeleton
- D. As cuticle of leaves

A. Fats do insulate (adipose tissue), but the question asks about C–H BONDS specifically; insulation is a tissue property, not what the bonds do.

B. C–H bonds are energy-rich: oxidising them releases more energy per gram than oxidising carbohydrates, which is why lipids are the densest energy store; correct.

C. Exoskeletons are chitin/protein (arthropods) or mineralised; C–H bonds in lipids build no exoskeleton.

D. The leaf cuticle is waxy (lipid-derived) and waterproofs, but the energetic importance of C–H bonds is the point of the stem, not the cuticle.

Question 94 Biology

These carbohydrates are sweetest among all carbohydrates:

- A. Monosaccharides ✓ **Correct answer**
- B. Disaccharides
- C. Oligosaccharides
- D. Polysaccharides

e keyed answer, on the strength of fructose — a monosaccharide and the sweetest common sugar, sweeter than sucrose. Flagged: as a CLASS claim it overgeneralises (glucose, also a monosaccharide, is LESS sweet than sucrose, a disaccharide); the answer rests on the fructose-based textbook convention.

B. Sucrose is very sweet, but the sweetest single sugar, fructose, is not a disaccharide.

C. Short chains (e.g. raffinose) are only mildly sweet at most; they are not the sweetest class.

D. Starch, cellulose and glycogen are essentially tasteless; the least sweet class.

Question 95 English

I _____ English for five years.

- A. Study
- B. Am Studying
- C. Have been studying ✓ **Correct answer**
- D. studies

A. Simple present ("I study English for five years") does not express an action continuing over a five-year period up to now.

B. Present continuous expresses an action in progress now, not one spanning five years.

C. Present perfect continuous: an action begun in the past and continuing to the present, exactly what "for five years" requires; correct.

D. Third-person singular form; it does not agree with "I" and is the wrong tense besides.

Question 96 English

The soup _____ good

- A. Taste

B. Tastes ✓ **Correct answer**

- C. Is tasting
- D. Has taste

A. Plural/base form; it does not agree with singular "soup".

B. Third-person singular present of the stative verb "taste" ("the soup tastes good"); correct.

C. Present continuous of a stative verb; "tasting" as an action (someone tasting) does not describe the soup's quality.

D. Ungrammatical as a substitute here ("the soup has taste good" is not English; "has a taste" would mean something else).

Question 97 English

Unless we _____ now, we cannot be on time

- A. Start ✓ **Correct answer**
- B. Will start
- C. Do not start
- D. Are starting

A. After "unless" (= if ... not), the present simple is used for a real future condition: "Unless we start now, we cannot be on time"; correct.

B. "Will" is not used in the unless-clause of a first conditional; it belongs in the result clause.

C. "Unless" already carries the negative; adding "not" double-negates the sense (it would mean "if we DO start").

D. Present continuous changes the meaning to a planned arrangement and is not the conditional form required.

Question 98 English

Daud is better than _____ of the college.

- A. All teachers
- B. Any teachers
- C. All other teachers ✓ **Correct answer**
- D. Any teacher

A. Wrongly includes Daud himself in the comparison group: Daud cannot be better than a group containing himself.

B. "Any" with a plural noun in this comparison is ungrammatical, and it does not exclude Daud.

C. "Other" excludes Daud from the group compared, giving the correct sense: better than every teacher except himself; correct.

D. "Any teacher" would compare Daud with one unspecified teacher, not with the whole staff, and does not carry the exclusion "other" supplies.

Question 99 English

Abide _____ the traffic laws for smooth and safe flow of traffic.

- A. On
- B. With
- C. By ✓ **Correct answer**
- D. To

A. "Abide on" is not a collocation; "on" does not follow "abide" in this sense.

B. "Abide with" is not standard (one "abides with" a person only in archaic usage meaning to stay with, not to obey).

C. The fixed collocation is "abide by" (to obey/comply with rules or laws); correct.

ide to" is not a collocation; "to" follows verbs like "adhere" only in different constructions ("adhere to").

Question 100 English

He prefers death _____ dishonor.

- A. Over
- B. On
- C. Upon
- D. To ✓ **Correct answer**

A. "Prefer X over Y" is used in some modern styles, but the idiomatic paper construction is "prefer X to Y"; "over" is not the keyed preposition here.

B. "Prefer ... on ..." is not a collocation.

C. "Upon" expresses position/time, not preference between alternatives.

D. The idiom is "prefer death to dishonour": prefer X TO Y; correct. (The stem prints the American spelling "dishonor".)

Question 101 English

What does the word 'SURPLUS' mean?

- A. In excess ✓ **Correct answer**
- B. A mathematical term
- C. Within reach
- D. Salutation

A. A surplus is an amount over and above what is needed or used; correct.

B. "Surplus" is used in economics and accounting, but it is not defined as "a mathematical term".

ans accessible or attainable; unrelated to surplus.

D. A greeting (e.g. "Dear Sir"); unrelated to surplus.

Question 102 English

What does the word 'SPILL' mean?

- A. Coil
- B. Deliver
- C. Spoil
- D. Spread ✓ **Correct answer**

A. To wind into loops (a rope, a spring); unrelated to "spill".

B. To hand over or distribute; unrelated to "spill".

C. To ruin or go bad; a near-spelling neighbour of "spill", not its meaning.

D. The nearest listed synonym: what spills flows out and spreads over a surface (e.g. spilled liquid spreads). Flagged: "spread" is a consequence of spilling, not an exact definition (to spill is to cause to flow over an edge); D is the only defensible option, and the answer rests on that nearest-synonym reading.

Question 103 English

What does the word 'CURIOUS' mean?

- A. Keen ✓ **Correct answer**
- B. Careful
- C. Quest
- D. Cruel

A. Eager to know or learn; "curious" means keenly interested in finding things out; correct.

B. Cautious and attentive; "curious" is about eagerness to know, not caution (an older

of "curious" as careful exists, but it is not the current meaning tested).

C. A search or expedition; a noun naming an activity, not the adjective's meaning.

D. Deliberately causing pain; unrelated except for the shared initial letters.

Question 104 English

Pick the sentence with correct punctuation:

- A. He had one motto "serving humanity."
- B. He, had one motto, serving humanity.
- C. He had one motto; serving humanity.
- D. He had one motto: serving humanity. ✓ **Correct answer**

A. A colon (not quotation marks) is needed before the explanatory phrase, and the full stop inside the quotes is misplaced for this construction.

B. The commas around "had one motto" wrongly isolate the verb and break the sentence's structure.

C. A semicolon joins two independent clauses; "serving humanity" is a phrase, not a clause, so the semicolon is wrong.

D. A colon correctly introduces the explanatory phrase after a complete clause; correct.

Question 105 English

Pick the word with correct spelling:

- A. Collique
- B. Colleague ✓ **Correct answer**
- C. Collegue
- D. Co-leageu

A. Misspells the word (wrong ending and missing letters).

standard spelling for a fellow worker; correct.

C. Omits the "a" of "colleague"; a common misspelling.

D. Hyphenated and misspelled; not a word.

Question 106 English

Pick the word with correct spelling:

- A. Acquaintance ✓ **Correct answer**
- B. Equatance
- C. Equantence
- D. Equentense

A. The standard spelling for a person one knows slightly; correct.

B. Drops the "acqu-" opening entirely; a misspelling.

C. Misspells both the opening and the ending.

D. Misspells the opening and substitutes a "tense" ending.

Question 107 English

Pick the word with correct spelling:

- A. Prayority
- B. Priarity
- C. Prioarily
- D. Priority ✓ **Correct answer**

A. Confuses the word with "pray"; misspelled.

B. Transposes letters ("aria" for "ori"); misspelled.

C. Adds a syllable and misspells the ending; not the word.

e standard spelling for something of primary importance; correct.

Question 108 English

Pick the sentence with correct punctuation:

- A. "He did his best that was all anyone could do in any job".
- B. He did his best, that was all anyone could do in any job.
- C. "He did his best: that was all anyone could do in any job".
- D. "He did his best; that was all anyone could do in any job". ✓ **Correct answer**

A. Two independent clauses run together with no punctuation between them (and the closing full stop sits outside the quotes in a way that leaves the sentence unpunctuated internally).

B. A comma splice: two independent clauses joined by a comma alone, with no quotation marks at all.

C. A colon wrongly joins two clauses where the second does not explain or exemplify the first in the colon's sense; the semicolon relation (two balanced clauses) is the intended one.

D. The semicolon correctly joins the two independent clauses within the quotation; correct on the paper's punctuation convention.

Question 109 — Excluded (defective)

Pick the correct option:

- A. How has the chair leg broken?
- B. How has the leg of the chair broken?
- C. How the leg of the chair has broken?
- D. How the chair's leg is broken?

No answer is given for this question, and none is taught. Both A ('How has the chair

oken?') and B ('How has the leg of the chair broken?') are grammatically correct questions, so no single answer can be asserted. The two second reproductions split on the key (ilmkidunya Q110 = A; educationinkarachi Q110 = B). Excluded as DEFECTIVE, decided by assistant under owner's 8 Nov delegation. This question must never be taught as having an answer.

A. A grammatically correct present-perfect question with proper inversion ("How has ... broken?") and the compound noun "chair leg", which is standard English. It is indistinguishable in correctness from B.

B. Also grammatically correct, with the same inversion and the "leg of the chair" phrasing. No rule of grammar, word order or tense distinguishes B from A: both use the same structure with an equivalent noun phrase.

C. Ungrammatical as a question: it lacks subject–auxiliary inversion ("How ... has broken?" is required).

D. Wrong on two counts: no inversion, and the present simple passive "is broken" does not express the completed event the other options express. DEFECTIVE: A and B are both correct, so the stem has two defensible answers and neither is asserted here; the two second reproductions split on the key (ilmkidunya Q110 = A; educationinkarachi Q110 = B), confirming there is no single key.

Question 110 Chemistry

Vapor pressure is independent of which factor?

- A. Temperature
- B. Intermolecular forces
- C. Density of liquid
- D. Surface area of liquid ✓ **Correct answer**

A. Vapour pressure rises steeply with temperature; it is strongly temperature-dependent.

B. Stronger intermolecular forces hold molecules in the liquid and lower the vapour

ure; it depends on them directly.

C. Density reflects molecular packing and intermolecular forces, which correlate with vapour pressure; it is not the textbook "independent" factor.

D. A larger surface reaches equilibrium FASTER, but the equilibrium vapour pressure itself is unchanged; correct as the independent factor.

Question 111 Chemistry

The boiling point of ether is less as compared to alcohols and phenols due to:

- A. Functional group
- B. Intermolecular forces ✓ **Correct answer**
- C. Nature of alkyl groups
- D. Isomerism

A. The functional group is the CAUSE (ethers lack the –OH group), but the direct reason for the lower boiling point is the forces that result; "functional group" alone does not state the mechanism.

B. Ethers cannot form hydrogen bonds between their own molecules (no O–H), so their intermolecular forces are weaker than the hydrogen bonding in alcohols and phenols, giving lower boiling points; correct.

C. Alkyl groups affect boiling point through size/dispersion forces, but the decisive difference between ethers and alcohols is hydrogen bonding, not the alkyl groups.

D. Isomerism (same formula, different arrangement) does not explain a systematic boiling-point difference between two classes of compounds.

Question 112 Chemistry

When 2 ice cubes are pressed over each other they unite to form one cube due to:

- A. Dipole dipole attraction

B. Covalent attraction

- C. Van Der Waal's forces
- D. H-bonding ✓ **Correct answer**

A. Dipole forces act between polar molecules generally; they do not specifically explain the regelation/fusion of ice under pressure.

B. No new covalent bonds form between the cubes; the bonding across the interface is hydrogen bonding, not covalent.

C. Weak dispersion forces are present in all matter but are far too weak and non-specific to account for ice cubes fusing.

D. Pressure locally melts the contact surfaces (regelation) and hydrogen bonds reform across the interface as the water refreezes, uniting the cubes; correct.

Question 113 — Excluded (defective)

Which statement correctly describes the structure of sodium chloride crystal?

- A. Each sodium ion is surrounded by six chloride ions and each chloride ions surrounded by six sodium ions
- B. The crystal is face centered cubic structure
- C. Each sodium ion is surrounded by 3 chloride ions and each chloride ion surrounded by 3 sodium ions
- D. Inter molecular forces are present between two oppositely charges ions

No answer is given for this question, and none is taught. Both A (6:6 coordination) and B (face-centred cubic structure) are descriptively true of sodium chloride, so no single answer can be asserted. The two second reproductions split on the key (ilmkidunya Q114 = B; educationinkarachi Q114 = A). Excluded as DEFECTIVE, decided by assistant under owner's 8 Nov delegation. This question must never be taught as having an answer.

A. The rock-salt structure: each Na^+ is octahedrally surrounded by six Cl^- and each Cl^- by six Na^+ (6:6 coordination); a true and complete description.

O descriptively true — the NaCl lattice is built on a face-centred cubic arrangement (two interpenetrating fcc sublattices; "Solid sodium chloride has a face-centred cubic unit cell", Curriculum Press Chem Factsheet 357).

C. 3:3 coordination is wrong for NaCl (NaCl is 6:6).

D. The forces between oppositely charged ions are IONIC (electrostatic) forces, not intermolecular forces; intermolecular forces act between separate molecules. DEFECTIVE: A and B are both true, so the stem has two correct answers and neither is asserted here; the two second reproductions split on the key (ilmkidunya Q114 = B; educationinkarachi Q114 = A).

Question 114 Chemistry

The greater Lattice energy is shown by:

- A. NaCl
- B. NaBr
- C. NaI
- D. NaF ✓ **Correct answer**

A. Chloride is larger than fluoride, so NaCl's lattice energy is lower than NaF's.

B. Bromide is larger still, so the lattice energy is lower again.

C. Iodide is the largest halide here, giving the LOWEST lattice energy of the four.

D. Lattice energy rises with ionic charge and falls with ionic radius; F^- is the smallest halide, so NaF has the greatest lattice energy; correct.

Question 115 Chemistry

Thermal conductivity of metals is due to:

- A. Layered structure of metals
- B. Freely moving electrons ✓ **Correct answer**

- C. Loosely held metal atoms
- D. Vibrational movement of metals

A. Metals are not generally layered (graphite is the layered conductor); layering does not explain metallic thermal conduction.

B. Delocalised conduction electrons transport thermal energy rapidly through a metal; the dominant mechanism; correct.

C. The atoms in a metal are held in a regular lattice by metallic bonding; they are not "loosely held" in a way that conducts heat.

D. Lattice vibrations (phonons) do carry some heat, but in metals electronic conduction dominates by far; vibration alone would make metals no better than insulators.

Question 116 Chemistry

The high pressure of 200 atm in Haber's process is used for:

- A. Better yield ✓ **Correct answer**
- B. Lower yield
- C. Lower rate
- D. Cost decrease

A. $N_2 + 3H_2 \rightleftharpoons 2NH_3$ goes from 4 gas moles to 2, so high pressure shifts equilibrium toward ammonia (Le Chatelier), improving yield; correct.

B. The opposite of the pressure effect; high pressure raises, not lowers, the equilibrium yield.

C. High pressure also increases the rate (higher concentrations); it does not lower it.

D. High pressure greatly INCREASES plant and operating costs; it is accepted DESPITE the cost, for the yield gain.

Question 117 Chemistry

By which of the following factors equilibrium state is attained earlier?

- A. Temperature
- B. Pressure
- C. Concentration
- D. Catalyst ✓ **Correct answer**

A. Temperature changes the equilibrium POSITION (and the rate), but the question asks what brings equilibrium about EARLIER without shifting it; temperature also shifts the position, and is not the textbook answer.

B. Pressure shifts the equilibrium position in gaseous systems; it does not by itself make equilibrium arrive earlier in the catalysis sense.

C. Concentration changes shift the position; they do not speed both directions equally toward the same equilibrium.

D. A catalyst lowers the activation energy for forward AND reverse reactions equally, so the system reaches the SAME equilibrium faster; correct.

Question 118 Chemistry

When temperature of reacting gases is raised by 10 K, the reaction rate will increase to:

- A. Double ✓ **Correct answer**
- B. Three times
- C. Four times
- D. Five times

A. The Q10 rule of thumb: many reaction rates approximately double for a 10 K rise; the keyed answer. Flagged: this is an APPROXIMATE rule, not a law — the true factor depends on the activation energy (Arrhenius equation) and varies widely; the answer rests on the textbook rule-of-thumb convention.

ossible factor for some reactions, but not the standard rule-of-thumb value.

C. Would require a much larger temperature effect than the rule assumes.

D. Far above the usual 10 K effect for ordinary activation energies.

Question 119 Chemistry

The minimum amount of energy required by the colliding particles for effective collisions is called:

- A. Activation energy ✓ **Correct answer**
- B. Lattice energy
- C. Bond energy
- D. Hydration energy

A. The minimum energy colliding particles must possess (with correct orientation) for a successful, reaction-producing collision; correct.

B. The energy released when gaseous ions form an ionic solid; unrelated to collision thresholds.

C. The energy needed to break one mole of a particular bond; a bond property, not the collision threshold.

D. The energy released when ions are surrounded by water; unrelated to collision thresholds.

Question 120 Chemistry

Which of the following is not a state function?

- A. Pressure (P)
- B. Work (W) ✓ **Correct answer**
- C. Volume (V)
- D. Temperature (T)

:tate function: fixed by the system's current state, independent of how it got there.

B. A path function: the work done depends on the route taken (e.g. the P–V path), not only on the initial and final states; correct as the NOT.

C. A state function, fixed by the current state.

D. A state function, fixed by the current state.

Question 121 Chemistry

Equation represents which energy change? $Mg^{2+}(g) + O^{2-}(g) \rightarrow MgO(s)$

- A. Atomization
- B. Neutralization
- C. Lattice energy ✓ **Correct answer**
- D. Solution

A. Atomisation converts an element into gaseous atoms; this equation starts from gaseous IONS and forms a solid, not atoms.

B. An acid–base reaction forming salt and water; no acid or base appears here.

C. The energy released when gaseous ions combine to form one mole of an ionic solid — exactly the equation shown; correct.

D. Dissolving a solid in a solvent (forming hydrated ions); the equation runs in the opposite direction, forming the solid.

Question 122 Chemistry

When nitric oxide reacts with ozone, the order of reaction will be:

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

D. Zero

A. NO + O_3 → NO_2 + O_2 is an elementary bimolecular step, first order in each reactant, second order overall; correct.

B. Would require three reactant particles colliding in the rate-determining step; the equation involves two.

C. Would require the rate to depend on one reactant only; the rate depends on both NO and O_3.

D. Zero order means the rate is independent of concentration; the rate here depends on both reactant concentrations.

Question 123 Chemistry

During electrolysis, reduction always occurs at the:

- A. Anode
- B. Cathode ✓ **Correct answer**
- C. SHE
- D. Salt bridge

A. Oxidation always occurs at the anode (in electrolytic and galvanic cells alike); reduction never occurs there.

B. Reduction (gain of electrons) always occurs at the cathode during electrolysis; correct.

C. The Standard Hydrogen Electrode is a reference electrode for measuring potentials, not the universal site of reduction.

D. The salt bridge completes the circuit and maintains charge balance in a galvanic cell; no redox reaction occurs in it.

Question 124 Chemistry

The reason of highest electronegativity value of Fluorine is:

- A. Complete outermost shell
- B. Ability to form negative ion
- C. Existence as diatomic molecule
- D. Smaller size and higher nuclear charge in the respective period ✓ **Correct answer**

A. Fluorine's outer shell is NOT complete ($2s^2 2p^5$, one electron short); a complete shell would describe neon, which has low electronegativity.

B. Forming F^- is a CONSEQUENCE of fluorine's electronegativity, not its reason.

C. F_2 exists because fluorine atoms share electrons; molecular form does not explain electronegativity.

D. Fluorine is the smallest atom of its period with a high effective nuclear charge, so its nucleus attracts bonding electrons most strongly; correct.

Question 125 Chemistry

Valance shell electron pair repulsion theory explains:

- A. Bond Energy
- B. Bond Length
- C. Shapes and Bond Energy
- D. Shapes ✓ **Correct answer**

A. Bond energies come from thermochemistry and bond-strength measurements; VSEPR predicts geometry, not energies.

B. Bond lengths come from spectroscopy/diffraction; VSEPR does not predict them.

C. VSEPR explains shapes only; adding bond energy makes the statement false.

:PR (Valence Shell Electron Pair Repulsion — stem prints "Valance") predicts molecular shapes from the repulsion of electron pairs around the central atom; correct.

Question 126 Chemistry

Which of the following has sp3 hybridization?

- A. BF3
- B. C2H4
- C. BeCl2
- D. CH4 ✓ **Correct answer**

A. Boron forms three sigma bonds with no lone pairs: sp^2 hybridisation, trigonal planar.

B. Each carbon forms a double bond: sp^2 hybridisation, planar.

C. Beryllium forms two sigma bonds: sp hybridisation, linear.

D. Carbon forms four single sigma bonds with no lone pairs: sp^3 hybridisation, tetrahedral; correct.

Question 127 Chemistry

The factor which is not affecting bond length is:

- A. Pressure of multiple bonds
- B. Nature of hybridization present
- C. Difference in electronegativity between the two bonded atoms
- D. Ionization energies of the two bonded atoms ✓ **Correct answer**

A. Printed "Pressure" for "presence": the presence of multiple bonds DOES affect bond length (double and triple bonds are shorter than single bonds).

B. Hybridisation affects bond length (more s-character gives shorter bonds).

C. Electronegativity difference introduces ionic character, which shortens bonds; it does

bond length.

D. Ionisation energies are properties of isolated atoms (energy to remove an electron); they do not directly determine the internuclear distance of a bonded pair; correct as the NOT.

Question 128 Chemistry

Which of the following substance is malleable and ductile?

- A. Sodium chloride
- B. Copper sulphate
- C. Mercury
- D. Aluminum ✓ **Correct answer**

A. An ionic solid: brittle, shattering under stress because like-charged ions repel when layers shift; neither malleable nor ductile.

B. An ionic solid: brittle, like NaCl; it is not malleable or ductile.

C. A liquid at room temperature; malleability and ductility are properties of SOLID metals being hammered or drawn, and do not apply to a liquid.

D. A metal with non-directional metallic bonding whose atoms can slide past one another, so it can be hammered into sheets (malleable) and drawn into wire (ductile); correct.

Question 129 Chemistry

Co-ordination number of Na is:

- A. 10
- B. 9
- C. 8 ✓ **Correct answer**
- D. 12

A. No common sodium structure has coordination number 10.

common sodium structure has coordination number 9.

C. Metallic sodium crystallises in a body-centred cubic (bcc) lattice, in which each atom has eight nearest neighbours; the keyed answer. Flagged: the stem does not say "metallic sodium" — in NaCl the Na^+ coordination number is 6 (see Q113), which is NOT among the options, so the answer rests on reading "Na" as the metal; on a NaCl reading the question has no listed answer.

D. 12 is the coordination number of close-packed (fcc/hcp) metals, not of bcc sodium.

Question 130 Chemistry

The cracking method used to obtain better quality gasoline is:

- A. Thermal
- B. Catalytic ✓ **Correct answer**
- C. Steam
- D. Radiations

A. Thermal cracking uses high temperature alone; it gives more gaseous alkenes and lower-octane products, of poorer gasoline quality than catalytic cracking.

B. Catalytic cracking (zeolite catalysts) produces branched and aromatic hydrocarbons of higher octane — better-quality gasoline — at lower temperatures; correct.

C. Steam cracking is used mainly to make ethene and other alkenes for petrochemicals, not to improve gasoline quality.

D. Radiation-induced cracking is not an industrial gasoline-production method.

Question 131 Chemistry

Homocyclic organic compounds are sub divided into two types namely:

- A. Alicyclic and Aromatic ✓ **Correct answer**
- B. Open chain and branched chain

- C. Aromatic and non-aromatic
- D. Antiaromatic and antialicyclic

A. Homocyclic (all-carbon ring) compounds divide into alicyclic rings (non-aromatic, e.g. cyclohexane) and aromatic rings (e.g. benzene); correct.

B. Those are divisions of ACYCLIC compounds, not of homocyclic (ring) compounds.

C. A looser description of the same division, but the paper's textbook pair is "alicyclic and aromatic"; "non-aromatic" is not the class name used for alicyclic rings here.

D. "Antiaromatic" is a real (destabilised) class, but "antialicyclic" is not a class name, and the pair is not the standard subdivision.

Question 132 Chemistry

Acetophenone can be formed by which of the following reaction of benzene?

- A. Alkylation
- B. Acylation ✓ **Correct answer**
- C. Halogenation
- D. Nitration

A. Friedel–Crafts alkylation attaches an ALKYL group (giving e.g. ethylbenzene), not the acetyl group of acetophenone.

B. Friedel–Crafts acylation (benzene + acetyl chloride/$AlCl_3$) attaches a $CH_3CO–$ group, giving acetophenone (methyl phenyl ketone); correct.

C. Attaches a halogen (e.g. chlorobenzene), not an acyl group.

D. Attaches a nitro group (nitrobenzene), not an acyl group.

Question 133 Chemistry

Generic formula of cycloalkane is:

- A. C_nH_{2n+2}
- B. C_nH_{2n} ✓ **Correct answer**
- C. C_nH_{2n-1}
- D. C_nCH_{2n-2}

A. The general formula of open-chain ALKANES; closing a ring loses two hydrogens.

B. Cycloalkanes (one ring, no double bonds) have two fewer hydrogens than the corresponding alkane; correct.

C. No hydrocarbon class has this general formula; a distractor.

D. A garbled option (it is not a valid formula as printed); the C_nH_{2n-2} family belongs to alkynes/cycloalkenes, not cycloalkanes.

Question 134 Chemistry

Which of the following reactions differentiates alcohol from phenol?

- A. Lucas test ✓ **Correct answer**
- B. Halogenations
- C. Nitration
- D. Iodoform test

A. $ZnCl_2$/conc. HCl converts alcohols (rapidly for tertiary, slowly for primary) to cloudy alkyl chlorides; phenols do not give the Lucas reaction under these conditions, so the test distinguishes them; the keyed answer.

B. Both alcohols and phenols can undergo halogenation-type reactions (phenols very readily); halogenation does not cleanly differentiate them.

C. Phenols nitrate readily; alcohols do not nitrate in the same way, but nitration is not the standard differentiating test (and is hazardous as a test).

D. Identifies methyl ketones and ethanol-type structures ($CH_3CHOH–$); it does not

entiate alcohols generally from phenols.

Question 135 Chemistry

The order of reactivity of alcohol when C-O bond breaks is:

- A. Tertiary alcohol > secondary alcohol > Primary alcohol ✓ **Correct answer**
- B. Secondary alcohol > primary alcohol > tertiary alcohol
- C. Primary alcohol > secondary alcohol > tertiary alcohol
- D. Tertiary alcohol > primary alcohol > secondary alcohol

A. C–O cleavage by the SN1 route goes through a carbocation; tertiary carbocations are the most stable, then secondary, then primary, so tertiary alcohols react fastest; correct.

B. Inverts the stability order at both ends; no mechanism gives this sequence.

C. The reverse of the SN1 order (it would be the order for an SN2 attack at carbon, not for C–O bond cleavage to a carbocation).

D. Misplaces primary above secondary; carbocation stability forbids primary reacting faster than secondary.

Question 136 Chemistry

CnH2nO is the general formula of:

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

A. Open-chain saturated ethers have formula CnH2n+2O (e.g. C_2H_6O); only CYCLIC ethers share CnH2nO, and ethers are not the class this formula is listed for.

B. Saturated carboxylic acids have formula $CnH2nO_2$ (two oxygens), not CnH2nO.

urated acyclic ketones have formula CnH2nO (e.g. C_3H_6O, acetone); the textbook listing; correct (aldehydes share the same formula, but no aldehyde option is offered).

D. Carbolic acid is phenol (C_6H_5OH, C_6H_6O), a specific compound, not the class with this general formula.

Question 137 Chemistry

Catalytic reduction of aldehyde & Ketone forms:

- A. Alcohol ✓ **Correct answer**
- B. Carboxylic acid
- C. Alkane
- D. Aldehyde

A. Catalytic hydrogenation reduces the carbonyl C=O to C–OH: aldehydes give primary alcohols and ketones give secondary alcohols; correct.

B. Carboxylic acids are OXIDATION products of aldehydes, not reduction products of aldehydes/ketones.

C. Complete reduction to an alkane needs stronger (Clemmensen/Wolff–Kishner) conditions, not ordinary catalytic hydrogenation of the carbonyl.

D. An aldehyde is a STARTING material here (and the reduction product of a ketone is never an aldehyde).

Question 138 Chemistry

Which of the following reacts with Carboxylic Acid to form Ester?

- A. Aldehyde
- B. Alkyl Halide
- C. Ketones
- D. Alcohol ✓ **Correct answer**

ehydes do not condense with carboxylic acids to give esters.

B. Alkyl halides react with carboxylate SALTS to give esters, not with the free carboxylic acid in the standard esterification.

C. Ketones do not react with carboxylic acids to form esters.

D. Fischer esterification: carboxylic acid + alcohol (acid-catalysed, with loss of water) gives an ester; correct.

Question 139 Chemistry

Hydrolysis of Nitriles produces:

- A. Carboxylic acid ✓ **Correct answer**
- B. Aldehydes
- C. Ketones
- D. Esters

A. Acidic or alkaline hydrolysis of a nitrile (R–C≡N) passes through an amide intermediate and ends at the carboxylic acid R–COOH (plus ammonia/ammonium); correct.

B. Aldehydes come from partial reduction of nitriles (e.g. Stephen reduction), not from hydrolysis.

C. Ketones are not hydrolysis products of nitriles.

D. Esters are not formed by nitrile hydrolysis; they would require an alcohol condensation step.

Question 140 Chemistry

What is the mass of sulphur in 24.5 g of H2SO4?

- A. 32 g
- B. 24 g

- C. 16 g
- D. 8 g ✓ **Correct answer**

A. The mass of sulfur in a full mole (98 g) of H_2SO_4; the sample is only a quarter of a mole.

B. No proportion of 24.5 g gives 24 g of sulfur; a distractor.

C. The sulfur in HALF a mole (49 g) of acid, not in 24.5 g.

D. Molar mass H_2SO_4 = 98 g/mol, containing 32 g S; 24.5 g is ¼ mol, so sulfur = 24.5 × 32/98 = 8 g; correct.

Question 141 Chemistry

From the equation (N2 + 3H2 → 2NH3), how many moles of NH3 are produced from 2.5 moles of N2?

- A. 2.5 moles
- B. 2 moles
- C. 5 moles ✓ **Correct answer**
- D. 7.5 moles

A. A 1:1 reading of the equation; the equation gives 2 moles of NH_3 per mole of N_2, not 1.

B. The coefficient of NH_3 in the equation, mistaken for the answer; the amount scales with the N_2 taken.

C. Mole ratio N_2:NH_3 = 1:2, so 2.5 × 2 = 5 moles (assuming sufficient H_2); correct.

D. 2.5 × 3, using the H_2 coefficient instead of the NH_3 coefficient.

Question 142 Chemistry

The amount of energy associated with quantum of radiation is directly proportional to:

- A. Photon
- B. Wavelength

C. Frequency ✓ **Correct answer**

- D. Velocity

A. A photon IS the quantum of radiation; energy is a property of it, not proportional to "photon" as a quantity.

B. Energy is INVERSELY proportional to wavelength ($E = hc/\lambda$); as wavelength rises, energy falls.

C. $E = h\nu$: the energy of a quantum is directly proportional to its frequency; correct.

D. All electromagnetic radiation travels at the same speed c in vacuum; energy does not scale with velocity.

Question 143 Chemistry

If value of azimuthal quantum number is 2 then total values of magnetic quantum number will be:

- A. 03
- B. 05 ✓ **Correct answer**
- C. 07
- D. 10

A. 3 values belong to $l = 1$ (p orbitals), not $l = 2$.

B. For $l = 2$, m_l runs $-2, -1, 0, +1, +2$: $2l + 1 = 5$ values; correct.

C. 7 values belong to $l = 3$ (f orbitals), not $l = 2$.

D. No subshell has 10 magnetic values from a single l (10 would be 2×5, confusing orbitals with electron capacity).

Question 144 Chemistry

Total number of directions of f-orbitals in space are:

A. 05

- B. 03
- C. 07 ✓ **Correct answer**
- D. 06

A. 5 is the number of d orbitals (l = 2), not f orbitals.

B. 3 is the number of p orbitals (l = 1), not f orbitals.

C. For f orbitals l = 3, so ml takes 2l + 1 = 7 values: seven distinct spatial orientations (seven f orbitals); correct.

D. No subshell has six orientations; 6 is not 2l + 1 for any l.

Question 145 Chemistry

Which of the following quantum number is not obtained from Schrodinger Wave equation?

- A. Principal Quantum Number
- B. Spin Quantum Number ✓ **Correct answer**
- C. Azimuthal Quantum Number
- D. Magnetic Quantum Number

A. n emerges from solving the Schrödinger equation; it sets the energy level/shell.

B. Spin (ms = ±½) does NOT come from the Schrödinger equation; it was introduced separately (and arises naturally only in Dirac's relativistic treatment) to account for the electron's intrinsic angular momentum; correct.

C. l emerges from the Schrödinger equation's angular solution; it sets the subshell shape.

D. ml emerges from the Schrödinger equation's angular solution; it sets orbital orientation.

Question 146 Chemistry

The electronic configuration for degenerate orbitals is explained by:

- A. Aufbau Principle
- B. n + l rule
- C. Hund's rule ✓ **Correct answer**
- D. Pauli exclusion principle

A. The building-up order (lowest energy first); it orders subshells, not the filling within degenerate orbitals.

B. Orders subshell ENERGIES (lower n + l fills first); it does not govern filling within one degenerate set.

C. Degenerate orbitals are filled singly, with parallel spins, before any pairing occurs, maximising total spin; correct.

D. Forbids two electrons sharing all four quantum numbers (hence at most two per orbital, opposite spins); it limits pairing but does not state the singly-first filling pattern.

Question 147 Chemistry

The idea that molecules in gases are in constant movement is called:

- A. Kinetic theory of gases ✓ **Correct answer**
- B. Crystal field theory
- C. Molecular orbital theory
- D. Transition state theory

A. Models a gas as a large number of particles in constant, random motion, explaining pressure, temperature and the gas laws; correct.

B. Describes d-orbital splitting in transition-metal complexes; it says nothing about gas molecules moving.

scribes bonding by molecular orbitals; it is not a theory of gas-particle motion.

D. Describes reaction rates via the activated complex; it is not the theory of constant molecular motion in gases.

Question 148 Chemistry

The SI unit for pressure is:

- A. mm of Hg
- B. Pascal ✓ **Correct answer**
- C. Bar
- D. Torr

A. Millimetres of mercury: a traditional pressure unit (760 mmHg = 1 atm), not SI.

B. 1 pascal = 1 newton per square metre (N/m^2), the SI unit of pressure; correct.

C. A metric but non-SI unit (1 bar = 10^5 Pa), commonly used in meteorology and industry.

D. A non-SI unit defined as 1/760 of an atmosphere; not the SI unit.

Question 149 Chemistry

If both temperature and volume of gas are doubled, the pressure:

- A. Cannot be predicted
- B. Is reduced to ½
- C. Remains unchanged ✓ **Correct answer**
- D. Is doubled

A. It can be predicted exactly from the ideal gas law; nothing is unknown.

B. That would be the effect of doubling volume ALONE at fixed temperature; the temperature doubling cancels it.

C. $P = nRT/V$; doubling T and doubling V gives $P' = nR(2T)/(2V) = nRT/V = P$; correct (fixed

nt of gas assumed).

D. That would be the effect of doubling temperature ALONE at fixed volume; the volume doubling cancels it.

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