MDCAT (BUMHS entry test, Blue) — 2025 · Solved Past Paper

Body: Bolan University of Medical and Health Sciences (BUMHS) · **Post:** MDCAT (BUMHS entry test, Blue) · **Year:** 2025 · **Questions:** 180 in the original paper — **179 solved and verified**, 1 excluded as defective (Q113) · **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. General Knowledge answers are as of the 2025 sitting.

Source note: Question stems and options: official BUMHS Blue booklet (31 pp, Ref No 1683957, 26 Oct 2025), bumhs.edu.pk/images/mdcat2025/Bluebooklet.pdf; answer key: official BUMHS Blue answer key (Q1–180), bumhs.edu.pk/images/mdcat2025/Blue.pdf (booklets and keys listed at bumhs.edu.pk/mdcat2025_answerkeys; accessed 9 Nov 2026). Cross-colour checks in the White and Brown booklets and keys (bumhs.edu.pk/images/mdcat2025/White.pdf and Brown.pdf). Exam held Sunday 26 October 2025. Blue is the same sitting as Brown, White and Yellow — the same 180 questions in a different order; do not build a second BUMHS 2025 colour. Subject split: Biology Q1–81, Chemistry Q82–126, Physics Q127–162, English Q163–171, Logical Reasoning Q172–180. 1 DEFECTIVE-excluded (Q113): both the E1 and the SN1 mechanisms proceed through a carbocation intermediate, so the question has two correct options and no unique answer. Note on Q122: the official Blue, White and Brown keys all list D (HI) for the lowest-boiling group VIIA hydride, but the measured boiling points are HCl -85 °C, HBr -67 °C, HI -35 °C and HF 19.5 °C, so HCl (B) is the lowest; B is served as correct and the key error is recorded in the Q122 explanation. Answers verified independently against reference facts, worked derivations and targeted sources, never from the printed key alone. Decisions by the assistant under the owner's 8 Nov 2026 delegation.

1 Implantation site

Implantation of the embryo occurs in which part of the female reproductive system?

- A. Ovary
- B. Uterus ✓ **Correct answer**
- C. Cervix
- D. Fallopian tube

A. wrong: the ovary releases the egg; implantation does not occur there.

B. correct: the blastocyst implants in the endometrium lining the uterus.

C. wrong: the cervix is the neck of the uterus and is not the implantation site.

D. wrong: fertilisation occurs in the fallopian tube, but implantation in the tube is an ectopic pregnancy, not normal.

Question 2 Axon

The structure that is directly continuous with the cell body transmits nerve impulses away from it, is:

- A. Axon ✓ **Correct answer**
- B. Synapse
- C. Dendrites
- D. Myelin sheath

A. correct: the axon is the long fibre continuous with the cell body that carries impulses away from it.

B. wrong: a synapse is the junction between two neurons, not a fibre of the neuron.

C. wrong: dendrites carry impulses toward the cell body, not away from it.

D. wrong: the myelin sheath insulates the axon; it does not itself transmit impulses away.

3 Homozygous genotype

A pea plant which upon self fertilization produces all the offspring of its own phenotype is called:

- A. Plant with homogenous genotype
- B. Plant with homozygous genotype ✓ **Correct answer**
- C. Plant with homologous genotype
- D. Plant with hemizygous genotype

A. wrong: 'homogenous' is not the genetic term for identical alleles.

B. correct: a homozygous plant carries two identical alleles, so self-fertilisation gives only offspring of its own phenotype.

C. wrong: 'homologous' describes paired chromosomes, not identical alleles.

D. wrong: hemizygous means a single copy of a gene, as on the male X chromosome, not two identical alleles.

Question 4 Inhalation pressure and volume

What happens to the pressure and volume of the thoracic cavity during inhalation?

- A. Pressure and volume both increase
- B. Pressure increases and volume decreases
- C. Pressure decreases and volume increases ✓ **Correct answer**
- D. Pressure and volume both decrease

A. wrong: as the thoracic volume increases, the pressure inside falls.

B. wrong: this is the reverse of inhalation.

C. correct: the diaphragm contracts and the rib cage rises, enlarging the thoracic cavity so its pressure falls below atmospheric pressure and air flows in.

D. wrong: the thoracic volume increases during inhalation.

5 Testes function

Which of the following is NOT a function of testes?

- A. Spermatogenesis
- B. production of FSH ✓ **Correct answer**
- C. Secretion of inhibin
- D. Secretion of testosterone

A. wrong: the testes do produce sperm, so this is a real function.

B. correct: FSH is produced by the anterior pituitary, not by the testes.

C. wrong: the Sertoli cells of the testes secrete inhibin.

D. wrong: the Leydig cells of the testes secrete testosterone.

Question 6 Crossing over

Crossing over is:

- A. Exchange of segments between sister chromatids of homologous chromosomes during meiosis.
- B. Exchange of segments between non-sister chromatids of homologous chromosomes during meiosis. ✓ **Correct answer**
- C. Exchange of segments between non-sister chromatids of heterologous chromosomes during meiosis.
- D. Exchange of segments between non-sister chromatids of homologous chromosomes during mitosis.

A. wrong: crossing over is between non-sister chromatids, not sister chromatids.

B. correct: in prophase I of meiosis, non-sister chromatids of homologous chromosomes exchange segments.

C. wrong: crossing over is between homologous chromosomes, not heterologous ones.

ossing over occurs in meiosis, not mitosis.

Question 7 Epiglottis

Nasal opening is closed by which of the following to prevent food from entering into food pipe?

- A. Hard palate
- B. Epiglottis ✓ **Correct answer**
- C. Soft palate
- D. Larynx

A. wrong: the hard palate forms the roof of the mouth and does not close any passage during swallowing.

B. correct: the epiglottis is the flap that covers the larynx during swallowing so food cannot enter the airway (the stem's wording is loose, but the epiglottis is the intended structure).

C. wrong: the soft palate closes the nasal passage during swallowing, not the airway.

D. wrong: the larynx is the airway itself, not the flap that guards it.

Question 8 Humoral immunity cells

Which cells are involved in humoral immunity?

- A. T cells
- B. B cells ✓ **Correct answer**
- C. T or B cells
- D. T and B cells

A. wrong: T cells mediate cell-mediated immunity, not humoral immunity.

B. correct: B cells produce antibodies, which is humoral immunity.

moral immunity is specifically the B-cell antibody response.

D. wrong: T cells belong to cell-mediated immunity, so both together is not the humoral arm.

Question 9 Nerve impulse

Which of the following travels along a neuron during nerve impulse conduction?

- A. waves of electrochemical changes ✓ **Correct answer**
- B. waves of thermal changes
- C. waves of magnetic changes
- D. waves of hormonal changes

A. correct: a nerve impulse is a wave of depolarisation and repolarisation travelling along the neuron.

B. wrong: no thermal wave travels along a neuron.

C. wrong: nerve conduction is electrochemical, not magnetic.

D. wrong: hormones travel in blood, not along neurons.

Question 10 Dialysing fluid

Dialyzing fluid has same osmotic pressure as the blood has, except that it lacks:

- A. Glucose
- B. Water
- C. Sodium and Potassium
- D. Nitrogenous waste ✓ **Correct answer**

A. wrong: dialysing fluid contains glucose at blood concentration.

B. wrong: dialysing fluid is mostly water.

C. wrong: dialysing fluid contains these ions at blood concentration.

the dialysing fluid matches blood in osmotic pressure but contains no urea or other nitrogenous waste, so waste diffuses out of the blood into it.

Question 11 Fat hydrolysis products

When fat molecule is hydrolyzed for energy, the end products will be:

- A. Amino acids and glycerol
- B. Glycerol and fatty acids ✓ **Correct answer**
- C. Fatty acids and amino acids
- D. Glycerol and nitrogenous bases

A. wrong: amino acids come from proteins, not fats.

B. correct: hydrolysing a fat (triglyceride) yields one glycerol and three fatty acids.

C. wrong: amino acids are not products of fat hydrolysis.

D. wrong: nitrogenous bases are parts of nucleotides, not of fats.

Question 12 HIV transmission

The less common cause of HIV mode of transmission is:

- A. Blood Transfusion
- B. Placenta of mother to baby
- C. Mosquito bite ✓ **Correct answer**
- D. Lactation from HIV positive mother to baby

A. wrong: HIV is transmitted through infected blood.

B. wrong: HIV can pass from mother to baby across the placenta.

C. correct: HIV is not transmitted by mosquito bites.

D. wrong: HIV can pass to the baby through breast milk.

13 Cerebellum

The cerebellum is mainly responsible for:

- A. Vision, hearing and reflexes
- B. Regulating heart beat only
- C. Conscious, thoughts and reasoning
- D. Balance, posture and coordination ✓ **Correct answer**

A. wrong: vision and hearing are processed in the cerebrum and midbrain, not mainly by the cerebellum.

B. wrong: heartbeat is regulated by the medulla, not the cerebellum.

C. wrong: conscious thought and reasoning are functions of the cerebrum.

D. correct: the cerebellum coordinates movement and maintains balance and posture.

Question 14 HIV screening of blood

Which of the following method is used to prevent HIV transmission during blood transfusion?

- A. By freezing blood before transfusion
- B. By using blood from young donors only
- C. By boiling blood before transfusion
- D. By screening blood for HIV before its transfusion ✓ **Correct answer**

A. wrong: freezing does not remove or kill HIV.

B. wrong: donor age does not prevent HIV.

C. wrong: boiling would destroy the blood itself.

D. correct: donated blood is tested for HIV antibodies/antigen so infected blood is not transfused.

15 Sperm storage and maturation

The part of male reproductive system involved in the storage and maturation of sperms:

- A. Scrotum
- B. Vas deferens
- C. Epididymis ✓ **Correct answer**
- D. Testes

A. wrong: the scrotum is the sac holding the testes at a lower temperature.

B. wrong: the vas deferens carries sperm from the epididymis toward the urethra.

C. correct: sperm are stored and mature in the epididymis.

D. wrong: the testes produce sperm, which then mature in the epididymis.

Question 16 H+ and OH- ions in cells

The correct function of H+ and OH- ions in cells is:

- A. Transporting proteins
- B. Breaking down fats
- C. Maintaining or changing pH ✓ **Correct answer**
- D. Producing light energy

A. wrong: H+ and OH- ions do not transport proteins.

B. wrong: breaking down fats is the work of lipases, not of H+ and OH- ions.

C. correct: H+ and OH- ions set the acidity and alkalinity of the cell, so their balance maintains and changes pH.

D. wrong: cells do not produce light energy from H+ and OH- ions.

17 Kidney stones prevention

One of the best preventive measure for kidney stones formation is:

- A. Taking antibiotic daily
- B. Avoiding all dairy food
- C. Drinking plenty of water ✓ **Correct answer**
- D. Reducing physical activity

A. wrong: antibiotics treat infection, they do not prevent kidney stones.

B. wrong: avoiding all dairy is not advised; normal calcium intake is fine.

C. correct: plenty of water dilutes the urine so salts are less likely to crystallise into stones.

D. wrong: less activity does not prevent kidney stones.

Question 18 Cardiac muscle layer

Which of the following layer is mainly composed of cardiac muscles?

- A. Endocardium
- B. Epicardium
- C. Pericardium
- D. Myocardium ✓ **Correct answer**

A. wrong: the endocardium is the thin inner lining of the heart.

B. wrong: the epicardium is the thin outer layer of the heart wall.

C. wrong: the pericardium is the sac around the heart, not a muscle layer.

D. correct: the myocardium is the thick middle layer made of cardiac muscle.

Question 19 Haemoglobin functions except

During the process of gaseous exchange, all of the following are the functions of

EXCEPT:

- A. It acts as a buffer to stabilize the blood pH
- B. It transports oxygen from lungs to other body tissues
- C. It transports carbon dioxide from body tissues to lungs
- D. It regulates the blood pressure when body is in stress ✓ **Correct answer**

A. wrong: haemoglobin does act as a buffer, so this is a real function.

B. wrong: carrying oxygen is haemoglobin's main function.

C. wrong: haemoglobin carries carbon dioxide as carbaminohaemoglobin.

D. correct: haemoglobin does not regulate blood pressure; that is the role of the nervous and hormonal systems.

Question 20 tRNA types for 20 amino acids

If a polypeptide of 20 amino acids is made up of all different amino acids, at least how many types of tRNA must take part in its synthesis?

- A. 20 ✓ **Correct answer**
- B. 45
- C. 61
- D. 64

A. correct: with 20 different amino acids, at least one distinct tRNA type is needed for each, so at least 20 types take part.

B. wrong: 45 is not the minimum; only 20 amino acids are involved.

C. wrong: 61 is the number of sense codons, not the number of tRNA types needed here.

D. wrong: 64 is the total number of codons, not the number of tRNA types needed here.

21 Conjugated molecule

Which of the following is NOT considered a conjugated molecule?

- A. A molecule containing linked sugar units
- B. A molecule made up only of carbon and hydrogen ✓ **Correct answer**
- C. A protein attached to a non-protein group
- D. A lipid combined with another chemical component

A. wrong: linked sugar units with a non-sugar group form a conjugated molecule (a glycoconjugate).

B. correct: a molecule of only carbon and hydrogen is a hydrocarbon; it has no non-carbon component attached, so it is not conjugated.

C. wrong: a protein with a non-protein group is a conjugated protein.

D. wrong: a lipid combined with another component is a conjugated lipid.

Question 22 Gonorrhoea cause

Which of the following is the causative agent of Gonorrhea?

- A. Herpes simplex virus
- B. Treponema pallidum
- C. Mycobacterium tuberculosis
- D. Neisseria gonorrhaeae ✓ **Correct answer**

A. wrong: herpes simplex virus causes herpes, not gonorrhoea.

B. wrong: Treponema pallidum causes syphilis.

C. wrong: Mycobacterium tuberculosis causes tuberculosis.

D. correct: gonorrhoea is caused by the bacterium Neisseria gonorrhoeae.

23 RNA structure

Which of the following is a correct structural feature of RNA?

- A. It contains deoxyribose sugar
- B. It has a double-stranded helical structure
- C. It contains base uracil instead of base thymine ✓ **Correct answer**
- D. It is confined to the nucleus only

A. wrong: RNA contains ribose, not deoxyribose.

B. wrong: RNA is normally single-stranded.

C. correct: RNA uses uracil in place of thymine.

D. wrong: RNA works in the cytoplasm as well as the nucleus.

Question 24 Vasodilator drug use

A drug that relaxes smooth muscles in blood vessels is useful for:

- A. Increasing skeletal muscles strength
- B. Reducing blood pressure (vasodilation) ✓ **Correct answer**
- C. Increase heart rate
- D. Causing voluntary contraction

A. wrong: relaxing vascular smooth muscle does not strengthen skeletal muscle.

B. correct: relaxing the smooth muscle of blood vessels widens them, lowering blood pressure.

C. wrong: a vasodilator does not raise the heart rate as its purpose.

D. wrong: vascular smooth muscle is involuntary, and the drug relaxes it rather than contracting it.

25 Withdrawal reflex

A person quickly withdraw their hand touching a hot iron. This type of reflex is best classified as:

- A. Cranial reflex
- B. Spinal reflex ✓ **Correct answer**
- C. Hormonal reflex
- D. Conditional reflex

A. wrong: a cranial reflex is mediated by the brain, not the spinal cord.

B. correct: withdrawing the hand from a hot object is a spinal reflex arc through the spinal cord.

C. wrong: no hormone mediates this rapid withdrawal.

D. wrong: this is an inborn reflex, not a learned (conditioned) one.

Question 26 Medulla oblongata

Which of the following function is under control of medulla oblongata?

- A. Memory
- B. Vision
- C. Breathing ✓ **Correct answer**
- D. Dreaming

A. wrong: memory is a function of the cerebrum.

B. wrong: vision is processed in the cerebrum and midbrain.

C. correct: the medulla oblongata contains the respiratory centre that controls breathing.

D. wrong: dreaming is associated with the cerebrum, not the medulla.

27 Resting neuron outer surface

The outer surface of the axon membrane in a resting neuron is:

- A. Negative due to sodium ions
- B. Positive due to sodium ions ✓ **Correct answer**
- C. Positive due to potassium ions
- D. Neutral due to balanced ions

A. wrong: the outer surface is positive in the resting state.

B. correct: in the resting state, sodium ions are more concentrated outside, so the outer surface is positive.

C. wrong: potassium ions are more concentrated inside the neuron at rest.

D. wrong: the ions are not balanced; the resting membrane is polarised.

Question 28 Sensory neuron in reflex arc

The primary function of the sensory neuron in a reflex arc is to:

- A. Contract muscles
- B. Detect environmental changes
- C. Transmit impulses to the brain
- D. Carry impulses to the spinal cord ✓ **Correct answer**

A. wrong: muscles are contracted by motor neurons, not sensory neurons.

B. wrong: detecting changes is the receptor's job; the sensory neuron carries the signal onward.

C. wrong: in a spinal reflex arc the sensory neuron carries impulses to the spinal cord.

D. correct: the sensory neuron carries the impulse from the receptor to the spinal cord.

29 Not related to large intestine

Which of the following is NOT related to large intestine?

- A. Villi ✓ **Correct answer**
- B. Sigmoid colon
- C. Appendix
- D. Rectum

A. correct: villi are finger-like projections of the small intestine, not the large intestine.

B. wrong: the sigmoid colon is part of the large intestine.

C. wrong: the appendix is attached to the caecum of the large intestine.

D. wrong: the rectum is the final part of the large intestine.

Question 30 Enzyme above optimum temperature

Which change occurs in enzyme activity when temperature increases beyond the optimum level?

- A. Activity remains same
- B. Activity increases
- C. Enzymes denatures ✓ **Correct answer**
- D. Enzymes specificity increases

A. wrong: activity falls sharply above the optimum.

B. wrong: activity increases only up to the optimum, then falls.

C. correct: beyond the optimum temperature the enzyme's shape is lost (denaturation), so activity drops.

D. wrong: specificity does not increase; the enzyme loses its shape and function.

31 Darwin's main reason for evolution

According to Darwin theory, the main reason of evolution is:

- A. Natural calamity
- B. Natural selection ✓ **Correct answer**
- C. Use and disuse of an organ
- D. Inheritance of acquired character

A. wrong: natural calamities are not Darwin's mechanism of evolution.

B. correct: Darwin's theory explains evolution by natural selection of favourable variations.

C. wrong: use and disuse is Lamarck's idea, not Darwin's.

D. wrong: inheritance of acquired characters is Lamarck's idea, not Darwin's.

Question 32 Action potential into muscle fibre

Which structure conducts the action potential deep into the muscle fiber?

- A. Z-line
- B. Sarcomere
- C. T-tubules ✓ **Correct answer**
- D. Sarcoplasmic reticulum

A. wrong: the Z-line marks the boundary of a sarcomere.

B. wrong: the sarcomere is the contractile unit, not the conducting structure.

C. correct: transverse tubules carry the action potential deep into the muscle fibre to the sarcoplasmic reticulum.

D. wrong: the sarcoplasmic reticulum stores and releases calcium; it does not conduct the action potential.

33 Chromosome composition

What is the chemical composition of chromosomes?

- A. RNA and lipids
- B. DNA and proteins ✓ **Correct answer**
- C. Proteins and carbohydrates
- D. Carbohydrates and nucleic acids

A. wrong: chromosomes are not made of RNA and lipids.

B. correct: a chromosome is DNA wrapped around histone proteins.

C. wrong: chromosomes contain DNA, not carbohydrates.

D. wrong: chromosomes contain DNA with proteins, not carbohydrates.

Question 34 Mendel's second step

In the second step of his experiment, what did Mendel do after selecting pure breeding tall and dwarf pea plants?

- A. Allowed them to self pollinate
- B. Crossed them to produced hybrid offspring ✓ **Correct answer**
- C. Collected seeds from random plants
- D. Grew them in different soil types

A. wrong: Mendel first crossed the pure-breeding parents, then self-pollinated the offspring.

B. correct: after selecting pure-breeding tall and dwarf plants, Mendel crossed them to produce the F1 hybrids.

C. wrong: Mendel collected seeds from the controlled cross.

D. wrong: soil type was not a variable in Mendel's crosses.

35 Not part of forebrain

Which one is NOT the part of fore brain?

- A. Cerebellum ✓ **Correct answer**
- B. Hypothalamus
- C. Hippocampus
- D. Amygdala

A. correct: the cerebellum is part of the hindbrain, not the forebrain.

B. wrong: the hypothalamus is part of the forebrain (diencephalon).

C. wrong: the hippocampus is part of the forebrain (limbic system).

D. wrong: the amygdala is part of the forebrain (limbic system).

Question 36 Saltatory conduction

During saltatory conduction, a nerve impulse jumps from one to another:

- A. Synapse
- B. Axon
- C. Node of Ranvier ✓ **Correct answer**
- D. Correct

A. wrong: the impulse jumps between nodes of Ranvier, not synapses.

B. wrong: the impulse travels along the axon but jumps from node to node, not from axon to axon.

C. correct: in saltatory conduction the impulse jumps from one node of Ranvier to the next.

D. wrong: the paper prints the word 'Correct' as option (d); it is not an anatomical structure, and the keyed answer is C, Node of Ranvier.

37 DNA nucleotide difference

Each DNA nucleotide differs from the others based on its:

- A. Nitrogenous bases ✓ **Correct answer**
- B. Phosphate group
- C. Sugar molecule
- D. Number of phosphorus atoms

A. correct: the four DNA nucleotides differ only in their nitrogenous base (A, T, G or C).

B. wrong: every nucleotide has the same phosphate group.

C. wrong: every DNA nucleotide has the same deoxyribose sugar.

D. wrong: every nucleotide has one phosphorus atom.

Question 38 Bone maintenance cells

Maintenance of healthy bone tissues by secreting enzymes and influencing bone mineral content is the duty of:

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

A. correct: osteocytes are mature bone cells that maintain healthy bone tissue and influence its mineral content.

B. wrong: osteoblasts build new bone rather than maintaining existing bone.

C. wrong: osteoclasts break down bone tissue.

D. wrong: osteogenic cells are stem cells that give rise to osteoblasts.

39 Glycolipid

Glycolipid is a combination of:

- A. Lipid and carbohydrate ✓ **Correct answer**
- B. Lipid and protein
- C. Nucleic acid and lipid
- D. Protein and carbohydrate

A. correct: a glycolipid is a lipid with a carbohydrate attached.

B. wrong: a lipid with a protein is a lipoprotein.

C. wrong: no such combination is called a glycolipid.

D. wrong: a protein with a carbohydrate is a glycoprotein.

Question 40 Special creation

Which idea suggests that life was created by a supernatural force?

- A. Special creation ✓ **Correct answer**
- B. Biogenesis
- C. Spontaneous generation
- D. Natural selection

A. correct: special creation is the idea that life was created by a supernatural force.

B. wrong: biogenesis is the idea that life comes from pre-existing life.

C. wrong: spontaneous generation is the idea that life arises from non-living matter.

D. wrong: natural selection is Darwin's mechanism of evolution, not creation by a supernatural force.

41 Catastrophism

Catastrophism explains that changes in life on earth are due to:

- A. Gradual evolution
- B. Natural selection
- C. Mutation
- D. Sudden natural disasters ✓ **Correct answer**

A. wrong: gradual change is uniformitarianism, not catastrophism.

B. wrong: natural selection is Darwin's mechanism.

C. wrong: mutation is a source of variation, not catastrophism.

D. correct: catastrophism holds that sudden disasters (floods, earthquakes) caused the changes in life on Earth.

Question 42 Not during muscle contraction

Which of the following does not occur during muscle contraction?

- A. Release of calcium from sarcoplasmic reticulum
- B. Formation of cross-bridge
- C. Sliding of actin over myosin
- D. Increase in sarcomere length ✓ **Correct answer**

A. wrong: calcium release does occur during contraction.

B. wrong: cross-bridges do form during contraction.

C. wrong: actin slides over myosin during contraction.

D. correct: the sarcomere shortens during contraction; it does not increase in length.

43 Cartilage nutrition

Cartilage receives its nutrition through the process of:

- A. Active transport
- B. Diffusion ✓ **Correct answer**
- C. Phagocytosis
- D. Osmosis

A. wrong: cartilage is avascular, so nutrients reach it by diffusion, not active transport.

B. correct: cartilage has no blood supply, so it receives nutrients by diffusion from surrounding tissue.

C. wrong: phagocytosis is the engulfing of particles by cells, not how cartilage is nourished.

D. wrong: osmosis moves water, not the nutrients cartilage needs.

Question 44 Biotechnology malaria vaccine benefit

Key benefit of using biotechnology in development of vaccine for malaria is:

- A. its ability to develop endosymbiotic relationship with host
- B. its ability to work as antimalarial drugs
- C. its ability to directly kills the malaria parasite in mosquitoes
- D. to create a targeted immune response against the parasite ✓ **Correct answer**

A. wrong: a vaccine does not develop an endosymbiotic relationship.

B. wrong: a vaccine prevents disease; it is not a drug that kills parasites.

C. wrong: a vaccine acts in the vaccinated person, not in mosquitoes.

D. correct: a biotechnology vaccine trains the immune system to recognise and attack the malaria parasite specifically.

45 Nucleotide identification

During lab analysis, a student extracted a molecule that contained a sugar, a phosphate group and a nitrogenous base. Which of the following molecules likely identified?

- A. Nucleotide ✓ **Correct answer**
- B. Amino acid
- C. Monosaccharides
- D. Polysaccharides

A. correct: a sugar, a phosphate group and a nitrogenous base together make a nucleotide.

B. wrong: an amino acid has an amino group and a carboxyl group, not a sugar and phosphate.

C. wrong: a monosaccharide is a simple sugar only.

D. wrong: a polysaccharide is a chain of sugars only.

Question 46 Protein identification

During sample analysis, students finds that it contains Carbon, Hydrogen, Oxygen and Nitrogen, but no phosphorous. Based on this information, which biological molecule is most likely to be in the sample?

- A. DNA
- B. Protein ✓ **Correct answer**
- C. Phospholipid
- D. RNA

A. wrong: DNA contains phosphorus in its phosphate groups, but the sample has no phosphorus.

B. correct: proteins contain carbon, hydrogen, oxygen and nitrogen but no phosphorus.

phospholipid contains phosphorus.

D. wrong: RNA contains phosphorus in its phosphate groups.

Question 47 Heart valve formation

Which tissue layer of heart wall is involved in the formation of heart valves?

- A. Epicardium
- B. Pericardium
- C. Endocardium ✓ **Correct answer**
- D. Myocardium

A. wrong: the epicardium is the outer layer of the heart wall.

B. wrong: the pericardium is the sac around the heart.

C. correct: the heart valves are folds of the endocardium, the inner lining of the heart.

D. wrong: the myocardium is the muscle layer; it does not form the valves.

Question 48 Vesicle formation from ER

During vesicle formation, endoplasmic reticulum membrane:

- A. Dissolve into the cytosol
- B. Breakdown into its chemical component s
- C. Expands and contributes to vesicle formation ✓ **Correct answer**
- D. Moves directly into Golgi apparatus

A. wrong: the ER membrane does not dissolve during vesicle formation.

B. wrong: the membrane is not broken down into chemicals.

C. correct: the ER membrane buds outward and its material forms the vesicle membrane.

D. wrong: vesicles bud off the ER and travel to the Golgi; the ER membrane itself does not

e Golgi.

Question 49 Excretory role except

All of the following have excretory role EXCEPT:

- A. Kidney
- B. Skin
- C. Appendix ✓ **Correct answer**
- D. Lungs

A. wrong: the kidney is the main excretory organ.

B. wrong: the skin excretes salts and water in sweat.

C. correct: the appendix has no excretory role.

D. wrong: the lungs excrete carbon dioxide and water vapour.

Question 50 Aldosterone and sodium

Which one of the following hormone increases the reabsorption of Na ions in the nephron?

- A. ADH
- B. LH
- C. Insulin
- D. Aldosteron ✓ **Correct answer**

A. wrong: ADH increases water reabsorption, not sodium reabsorption.

B. wrong: LH acts on the gonads, not the nephron.

C. wrong: insulin lowers blood glucose; it does not regulate sodium reabsorption.

D. correct: aldosterone increases the reabsorption of sodium ions in the distal convoluted tubule and collecting duct.

51 Lymph vessels vs nodes

The key difference between lymph nodes and lymph vessels is:

- A. Vessels move lymph; nodes filter it ✓ **Correct answer**
- B. Vessels carry oxygen; nodes produce bile
- C. Vessels digest toxins; nodes transport lymph
- D. Vessels store lymphocytes; nodes make plasma

A. correct: lymph vessels carry lymph, and lymph nodes filter it and trap pathogens.

B. wrong: lymph vessels do not carry oxygen and nodes do not produce bile.

C. wrong: the roles are reversed; vessels transport and nodes filter.

D. wrong: nodes store lymphocytes, and neither makes plasma.

Question 52 Resting membrane potential

A typical value of resting membrane potential in a neuron is:

- A. -50 millivolts
- B. +50 millivolts
- C. -70 millivolts ✓ **Correct answer**
- D. +70 millivolts

A. wrong: the resting potential is more negative than -50 mV.

B. wrong: the resting potential is negative, not positive.

C. correct: a typical resting membrane potential is about -70 mV inside relative to outside.

D. wrong: the resting potential is negative, not positive.

Question 53 tRNA kinds in humans

In humans, how many kinds of tRNA are present for the synthesis of proteins?

- B. 45 ✓ **Correct answer**
- C. 43
- D. 50

A. wrong: the textbook figure for the kinds of tRNA in humans is 45, not 40.

B. correct: because of wobble pairing, 45 kinds of tRNA serve the 61 sense codons in humans.

C. wrong: the textbook figure is 45, not 43.

D. wrong: the textbook figure is 45, not 50.

Question 54 Plant cell under microscope

A cell shows green structures and a large fluid-filled area under the microscope. What does this indicate?

- A. Plant cell with chloroplasts and vacuole ✓ **Correct answer**
- B. Fungal cell without chloroplasts
- C. Algal cells with chloroplasts but lacking large vacuole
- D. Animal cell with small vacuoles

A. correct: green structures are chloroplasts and the large fluid-filled area is the central vacuole of a plant cell.

B. wrong: fungal cells have no chloroplasts, so they would not show green structures.

C. wrong: the large fluid-filled area is a vacuole, which the sample shows.

D. wrong: animal cells have no chloroplasts and only small vacuoles.

Question 55 Lactose composition

Lactose sugar is found in milk and is composed of _____.

- B. Glucose + Fructose
- C. Glucose + Galactose ✓ **Correct answer**
- D. Fructose + Galactose

A. wrong: glucose plus glucose is maltose.

B. wrong: glucose plus fructose is sucrose.

C. correct: lactose is glucose joined to galactose.

D. wrong: fructose plus galactose is not lactose.

Question 56 Species chromosome number

Which option best reflects species specific chromosome number?

- A. Same in all animals
- B. Varies by tissue type
- C. Fixed for each species ✓ **Correct answer**
- D. More in larger organisms

A. wrong: chromosome number differs between species.

B. wrong: within a species, all somatic cells of the body have the same chromosome number.

C. correct: each species has a characteristic, fixed chromosome number.

D. wrong: chromosome number is not related to the size of the organism.

Question 57 Anticodon location

Anticodon that consist of complementary basis of three nucleotides is located on:

- A. rRNA
- B. mRNA

A ✓ Correct answer

- D. DNA

A. wrong: rRNA is part of ribosomes and carries no anticodon.

B. wrong: mRNA carries codons, not anticodons.

C. correct: the anticodon, three complementary bases, is on the tRNA molecule.

D. wrong: DNA carries the gene sequence, not anticodons.

Question 58 Renal pelvis

Which part of kidney is responsible for collecting urine before it enters the ureter?

- A. Renal pelvis ✓ **Correct answer**
- B. Renal medulla
- C. Renal cortex
- D. Renal pyramids

A. correct: the renal pelvis collects urine from the kidney before it enters the ureter.

B. wrong: the medulla contains the pyramids and loops of Henle.

C. wrong: the cortex contains the glomeruli and Bowman's capsules.

D. wrong: the pyramids drain urine into the calyces, not directly into the ureter.

Question 59 Ventricular systole

Ventricular systole causes:

- A. Atrial relaxation
- B. Atrial contraction
- C. Closing of semilunar valve
- D. Closing of atrioventricular valves ✓ **Correct answer**

ntricular systole is the contraction of the ventricles, not the relaxation of the atria.

B. wrong: atrial contraction (atrial systole) precedes ventricular systole.

C. wrong: the semilunar valves open during ventricular systole so blood leaves the heart.

D. correct: when the ventricles contract, pressure rises and the atrioventricular valves shut, preventing backflow into the atria.

Question 60 Corpus luteum

After ovulation, the ruptured follicle in ovary transformed into:

- A. Corpus luteum ✓ **Correct answer**
- B. Corpus callosum
- C. Secondary follicle
- D. Tertiary follicle

A. correct: after ovulation the ruptured follicle becomes the corpus luteum, which secretes progesterone.

B. wrong: the corpus callosum is the band of fibres joining the two cerebral hemispheres.

C. wrong: the secondary follicle is an earlier stage before ovulation.

D. wrong: the tertiary (Graafian) follicle is the stage just before ovulation.

Question 61 Bone destroying cells

Which one are bone destroying cells?

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

osteoclasts break down (resorb) bone tissue.

B. wrong: osteocytes maintain bone tissue.

C. wrong: osteogenic cells are stem cells that produce osteoblasts.

D. wrong: osteoblasts build bone tissue.

Question 62 Spleen function

Spleen contributes towards:

- A. Producing insulin and glucagon
- B. Producing antibodies against fats
- C. Increasing oxygen binding to hemoglobin
- D. Filtering blood and removing old red blood cells ✓ **Correct answer**

A. wrong: insulin and glucagon are produced by the pancreas.

B. wrong: the spleen does not produce antibodies against fats.

C. wrong: the spleen does not change haemoglobin's oxygen binding.

D. correct: the spleen filters the blood and removes old and damaged red blood cells.

Question 63 Haemophilia probability

Hemophilia is a sex linked recessive trait. A hemophiliac man marries to a normal woman (whose father ishemophiliac). If they have daughter, what is the probability that she will be hemophiliac?

- A. 0%
- B. 25%
- C. 50% ✓ **Correct answer**
- D. 75%

A. wrong: the daughter always receives the affected X from her father.

e chance is one in two, not one in four.

C. correct: the mother is a carrier (her father was haemophiliac), so a daughter has a 50% chance of receiving her affected X and being haemophiliac.

D. wrong: the chance is one in two, not three in four.

Question 64 Morgan gene linkage

Morgan's experiment showed deviation from the law of independent assortment due to:

- A. Crossing over
- B. Gene linkage ✓ **Correct answer**
- C. Random mutation
- D. Natural selection

A. wrong: crossing over breaks linkage; it is not the cause of the deviation from independent assortment.

B. correct: Morgan showed that genes on the same chromosome are linked and do not assort independently.

C. wrong: mutation was not the cause of the deviation.

D. wrong: natural selection does not affect the assortment of genes.

Question 65 Active site

The active site is important in enzyme action because:

- A. It binds to the substrate ✓ **Correct answer**
- B. It maintains the pH of reaction
- C. It provide energy for reaction
- D. It changes the shape of the enzyme

A. correct: the active site is the pocket where the substrate binds so the reaction can

B. wrong: the active site does not maintain pH.

C. wrong: the active site lowers activation energy; it does not supply energy.

D. wrong: the active site's shape fits the substrate; it does not itself change the enzyme's shape.

Question 66 Pacinian corpuscles

The main function of Pacinian corpuscles is to detect:

- A. Chemical composition of food
- B. Changes in temperature
- C. Stimuli of pressure ✓ **Correct answer**
- D. Sharp pain signals

A. wrong: chemical composition is detected by chemoreceptors, not Pacinian corpuscles.

B. wrong: temperature is detected by thermoreceptors.

C. correct: Pacinian corpuscles in the skin detect deep pressure and vibration.

D. wrong: sharp pain is detected by pain receptors (nociceptors).

Question 67 Tendon

The connective tissue which connects skeletal muscle to bone is:

- A. Tendon ✓ **Correct answer**
- B. Ligament
- C. Cartilage
- D. Synovial membrane

A. correct: a tendon is the tough connective tissue joining a skeletal muscle to a bone.

ligament joins bone to bone.

C. wrong: cartilage is the flexible tissue covering bone ends and in joints.

D. wrong: the synovial membrane lines the joint capsule and secretes synovial fluid.

Question 68 Lipid synthesis in liver

Cholesterol and phospholipids are mainly synthesized in liver cells by:

- A. Golgi complex
- B. Mitochondria
- C. Rough endoplasmic reticulum (RER)
- D. Smooth endoplasmic reticulum (SER) ✓ **Correct answer**

A. wrong: the Golgi modifies and packages molecules; it does not synthesise cholesterol and phospholipids.

B. wrong: mitochondria produce energy; they do not synthesise cholesterol and phospholipids.

C. wrong: the rough ER synthesises proteins, not lipids.

D. correct: the smooth ER synthesises cholesterol, phospholipids and other lipids.

Question 69 T-tubules in muscle

The nerve impulse for the contraction of skeletal muscle fiber is carried from sarcolemma to every myofibril of a muscle cell via:

- A. T-tubules ✓ **Correct answer**
- B. H-zone
- C. Thin myofilaments
- D. Thick myofilaments

A. correct: transverse tubules carry the nerve impulse from the sarcolemma deep into the

to every myofibril.

B. wrong: the H-zone is the central region of the sarcomere containing only thick filaments.

C. wrong: thin filaments (actin) slide during contraction; they do not carry the impulse.

D. wrong: thick filaments (myosin) pull during contraction; they do not carry the impulse.

Question 70 Oxygen carrying capacity

Which of the following is the most appropriate concept of oxygen carrying capacity of blood?

- A. Ability of blood to carry oxygen
- B. Ability of hemoglobin to bind with oxygen ✓ **Correct answer**
- C. Amount of oxygen present in the plasma
- D. Rate of binding of fibrinogen with proteins

A. wrong: this is too vague; the capacity depends on haemoglobin binding.

B. correct: the oxygen-carrying capacity of blood is the ability of haemoglobin to bind oxygen.

C. wrong: only a small amount of oxygen dissolves in plasma.

D. wrong: fibrinogen is involved in clotting, not oxygen transport.

Question 71 Central dogma

The central dogma of molecular biology describes the flow of genetic information as:

- A. DNA → mRNA → Protein ✓ **Correct answer**
- B. mRNA → DNA → Protein
- C. Protein → DNA → mRNA
- D. DNA → Protein → mRNA

genetic information flows from DNA to mRNA (transcription) and then to protein (translation).

B. wrong: information does not flow from mRNA to DNA in the central dogma.

C. wrong: information does not flow from protein back to DNA.

D. wrong: DNA is not translated directly into protein; mRNA comes first.

Question 72 Acylglycerols

Acylglycerols like fats and oils are esters formed by condensation reaction between:

- A. Fatty acid and water
- B. Fatty acid and phosphates
- C. Fatty acid and glucose
- D. Fatty acid and alcohol ✓ **Correct answer**

A. wrong: water is released in condensation, not a reactant that forms the ester.

B. wrong: phosphates are not part of acylglycerols.

C. wrong: glucose is a sugar, not the alcohol of a fat.

D. correct: fats and oils are esters formed by condensation of fatty acids with an alcohol (glycerol).

Question 73 Reflex action

Reflex action is considered as the simplest form of response in:

- A. Simple animals
- B. Higher animals ✓ **Correct answer**
- C. Lowest animals
- D. Smaller animals

A. wrong: the textbook states reflex action is the simplest form of response in higher

B. correct: in higher animals, the reflex action is the simplest form of response.

C. wrong: the lowest animals respond by simpler means such as taxis.

D. wrong: size is not the criterion; the statement concerns higher animals.

Question 74 Platform for protein synthesis

A platform for protein synthesis in the cell is provided by:

- A. mRNA
- B. rRNA ✓ **Correct answer**
- C. tRNA
- D. protein encoding DNA

A. wrong: mRNA carries the message, it is not the platform.

B. correct: ribosomal RNA forms the ribosome, the platform on which protein synthesis occurs.

C. wrong: tRNA brings amino acids; it is not the platform.

D. wrong: DNA holds the code but is not the site of synthesis.

Question 75 Monoclonal antibodies in diagnosis

In disease diagnosis, the main function of monoclonal antibodies is:

- A. To stimulate white blood cell production
- B. To detect specific antigens in clinical samples ✓ **Correct answer**
- C. To bind to toxins produced by pathogens
- D. To label abnormal cells for immune destruction

A. wrong: monoclonal antibodies do not stimulate white blood cell production.

diagnosis, monoclonal antibodies bind a specific antigen so it can be detected in a sample.

C. wrong: binding toxins is a treatment role, not the main diagnostic use.

D. wrong: labelling cells for destruction is a therapeutic use, not diagnosis.

Question 76 Smallest carbohydrate

Pick the smallest form of carbohydrates from the following, which cannot be further hydrolyzed into simpler form.

- A. sucrose
- B. lactose
- C. glucose ✓ **Correct answer**
- D. starch

A. wrong: sucrose is a disaccharide that can be hydrolysed into glucose and fructose.

B. wrong: lactose is a disaccharide that can be hydrolysed into glucose and galactose.

C. correct: glucose is a monosaccharide, the smallest carbohydrate, and cannot be hydrolysed further.

D. wrong: starch is a polysaccharide that can be hydrolysed into many glucose units.

Question 77 Non-competitive inhibitor

Which type of inhibitor binds to a site other than the active site and changes the shape of active site?

- A. Competitive inhibitor
- B. Un-competitive inhibitor
- C. Allosteric activator
- D. Non - competitive inhibitor ✓ **Correct answer**

competitive inhibitor binds the active site itself.

B. wrong: an uncompetitive inhibitor binds only the enzyme-substrate complex.

C. wrong: an activator increases enzyme activity; it does not inhibit it.

D. correct: a non-competitive inhibitor binds a site other than the active site and changes the active site's shape.

Question 78 Saltatory conduction site

Saltatory conduction of nerve impulse occurs in:

- A. Myelinated axons ✓ **Correct answer**
- B. Cell bodies
- C. Unmyelinated axons
- D. Dendrites

A. correct: saltatory conduction (jumping between nodes of Ranvier) occurs in myelinated axons.

B. wrong: impulses do not jump between nodes in the cell body.

C. wrong: conduction in unmyelinated axons is continuous, not saltatory.

D. wrong: dendrites carry impulses toward the cell body; saltatory conduction is an axon phenomenon.

Question 79 Chromatid

Thread-like single strand of a chromosome that is made of DNA and protein is known as:

- A. Chromosome arm
- B. Nucleosome
- C. Chromosome
- D. Chromatid ✓ **Correct answer**

chromosome arm is one side of a chromosome, not a single strand.

B. wrong: a nucleosome is DNA wrapped around histone proteins.

C. wrong: a chromosome is the whole duplicated structure, made of two chromatids.

D. correct: a chromatid is one thread-like strand of a duplicated chromosome, made of DNA and protein.

Question 80 Bile composition except

Which of the following is NOT included in the composition of bile?

- A. Bile salt
- B. Bile pigment
- C. Cholesterol
- D. Lipase ✓ **Correct answer**

A. wrong: bile salts are a normal component of bile.

B. wrong: bile pigments (bilirubin) are a normal component of bile.

C. wrong: cholesterol is a normal component of bile.

D. correct: lipase is a pancreatic enzyme; it is not a component of bile.

Question 81 pH and active site ionisation

Which factor affects the ionization state of an enzyme's active site?

- A. Temperature
- B. Enzyme concentration
- C. Substrate concentration
- D. pH ✓ **Correct answer**

A. wrong: temperature affects the rate of reaction, not the ionisation state of the active site.

zyme concentration changes the rate, not the ionisation of the active site.

C. wrong: substrate concentration changes the rate, not the ionisation of the active site.

D. correct: pH changes the ionisation of the amino acid groups in the active site, affecting enzyme activity.

Question 82 Common ion effect

When hydrochloric acid is added to brine, solubility of sodium chloride _____.

- A. Decreases ✓ **Correct answer**
- B. Increases
- C. Remains same
- D. Become equal to HCl

A. correct: adding HCl supplies extra chloride ions, so by the common ion effect the solubility of NaCl decreases.

B. wrong: a common ion suppresses solubility; it does not increase it.

C. wrong: the added chloride shifts the equilibrium and the solubility changes.

D. wrong: the solubility of NaCl does not become equal to the acid concentration.

Question 83 Clemmensen reduction of acetaldehyde

Zn-Hg/conc. HCl reduces acetaldehyde to:

- A. Ethane ✓ **Correct answer**
- B. Ethene
- C. acetic acid
- D. Para aldehyde

A. correct: Clemmensen reduction (Zn-Hg/conc. HCl) reduces the carbonyl of acetaldehyde (CH3CHO) to a methylene group, giving ethane (CH3CH3).

hene is an alkene, Clemmensen reduction gives the alkane, not the alkene.

C. wrong: acetic acid is the oxidation product of acetaldehyde, not the reduction product.

D. wrong: paraldehyde is a polymer of acetaldehyde, not its reduction product.

Question 84 Chromophore

Which of the following group acts as chromophore?

- A. amino group
- B. azo group ✓ **Correct answer**
- C. hydroxyl group
- D. sulfonic acid group

A. wrong: the amino group is an auxochrome, not a chromophore.

B. correct: the azo group (-N=N-) is a chromophore that absorbs visible light and gives colour.

C. wrong: the hydroxyl group is an auxochrome, not a chromophore.

D. wrong: the sulfonic acid group makes a dye water-soluble; it is not the chromophore.

Question 85 Natural adhesive

Which of the following is natural adhesive?

- A. silicones
- B. polyvinylacetate
- C. casein glue ✓ **Correct answer**
- D. polyamide

A. wrong: silicones are synthetic polymers.

B. wrong: polyvinyl acetate is a synthetic adhesive.

…isein glue, made from milk protein, is a natural adhesive.

D. wrong: polyamides (nylons) are synthetic polymers.

Question 86 NH3 vs BF3 dipole

NH_3 has net dipole moment but BF_3 has zero net dipole moment because of?

- A. B is less E.N than N
- B. F is more E.N than N
- C. BF_3 is pyramidal
- D. NH_3 is pyramidal ✓ **Correct answer**

A. wrong: electronegativity difference alone does not explain the zero dipole of BF3.

B. wrong: the high electronegativity of fluorine does not cancel the dipole by itself.

C. wrong: BF3 is trigonal planar, not pyramidal.

D. correct: NH3 is pyramidal, so its bond dipoles do not cancel and it has a net dipole, while planar BF3 has bond dipoles that cancel exactly.

Question 87 Lowest vapour pressure

Which of the following has lower vapour pressure?

- A. $CHCl_3$
- B. CCl_4
- C. H_2O ✓ **Correct answer**
- D. CH_3COCH_3

A. wrong: chloroform is volatile and has a higher vapour pressure than water.

B. wrong: carbon tetrachloride is volatile and has a higher vapour pressure than water.

C. correct: water's strong hydrogen bonding holds its molecules together, giving it the lowest vapour pressure of the four.

etone is volatile and has a higher vapour pressure than water.

Question 88 Orbital after 3d

The electrons will enter which of these orbitals after filling the 3d orbital.

- A. 4d
- B. 4f
- C. 4s
- D. 4p ✓ **Correct answer**

A. wrong: 4d fills after 5s, not directly after 3d.

B. wrong: 4f fills much later in the sequence.

C. wrong: 4s fills before 3d, not after it.

D. correct: after 3d is filled, electrons enter the 4p orbital.

Question 89 Dehydration of alcohol

Dehydration of alcohol to form ethene is an example of:

- A. substitution reaction
- B. addition reaction
- C. elimination reaction ✓ **Correct answer**
- D. redox reaction

A. wrong: no atom is substituted in dehydration.

B. wrong: a molecule is removed, not added.

C. correct: dehydration removes water from the alcohol to form ethene, an elimination reaction.

D. wrong: dehydration is not a redox reaction.

90 Triatomic molecule shape

A triatomic molecule must be either linear with bond angle of 180° or else?

- A. t-shape
- B. bent ✓ **Correct answer**
- C. pyramidal
- D. tetrahedral

A. wrong: a triatomic molecule is not T-shaped.

B. correct: a triatomic molecule is either linear (180°) or bent (less than 180°), as in water.

C. wrong: pyramidal is a shape for four-atom molecules with a lone pair.

D. wrong: tetrahedral is a shape for five-atom molecules.

Question 91 Strong dipole-dipole forces

If molecules have strong dipole dipole force, then they have high?

- A. heat of neutralization
- B. heat of combustion
- C. heat of vaporization ✓ **Correct answer**
- D. heat atomization

A. wrong: neutralisation heat depends on the acid-base reaction, not dipole forces.

B. wrong: combustion heat depends on bond energies, not dipole forces.

C. correct: strong dipole-dipole forces must be overcome to vaporise a liquid, so the heat of vaporisation is high.

D. wrong: atomisation heat breaks covalent bonds, not dipole forces.

92 Most volatile liquid

Which one is the most volatile liquid?

- A. water
- B. methanol
- C. benzene
- D. diethylether ✓ **Correct answer**

A. wrong: water has strong hydrogen bonding and is the least volatile here.

B. wrong: methanol hydrogen-bonds and is less volatile than diethyl ether.

C. wrong: benzene is less volatile than diethyl ether.

D. correct: diethyl ether has weak intermolecular forces and the lowest boiling point, so it is the most volatile.

Question 93 Non-zero dipole moment

The molecules that has non zero dipole moment is?

- A. CO_2
- B. CO ✓ **Correct answer**
- C. BF_3
- D. $AlCl_3$

A. wrong: carbon dioxide is linear, so its bond dipoles cancel.

B. correct: carbon monoxide is polar, so it has a non-zero dipole moment.

C. wrong: boron trifluoride is trigonal planar, so its bond dipoles cancel.

D. wrong: aluminium chloride is trigonal planar, so its bond dipoles cancel.

94 Smallest ionic radius

Which element has smallest ionic radius?

- A. Li+1 ✓ **Correct answer**
- B. Na+1
- C. K+1
- D. Rb+1

A. correct: among Li+, Na+, K+ and Rb+, lithium ion is the smallest, being at the top of the group with the fewest shells.

B. wrong: sodium ion is larger than lithium ion.

C. wrong: potassium ion is larger than lithium and sodium ions.

D. wrong: rubidium ion is the largest of the four. (The options are printed in a faded superscript font and were recovered from the rendered page.)

Question 95 Liquids on heating

When liquids are heated, volume _____.

- A. decreases
- B. increases ✓ **Correct answer**
- C. remains same
- D. cannot be measured

A. wrong: heating a liquid makes its volume larger, not smaller.

B. correct: on heating, the molecules move further apart and the volume of a liquid increases.

C. wrong: the volume changes with temperature.

D. wrong: the volume of a liquid can be measured.

96 Heat-stable metal hydroxide

Which metal hydroxide is stable to heat?

- A. Li
- B. Na ✓ **Correct answer**
- C. Mg
- D. Ca

A. wrong: lithium hydroxide decomposes on heating.

B. correct: sodium hydroxide is stable to heat (group 1 hydroxides other than lithium are heat-stable).

C. wrong: magnesium hydroxide decomposes on heating to MgO and water.

D. wrong: calcium hydroxide decomposes on heating to CaO and water.

Question 97 Redox except

Which one of the following reactions involve either oxidation or reduction EXCEPT:

- A. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
- B. $Cu^{2+} + Zn \rightarrow Zn^{2+} + Cu$
- C. $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ ✓ **Correct answer**
- D. $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

A. wrong: carbon is oxidised and oxygen is reduced, so this is redox.

B. wrong: zinc is oxidised and copper is reduced, so this is redox.

C. correct: this is an acid-base (neutralisation) reaction; no oxidation numbers change, so it is neither oxidation nor reduction.

D. wrong: zinc is oxidised and hydrogen is reduced, so this is redox.

98 Intermolecular forces vanish

If intermolecular forces between gas molecules disappear suddenly, which of the following would happen?

- A. pressure decreases
- B. pressure increases ✓ **Correct answer**
- C. gas collapses
- D. pressure remain unchanged

A. wrong: attractions lower the pressure of a real gas, so removing them raises it.

B. correct: without intermolecular attractions the gas behaves ideally and exerts a higher pressure.

C. wrong: removing attractions does not make the gas collapse.

D. wrong: the pressure changes because real-gas attractions are removed.

Question 99 Strongest metallic bond

Which one has strongest metallic bond?

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

A. wrong: sodium has one valence electron and a weaker metallic bond than aluminium.

B. wrong: magnesium has two valence electrons, fewer than aluminium.

C. correct: aluminium has three valence electrons and a small size, giving the strongest metallic bond of the four.

D. wrong: phosphorus is a non-metal and does not form metallic bonds.

100 Rate constant depends on

Rate constant depends upon:

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

A. wrong: the rate constant does not depend on the volume of the vessel.

B. correct: the rate constant k varies with temperature (Arrhenius equation).

C. wrong: the rate depends on concentration, but the rate constant does not.

D. wrong: the rate constant does not depend on pressure.

Question 101 Nylon 6,6 monomer

Which monomer is used for synthesis of nylon 6,6?

- A. sobacoyl chloride
- B. methylene diamine
- C. heptane-1,7-dioic acid
- D. hexamethylene diamine ✓ **Correct answer**

A. wrong: sebacoyl chloride is used for nylon 6,10, not nylon 6,6.

B. wrong: methylene diamine is not a nylon 6,6 monomer.

C. wrong: heptane-1,7-dioic acid is not a nylon 6,6 monomer.

D. correct: nylon 6,6 is made from hexamethylenediamine and adipic acid.

Question 102 Friedel-Crafts alkylation

Aromatic compound that is more likely to undergo Friedel-Craft alkylation is

- A. benzene
- B. toluene ✓ **Correct answer**
- C. nitrobenzene
- D. benzaldehyde

A. wrong: benzene reacts, but toluene is more reactive because the methyl group activates the ring.

B. correct: the methyl group of toluene activates the ring, so toluene undergoes Friedel-Crafts alkylation most readily.

C. wrong: the nitro group deactivates the ring, so nitrobenzene is least reactive.

D. wrong: the aldehyde group deactivates the ring.

Question 103 3-oxopentanal

The IUPAC name for CH_3-CH_2-CO-CH_2-CHO is :

- A. 3-one pentanal
- B. 3-oxo pentanal ✓ **Correct answer**
- C. 3-one pentanol
- D. 3-oxo pentanol

A. wrong: the ketone suffix in a substituted aldehyde is 'oxo', not 'one'.

B. correct: CH3-CH2-CO-CH2-CHO is a five-carbon aldehyde with a keto group at carbon 3, i.e. 3-oxopentanal.

C. wrong: the compound is an aldehyde, not an alcohol, and 'oxo' is the right prefix.

D. wrong: the compound is an aldehyde, not an alcohol.

104 n + l for 4d

n + l value for 4d orbital is:

- A. 4
- B. 5
- C. 6 ✓ **Correct answer**
- D. 7

A. wrong: 4 is the value of n alone.

B. wrong: 5 is n + l for 4p (l = 1) or 3d (l = 2).

C. correct: for a 4d orbital n = 4 and l = 2, so n + l = 6.

D. wrong: 7 is n + l for 4f (l = 3).

Question 105 Boyle's law pressure tripled

At constant temperature, when the pressure of gas is increased three times then its volume becomes:

- A. 2V/3
- B. 3V
- C. V/3 ✓ **Correct answer**
- D. 5V

A. wrong: tripling the pressure does not give 2V/3.

B. wrong: increasing pressure decreases the volume, not increases it.

C. correct: at constant temperature, pressure and volume are inversely proportional, so tripling the pressure reduces the volume to one third.

D. wrong: increasing pressure decreases the volume.

106 Ketone with LiAlH4

Ketones when treated with $LiAlH_4$ in the presence of dry ether, they are converted to:

- A. Primary Alcohol
- B. Monohyderic alcohol
- C. Secondary alcohol ✓ **Correct answer**
- D. Dihyderic alcohol

A. wrong: ketones give secondary alcohols, not primary ones.

B. wrong: this is not the specific product of ketone reduction.

C. correct: LiAlH4 reduces a ketone to a secondary alcohol.

D. wrong: a ketone gives a monohydric secondary alcohol, not a dihydric one.

Question 107 Terminal alkyne with Lindlar

A terminal alkyne is treated with lindler catalyst and Hydrogen. The major product is:

- A. Trans- alkene
- B. Cis-alkene ✓ **Correct answer**
- C. alkane
- D. vinyl chloride

A. wrong: Lindlar's catalyst gives the cis-alkene, not the trans-alkene.

B. correct: Lindlar's catalyst partially hydrogenates an alkyne to the cis-alkene.

C. wrong: Lindlar's catalyst stops at the alkene; it does not give the alkane.

D. wrong: no chlorine is involved, so no vinyl chloride forms.

Question 108 Actual and percentage yield

A student starts a reaction expecting to get 28g of product. After isolating and drying the

obtains 18g. Later it was found that 4g was lost due to spillage. What is the actual and percentage yield?

- A. 14g and 50% ✓ **Correct answer**
- B. 18g and 75%
- C. 28g and 85%
- D. 24g and 90%

A. wrong: the isolated product is 18 g, not 14 g.

B. correct: 18 g of product was isolated, and on the paper's own arithmetic (28 g expected less 4 g lost by spillage = 24 g) the percentage yield is 18/24 = 75%.

C. wrong: 28 g is the expected amount, not the amount obtained.

D. wrong: 24 g is the expected amount after deducting the spillage, not the amount obtained.

Question 109 Pentanoic acid common name

Common name of pentanoic acid is

- A. valeric acid ✓ **Correct answer**
- B. caproic acid
- C. stearic acid
- D. oxalic acid

A. correct: pentanoic acid is commonly called valeric acid.

B. wrong: caproic acid is hexanoic acid.

C. wrong: stearic acid is octadecanoic acid.

D. wrong: oxalic acid is ethanedioic acid.

110 Exothermic process

Which one of the following is an exothermic process?

- A. Melting of ice
- B. Evaporation of water
- C. Oxidation of Sulphur ✓ **Correct answer**
- D. Photosynthesis

A. wrong: melting absorbs heat, so it is endothermic.

B. wrong: evaporation absorbs heat, so it is endothermic.

C. correct: the oxidation (burning) of sulphur releases heat, so it is exothermic.

D. wrong: photosynthesis absorbs light energy, so it is endothermic.

Question 111 Most reactive toward electrophile

If an electrophile is the attacking reagent, which one is the most reactive?

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

A. wrong: the alkyl iodide is the least reactive toward an electrophile in this series.

B. correct: the alkyl fluoride is the most reactive toward an electrophile, because the highly polar C-F bond and the fluorine lone pairs interact most strongly with the electrophile.

C. wrong: the alkyl bromide is less reactive than the fluoride.

D. wrong: the alkyl chloride is less reactive than the fluoride.

112 Activation energy

The activation energy of a reaction is usually:

- A. Unaffected by the process of a catalyst.
- B. Low for the reaction that takes place slowly.
- C. Different for the forward and backward reaction. ✓ **Correct answer**
- D. Increases with rise in temperature.

A. wrong: a catalyst lowers the activation energy.

B. wrong: slow reactions have high activation energy.

C. correct: the activation energy of the forward reaction differs from that of the backward reaction (by the enthalpy change).

D. wrong: activation energy does not change with temperature; the rate constant does.

Question 113 Carbocation intermediate

Which of the following mechanism involves a carbocation intermediate?

- A. E1 mechanism
- B. E2 mechanism
- C. SN1 mechanism
- D. SN2 mechanism

No answer is given for this question, and none is taught. DEFECTIVE-excluded (two options true — see note)

A. ALSO true: the E1 mechanism proceeds through a carbocation intermediate after the leaving group departs.

B. wrong: E2 is concerted, with no carbocation intermediate.

C. true: the SN1 mechanism proceeds through a carbocation intermediate.

2 is concerted, with no carbocation intermediate. DEFECTIVE-excluded: both E1 (A) and SN1 (C) involve a carbocation intermediate, so the question has two correct options and no unique answer; the official key names C only. Decided by the assistant under the owner's 8 Nov 2026 delegation. The question stays in the file with no answer taught and never enters the website JSON.

Question 114 Homolysis product

What is formed by homolysis of covalent bond?

- A. free radical ✓ **Correct answer**
- B. molecule
- C. ion
- D. atom

A. correct: homolysis splits a covalent bond so each atom keeps one electron, forming two free radicals.

B. wrong: homolysis does not form a molecule.

C. wrong: ions are formed by heterolysis, not homolysis.

D. wrong: homolysis forms radicals, which are atoms or groups with an unpaired electron, but the product is named a free radical.

Question 115 Alkene characteristic reaction

Which of the following reaction is the characteristic of alkene?

- A. Electrophilic addition ✓ **Correct answer**
- B. Nucleophilic substitution
- C. Free radical substitution
- D. Elimination

A. correct: the characteristic reaction of alkenes is electrophilic addition across the double

B. wrong: nucleophilic substitution is characteristic of alkyl halides, not alkenes.

C. wrong: free radical substitution is characteristic of alkanes.

D. wrong: elimination is characteristic of alkyl halides and alcohols, not alkenes.

Question 116 Toluene with bromine and UV

Toluene reacts with bromine in the presence of UV light to produce:

- A. m-bromotoluene
- B. benzylbromide ✓ **Correct answer**
- C. o-bromotoluene
- D. bromobenzene

A. wrong: under UV light the reaction is at the side chain, not on the ring.

B. correct: with UV light, bromine substitutes a benzylic hydrogen by a free-radical mechanism, giving benzyl bromide.

C. wrong: ring bromination needs a Lewis catalyst, not UV light.

D. wrong: bromobenzene would require replacing the methyl group entirely.

Question 117 Phenol with acetyl chloride

Reaction of Phenol with Acetyl chloride will yield:

- A. Alcohol
- B. Ester ✓ **Correct answer**
- C. Carboxylic acid
- D. Ether

A. wrong: phenol is already an alcohol-like compound; the product is not an alcohol.

henol reacts with acetyl chloride to give phenyl acetate, an ester.

C. wrong: no carboxylic acid is formed.

D. wrong: the product contains the ester linkage, not an ether linkage.

Question 118 Sodium and chlorine stoichiometry

Consider the reaction: $2Na + Cl_2 \rightarrow 2NaCl$ If 4 moles of Na and 2 moles of Cl_2 are reacted, how much Cl_2 will remain unreacted?

- A. 0 mol ✓ **Correct answer**
- B. 0.5 mol
- C. 1 mol
- D. 1.5 mol

A. correct: 4 mol Na needs exactly 2 mol Cl2 (2Na + Cl2 → 2NaCl), so no chlorine remains.

B. wrong: the reactants are in exact stoichiometric ratio.

C. wrong: the reactants are in exact stoichiometric ratio.

D. wrong: the reactants are in exact stoichiometric ratio.

Question 119 Unit of rate constant

Unit of rate constant for a particular reaction depends upon the:

- A. temperature of reaction
- B. activation energy of reaction
- C. molecularity of reaction
- D. order of reaction ✓ **Correct answer**

A. wrong: the unit of the rate constant does not depend on temperature.

B. wrong: the unit of the rate constant does not depend on activation energy.

e unit depends on the order, not the molecularity.

D. correct: the unit of the rate constant depends on the overall order of the reaction.

Question 120 Boyle's law expression

Expression for Boyle's law is:

- A. V α n
- B. V α P^{-1} ✓ **Correct answer**
- C. T α P
- D. P α n

A. wrong: V proportional to n is Avogadro's law.

B. correct: Boyle's law states that at constant temperature, volume is inversely proportional to pressure.

C. wrong: T proportional to P at constant volume is Gay-Lussac's law.

D. wrong: P proportional to n at constant volume and temperature is not Boyle's law.

Question 121 Chiral molecule

A molecule will be chiral, if it has:

- A. three different group
- B. no element of symmetry ✓ **Correct answer**
- C. superimposed
- D. mirror image

A. wrong: a chiral centre needs four different groups, and chirality is about symmetry, not just group count.

B. correct: a molecule is chiral if it has no element of symmetry (no plane or centre of symmetry).

chiral molecule is non-superimposable on its mirror image; 'superimposed' is the opposite.

D. wrong: having a mirror image does not make a molecule chiral; it must be non-superimposable on it.

Question 122 Lowest boiling group VIIA hydride

Which hydride of group VIIA has lowest boiling point?

- A. HF
- B. HCl
- C. HBr
- D. HI ✓ **Correct answer**

A. wrong: HF has the highest boiling point (19.5 °C) because of hydrogen bonding.

B. correct: the measured boiling points are HCl -85 °C, HBr -67 °C, HI -35 °C and HF 19.5 °C, so HCl has the lowest boiling point.

C. wrong: HBr boils at -67 °C, higher than HCl.

D. wrong: HI boils at -35 °C, higher than HCl; the official Blue, White and Brown keys all list D (HI), which is a key error, and B is served as correct under the owner's 8 Nov 2026 delegation.

Question 123 Kc changes with

Kc value will change, if we change:

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

A. wrong: changing the pressure does not change the equilibrium constant.

: changes only when the temperature changes.

C. wrong: changing concentrations shifts the equilibrium but does not change Kc.

D. wrong: Kc changes only with temperature, not with any change.

Question 124 NF3 bond angle

The N-F-N bond in NF is 101.9° -102.4°, much lesser than in ammonia due to:

- A. Presence of lone pair on F
- B. high electronegativity of F ✓ **Correct answer**
- C. large size of F
- D. Its drawback of VSEPR

A. wrong: fluorine's lone pairs do not cause the smaller angle.

B. correct: fluorine's high electronegativity pulls the bonding pairs away from nitrogen, reducing bond-pair repulsion and shrinking the angle below that of ammonia.

C. wrong: the size of fluorine is not the cause.

D. wrong: VSEPR does explain the angle; there is no drawback here.

Question 125 Oxidation number method n

$NO_2^- \rightarrow NO_3^- + ne^-$. Value of "n" by the oxidation number method is:

- A. 1
- B. 2 ✓ **Correct answer**
- C. 3
- D. 6

A. wrong: nitrogen changes by two oxidation units, not one.

B. correct: nitrogen goes from +3 in NO2- to +5 in NO3-, a loss of 2 electrons, so n = 2.

e oxidation number changes by two, not three.

D. wrong: the oxidation number changes by two, not six.

Question 126 Toluene chlorination with Lewis catalyst

Reaction of toluene with chlorine in presence of Lewis catalyst, the major product will be:

- A. o-chlorotoluene
- B. m-chlorotoluene
- C. p-chlorotoluene ✓ **Correct answer**
- D. equal mixture of o and p toluene

A. wrong: the ortho product forms but is the minor product because of crowding next to the methyl group.

B. wrong: the methyl group directs ortho and para, not meta.

C. correct: with a Lewis catalyst, electrophilic chlorination of toluene gives mainly the para product.

D. wrong: the para product predominates over the ortho product.

Question 127 Gamma vs X-ray photon

If a photon of gamma ray and one of x-ray are compared, then:

- A. x-ray photon has more energy
- B. Both have same energy
- C. Gamma-ray photon has more energy ✓ **Correct answer**
- D. Both have same wavelength

A. wrong: X-rays have lower frequency and lower energy than gamma rays.

B. wrong: gamma rays and X-rays have different energies.

C. correct: gamma rays have higher frequency than X-rays, so a gamma photon carries

D. wrong: gamma rays have shorter wavelength than X-rays.

Question 128 Negative dot product projection

The dot product of two vectors is negative. If one vector lies along the positive x-axis, then the projection of second vector is along:

- A. x.axis
- B. - x-axis ✓ **Correct answer**
- C. y-axis
- D. - y-axis

A. wrong: a positive projection on the x-axis would make the dot product positive.

B. correct: a negative dot product means the second vector has a component opposite to the first, so its projection is along the negative x-axis.

C. wrong: a projection on the y-axis would be perpendicular and give zero dot product.

D. wrong: a projection on the negative y-axis would be perpendicular and give zero dot product.

Question 129 Work between equal potentials

If two points are at the same potential in a electric field, then the work done in moving a unit positive charge from one point to another is equal to:

- A. - 0.5 J
- B. 0 J ✓ **Correct answer**
- C. 1 J
- D. 2 J

A. wrong: no work is done when the potential does not change.

ork done = charge × potential difference, and the potential difference is zero, so the work is zero.

C. wrong: the work is zero, not 1 J.

D. wrong: the work is zero, not 2 J.

Question 130 String harmonic wavelengths

A string vibrates in the first, second and third harmonics. The ratio of their wavelength is:

- A. 1 : 2 : 3
- B. 3 : 2 : 1 ✓ **Correct answer**
- C. 1 : 4 : 9
- D. 3 : 6 : 9

A. wrong: this is the ratio of the frequencies, not the wavelengths.

B. correct: the wavelengths are 2L, L and 2L/3, giving the ratio 3 : 2 : 1.

C. wrong: this is not the wavelength ratio of the first three harmonics.

D. wrong: this is not the wavelength ratio of the first three harmonics.

Question 131 Angle in three turns

The angle that a body covers at the center of the circle in three turns in radian is:

- A. 0
- B. 3
- C. 10.8
- D. 18.8 ✓ **Correct answer**

A. wrong: three turns cover a large angle, not zero.

B. wrong: 3 is the number of turns, not the angle in radians.

ree turns are 6π radians, about 18.8, not 10.8.

D. correct: one turn is 2π radians, so three turns are 6π ≈ 18.8 radians.

Question 132 EMF source efficiency 50%

The efficiency of an emf source becomes 50% when the load resistance is equal to:

- A. internal resistance ✓ **Correct answer**
- B. double the internal resistance
- C. half the internal resistance
- D. zero

A. correct: the efficiency is 50% when the load resistance equals the internal resistance, so half the power is lost inside the source.

B. wrong: with the load double the internal resistance the efficiency would be about 67%.

C. wrong: with the load half the internal resistance the efficiency would be about 33%.

D. wrong: with zero load resistance all the power is lost inside the source.

Question 133 Resistivity on doubling length

If the length of a copper wire connected in a circuit is doubled, its resistivity:

- A. Becomes half
- B. Becomes double
- C. Becomes four times
- D. Remains same ✓ **Correct answer**

A. wrong: resistivity is a property of the material, not of the length.

B. wrong: doubling the length doubles the resistance, not the resistivity.

C. wrong: resistivity does not change with length.

esistivity depends only on the material and temperature, not on the length of the wire.

Question 134 Power at 90 degrees

If the angle between force and velocity is 90°, the power delivered by the force is:

- A. Zero ✓ **Correct answer**
- B. Maximum
- C. Minimum but not zero
- D. Infinite

A. correct: power = F·v = Fv cosθ, and cos 90° = 0, so no power is delivered.

B. wrong: power is maximum when the angle is 0°, not 90°.

C. wrong: at 90° the power is exactly zero.

D. wrong: the power is zero, not infinite.

Question 135 Horizontal velocity component

A ball is thrown vertically upward with a certain velocity making an angle with the horizontal (neglecting air resistance). With the passage of time horizontal component of velocity _____.

- A. Increases
- B. Decreases
- C. Remains same ✓ **Correct answer**
- D. First decreases then increases

A. wrong: with no air resistance there is no horizontal force, so the horizontal velocity does not increase.

B. wrong: with no air resistance there is no horizontal force, so the horizontal velocity does not decrease.

with no horizontal force acting, the horizontal component of velocity stays constant.

D. wrong: the horizontal component stays constant throughout.

Question 136 RC time constant

A capacitor of capacitance 2 μF is connected in series with 1 MΩ resistance and 12 volts battery. The time taken by this capacitor take to 63% of its equilibrium charge will be:

- A. 1 second
- B. 2 seconds ✓ **Correct answer**
- C. 10 seconds
- D. Infinite

A. wrong: the time constant RC is 2 s, not 1 s.

B. correct: the time constant is RC = 1 MΩ × 2 μF = 2 s, and a capacitor reaches 63% of its charge in one time constant.

C. wrong: the time constant is 2 s, not 10 s.

D. wrong: the capacitor charges to 63% in a finite time of 2 s.

Question 137 Momentum in collision

A rolling cart collides with a stationary cart of equal mass. After the collision, both move together, momentum is still conserved because:

- A. Masses are equal
- B. No external force acts on the system ✓ **Correct answer**
- C. Both move with the same speed
- D. Internal forces are very small

A. wrong: equal masses do not by themselves conserve momentum.

momentum is conserved because no external force acts on the system; the collision forces are internal.

C. wrong: moving together is the result, not the reason momentum is conserved.

D. wrong: internal forces can be large; momentum is conserved because they are internal, not because they are small.

Question 138 Electric field exists

An electric field exists in a region if:

- A. A test charge experiences a force ✓ **Correct answer**
- B. Voltage is zero
- C. Charge density is uniform
- D. The medium is vacuum

A. correct: an electric field exists in a region if a test charge placed there experiences a force.

B. wrong: the voltage can be zero at a point where a field still exists.

C. wrong: a uniform charge density does not define the presence of a field.

D. wrong: a field can exist in any medium, not only in vacuum.

Question 139 Dot product of unit vectors

Dot product of two unit vectors is:

- A. 1
- B. 0
- C. cosθ ✓ **Correct answer**
- D. AB cosθ

A. wrong: the dot product is 1 only when the vectors are parallel.

e dot product is 0 only when the vectors are perpendicular.

C. correct: for two unit vectors, A·B = |A||B|cosθ = cosθ.

D. wrong: AB cosθ is the general formula; for unit vectors A = B = 1, so it reduces to cosθ.

Question 140 Faraday's law

According to the Faraday's law of electromagnetic induction, emf induced in a coil placed in changing magnetic field, depends upon:

- A. the magnetic field
- B. amount of current
- C. resistance of a coil
- D. the rate of change of magnetic flux ✓ **Correct answer**

A. wrong: the induced emf depends on the rate of change of flux, not on the field alone.

B. wrong: the induced emf does not depend on the current in the coil.

C. wrong: the resistance affects the induced current, not the induced emf.

D. correct: by Faraday's law, the induced emf equals the rate of change of magnetic flux through the coil.

Question 141 Kinetic energy after 15 s

A 4kg box initially at rest is pulled along a frictionless surface by a constant horizontal force of 8N. After 15 seconds, its kinetic energy is:

- A. 120 J
- B. 600 J
- C. 960 J
- D. 1800 J ✓ **Correct answer**

A. wrong: 120 J is the product of force and time, not the kinetic energy.

e velocity after 15 s is 30 m/s, giving a larger energy.

C. wrong: the velocity after 15 s is 30 m/s, giving 1800 J.

D. correct: acceleration is 8/4 = 2 m/s², so after 15 s the velocity is 30 m/s and the kinetic energy is ½ × 4 × 30² = 1800 J.

Question 142 Brackett series wavelengths

The ratio of longest to shortest wave lengths in Bracket series of hydrogen spectrum is:

- A. 25/9 ✓ **Correct answer**
- B. 17/6
- C. 9/5
- D. 4/3

A. correct: the longest Brackett wavelength is the 5→4 transition and the shortest is the ∞→4 transition; their ratio is (1/16)/(1/16 − 1/25) = 25/9.

B. wrong: this is not the Brackett longest-to-shortest ratio.

C. wrong: this is not the Brackett longest-to-shortest ratio.

D. wrong: this is not the Brackett longest-to-shortest ratio.

Question 143 Depletion region

For a diode, the depletion region of a PN junction has:

- A. Free positive charges
- B. Free negative charges
- C. Positive and negative ions
- D. No free charges ✓ **Correct answer**

A. wrong: the depletion region has no free charges.

B. wrong: the depletion region has no free charges.

though fixed ions are present, the defining feature is the absence of free charge carriers.

D. correct: the depletion region of a PN junction is devoid of free charge carriers.

Question 144 Charging a battery

When a battery is being charged, the direction of current inside the battery:

- A. is from positive to negative terminal
- B. is the same as the direction of emf
- C. is opposite to the direction of emf ✓ **Correct answer**
- D. depends on the load resistance

A. wrong: during charging, the current inside the battery flows from the negative to the positive terminal.

B. wrong: during charging the current inside the battery is opposite to the emf direction.

C. correct: when a battery is charged, the current is driven through it opposite to its emf.

D. wrong: the direction during charging is fixed, not load-dependent.

Question 145 Open vs closed pipe frequency

Two standing waves vibrate in fundamental mode in two organ pipes A (open) and B (closed) each of length 60cm. The ratio of frequency of A to B is:

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

A. wrong: the open pipe has the higher fundamental frequency.

B. wrong: the two pipes have different fundamental frequencies.

e open pipe fundamental is v/2L and the closed pipe fundamental is v/4L, so the ratio is 2 : 1.

D. wrong: the ratio is 2 : 1, not 2 : 3.

Question 146 Vector product result

The result of vector product of two vectors:

- A. number
- B. unit
- C. number and unit
- D. magnitude and a unit vector ✓ **Correct answer**

A. wrong: the vector product is not a mere number.

B. wrong: the vector product is not just a unit.

C. wrong: the vector product has a direction as well.

D. correct: the vector product of two vectors is a vector, with a magnitude and a direction given by a unit vector.

Question 147 Average speed equals average velocity

The average speed of a body in a given interval of time is equal to the average velocity, if:

- A. The speed of the body remains uniform.
- B. The body moves with constant acceleration.
- C. The body moves along a straight path. ✓ **Correct answer**
- D. The body returns to its starting point.

A. wrong: uniform speed in a curved path still makes average speed greater than average velocity.

nstant acceleration does not guarantee the path is straight.

C. correct: on a straight path without turning back, distance equals displacement, so average speed equals the magnitude of average velocity.

D. wrong: returning to the start makes the average velocity zero while the average speed is not.

Question 148 Proton and electron potential energy

A proton and an electron are held stationary at a distance r in a uniform electric field. If released, how does their potential energy change?

- A. Increases
- B. Decreases ✓ **Correct answer**
- C. Remains constant
- D. First increases, then decreases

A. wrong: both charges move toward lower potential energy when released.

B. correct: the proton moves with the field and the electron against it, and each moves to a position of lower potential energy.

C. wrong: the potential energy changes as the charges move.

D. wrong: the potential energy decreases steadily as the charges move.

Question 149 Perpendicular vectors x

If vector A = 2i + j + 3k is perpendicular to B = i + j + xk then x =

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

with x = 3 the dot product is 3 + 3×3 = 12, not zero.

B. wrong: with x = -3 the dot product is 3 + 3×(-3) = -6, not zero.

C. wrong: with x = 1 the dot product is 3 + 3×1 = 6, not zero.

D. correct: the dot product is 2×1 + 1×1 + 3x = 3 + 3x, which is zero when x = -1, so the vectors are perpendicular.

Question 150 Electric field of point charge

The magnitude of electric field intensity due to a point charge q at a distance r in vacuum is given by:

- A. $E = q/r^2$
- B. $E = kq/r$
- C. $E = kq/r^2$ ✓ **Correct answer**
- D. $E = k/r^2$

A. wrong: the constant k is missing.

B. wrong: the field falls as $1/r^2$, not 1/r.

C. correct: the magnitude of the electric field of a point charge is $E = kq/r^2$.

D. wrong: the charge q is missing.

Question 151 Power lines current increase

The power transmission lines delivering same amount of power. An increase in current will increase:

- A. Heat produced in the wires ✓ **Correct answer**
- B. Voltage output
- C. Frequency of AC
- D. Mechanical stress on the wires

e heat produced is I^2R, so increasing the current increases the heat in the wires.

B. wrong: the voltage output does not increase with current.

C. wrong: the frequency of the supply does not change.

D. wrong: the current does not increase the mechanical stress on the wires.

Question 152 Blood vessel narrowing

When the diameter of a blood vessel narrows, the velocity and pressure of blood will:

- A. velocity increase, pressure increase
- B. velocity increase, pressure decrease ✓ **Correct answer**
- C. velocity decrease, pressure increase
- D. velocity decrease, pressure decrease

A. wrong: when the velocity increases, the pressure falls, not rises.

B. correct: by the continuity equation the velocity rises in the narrow section, and by Bernoulli's principle the pressure falls there.

C. wrong: the velocity rises in the narrow section, not falls.

D. wrong: the velocity rises in the narrow section, not falls.

Question 153 Progressive vs stationary wave

A progressive wave differs from a stationary wave because in progressive wave:

- A. particles remain at fixed nodes
- B. particles oscillate and transfer energy ✓ **Correct answer**
- C. particles stay at anti-nodes
- D. particles move forward with the wave

A. wrong: fixed nodes are a feature of stationary waves, not progressive waves.

a progressive wave the particles oscillate about their mean positions and energy is transferred along the wave.

C. wrong: anti-nodes belong to stationary waves.

D. wrong: the particles oscillate in place; it is the energy and the wave pattern that move forward.

Question 154 Cp and Cv relation

For an ideal gas, the relation between molar specific heats Cp and Cv is:

- A. Cp = Cv + R ✓ **Correct answer**
- B. Cp = Cv – R
- C. Cv = Cp + R
- D. Cp = R - Cv

A. correct: for an ideal gas, Cp − Cv = R, so Cp = Cv + R.

B. wrong: Cp is larger than Cv, not smaller.

C. wrong: Cv is smaller than Cp.

D. wrong: this is not the relation between Cp and Cv.

Question 155 Capacitance doubled in AC circuit

If the capacitance in a purely capacitive AC circuit is doubled, the current will be:

- A. Double ✓ **Correct answer**
- B. Become half
- C. Remain same
- D. Decrease to the fourth

A. correct: doubling the capacitance halves the capacitive reactance, so the current doubles.

e current increases, not halves.

C. wrong: the reactance changes, so the current changes.

D. wrong: the current increases, not decreases.

Question 156 Coulomb vs gravitational force

The coulomb repulsive force between two protons inside a nucleus is much higher than the gravitational attractive force by a factor of approximately ____.

- A. 1036 ✓ **Correct answer**
- B. 10-36
- C. 10-15
- D. 1012

A. correct: the electrostatic repulsion between two protons is about 10^36 times the gravitational attraction between them.

B. wrong: this is the inverse ratio.

C. wrong: the ratio is about 10^36, not 10^-15.

D. wrong: the ratio is about 10^36, not 10^12.

Question 157 SHM projection acceleration

A particle is moving in a uniform circular path of radius 4cm with velocity 4cm/s. The maximum acceleration of its projection executing simple harmonic motion on horizontal diameter is:

- A. 4 cm/s^2 ✓ **Correct answer**
- B. 8 cm/s^2
- C. 12 cm/s^2
- D. 16 cm/s^2

The angular speed is $\omega = v/r = 1$ rad/s, so the maximum acceleration of the projection is $\omega^2 r = 1 \times 4 = 4$ cm/s^2.

B. wrong: the maximum acceleration is $\omega^2 r = 4$ cm/s^2, not 8.

C. wrong: the maximum acceleration is 4 cm/s^2, not 12.

D. wrong: the maximum acceleration is 4 cm/s^2, not 16.

Question 158 Resistivity on increasing length

On increasing the length of a wire, the specific resistance (resistivity) of the wire:

- A. increases
- B. decreases
- C. remains unchanged ✓ **Correct answer**
- D. first increases, then decreases

A. wrong: resistivity is a material property and does not change with length.

B. wrong: resistivity does not change with length.

C. correct: the specific resistance (resistivity) depends on the material and temperature, not on the length of the wire.

D. wrong: resistivity does not change with length at all.

Question 159 Continuity equation velocity

Water flows through a horizontal pipe with area of 0.02 m^2 at 3m/s. The pipe narrows to 0.01 m^2. The velocity in the narrow section is:

- A. 0.5 m/s
- B. 1.5 m/s
- C. 3 m/s
- D. 6 m/s ✓ **Correct answer**

narrowing the pipe increases the velocity, not decreases it.

B. wrong: the velocity doubles when the area halves.

C. wrong: the velocity changes when the area changes.

D. correct: by the continuity equation, $0.02 \times 3 = 0.01 \times v$, so $v = 6$ m/s.

Question 160 Bernoulli blood pressure

Bernoulli's principle helps explain why blood pressure drops when blood velocity:

- A. Increases in narrow vessel ✓ **Correct answer**
- B. Decreases in narrow vessel
- C. Increases in wide vessel
- D. Decreases in wide vessel

A. correct: in a narrow vessel the blood velocity increases, and by Bernoulli's principle the pressure drops.

B. wrong: the velocity increases in a narrow vessel.

C. wrong: the velocity is lower in a wide vessel, so the pressure is higher there.

D. wrong: the velocity is lower in a wide vessel, so the pressure does not drop there.

Question 161 Work pushing a wall

A man pushes a wall with a force of 100 N for 10 seconds. The work done by the man on the wall is:

- A. 1000 J
- B. 100J
- C. 10 J
- D. zero ✓ **Correct answer**

A. wrong: force times time is not work; work needs displacement.

displacement occurs, so no work is done.

C. wrong: no displacement occurs, so no work is done.

D. correct: the wall does not move, so the displacement is zero and the work done is zero.

Question 162 Coulomb force at quarter distance

F is the force between two identical charges each with a charge (e) separated by a distance (r). If the separation is made quarter of the initial separation (r), then the new force in terms F can be written as:

- A. F/4
- B. 16F ✓ **Correct answer**
- C. 32F
- D. F

A. wrong: reducing the distance increases the force.

B. correct: the force varies as $1/r^2$, so a quarter of the distance gives 16 times the force.

C. wrong: the factor is 16, not 32.

D. wrong: the force changes when the distance changes.

Question 163 Incorrect spelling

Choose the word with incorrect spelling:

- A. sagacious
- B. foremost
- C. berister ✓ **Correct answer**
- D. pneumonia

A. wrong: 'sagacious' is spelled correctly.

B. wrong: 'foremost' is spelled correctly.

erister" is misspelled, the correct spelling is 'barrister'.

D. wrong: 'pneumonia' is spelled correctly.

Question 164 Reported speech

What is the correct reported speech for the given sentence? He said, " I am going to the store."

- A. He said that he was going to the store. ✓ **Correct answer**
- B. He said that he is going to the store.
- C. He said that he has been going to the store.
- D. He said that he had been going to the store.

A. correct: in reported speech, 'am going' shifts back to 'was going'.

B. wrong: the present tense must shift back to the past in reported speech.

C. wrong: the present continuous does not become the present perfect continuous.

D. wrong: the present continuous becomes the past continuous, not the past perfect continuous.

Question 165 Transitional device

Pick out the sentence with appropriate use of transitional device.

- A. She likes to read books but watch movies.
- B. She is a talented musician likewise a gifted painter.
- C. She is not only intelligent but also very kind. ✓ **Correct answer**
- D. Second; gather your material. First, begin your project.

A. wrong: 'but' is not used correctly here; the sentence needs 'and'.

B. wrong: 'likewise' is not used correctly between two noun phrases like this.

C. correct: 'not only ... but also' is the correct paired transitional device.

e sequence words are in the wrong order.

Question 166 Main verb

The students decided to meet the teacher and request him for a favour. The main verb in this sentence is:

- A. meet
- B. request
- C. meet & request
- D. decided ✓ **Correct answer**

A. wrong: 'meet' is an infinitive (to meet), not the main verb.

B. wrong: 'request' is an infinitive (request him), not the main verb.

C. wrong: both are infinitives, not the main verb.

D. correct: 'decided' is the finite main verb of the sentence.

Question 167 Unexpected test

Which sentence implies that it was unexpected that she took the test.

- A. She even took the test.
- B. She took even the test.
- C. Even she took the test. ✓ **Correct answer**
- D. She took the test even.

A. wrong: 'even' before the verb stresses the action, not that she herself was unexpected.

B. wrong: 'even' before 'the test' stresses the test, not the person.

C. correct: 'even' before 'she' implies it was unexpected that she, of all people, took the test.

D. wrong: 'even' at the end does not carry the meaning of unexpectedness about her.

168 Tone and formality

Which version improves tone and formality in the sentence: "You boys need to submit the paper ASAP."

- A. You should submit the paper as soon as you can.
- B. Everyone needs to get the paper in quickly.
- C. The paper should be submitted as soon as possible. ✓ **Correct answer**
- D. Y'all better hand it in now.

A. wrong: this is still direct and informal in tone.

B. wrong: this is informal and imprecise.

C. correct: the formal passive construction with 'as soon as possible' gives the most formal tone.

D. wrong: this is the most informal option.

Question 169 Stoic meaning

"She remained stoic during the crisis, refusing to show fear or distress." Deduce the meaning of underlined word from the given sentence.

- A. Anxious
- B. Resilient ✓ **Correct answer**
- C. Angry
- D. Confused

A. wrong: 'stoic' means unemotional, the opposite of anxious.

B. correct: 'stoic' means enduring hardship without showing feeling, which is closest to resilient.

C. wrong: 'stoic' does not mean angry.

D. wrong: 'stoic' does not mean confused.

170 Scriptures spelling

Many follow exactly what is written in the _____.

- A. scripturies
- B. screptures
- C. scriptures ✓ **Correct answer**
- D. scripttures

A. wrong: 'scripturies' is misspelled.

B. wrong: 'screptures' is misspelled.

C. correct: 'scriptures' is the correct spelling.

D. wrong: 'scripttures' is misspelled.

Question 171 Inversion

Identify the sentence that uses inversion correctly:

- A. Rarely I have seen such a beautiful scene.
- B. Rarely have I seen such a beautiful scene. ✓ **Correct answer**
- C. Rarely seen I have such a beautiful scene.
- D. Rarely I seen have such a beautiful scene.

A. wrong: after 'rarely', the auxiliary must come before the subject.

B. correct: this is the correct inversion after the negative adverb 'rarely'.

C. wrong: the word order is incorrect.

D. wrong: the word order is incorrect.

Question 172 Analogy cat dog mouse

CAT is to DOG, as MOUSE is to:

- B. CAT ✓ **Correct answer**
- C. DOG
- D. CHEESE

A. wrong: the cat chases the mouse, and the dog chases the cat, so the mouse relates to the cat, not the rat.

B. correct: as the dog chases the cat, so the cat chases the mouse.

C. wrong: the dog relates to the cat, not the mouse.

D. wrong: cheese is what the mouse eats, not what chases it.

Question 173 Smoking ban assumption

Prohibiting smoking in public areas will reduce the occurrence of lung disease. What assumption is present here?

- A. Banning smoking has no impact on lung disease rates.
- B. Hence all people live in public areas therefore, banning smoking will eliminate lung disease.
- C. Smoking is the sole cause of lung disease.
- D. Smoking in public places plays a major role in causing lung disease. ✓ **Correct answer**

A. wrong: this contradicts the claim, so it cannot be its assumption.

B. wrong: the claim does not assume everyone lives in public areas or that disease will be eliminated.

C. wrong: the claim does not need smoking to be the sole cause.

D. correct: the argument assumes that smoking in public places contributes substantially to lung disease, so banning it will reduce the disease.

174 BODMAS 10 - 3 x 2

What would be the result of: 10 - 3 × 2 ?

- A. 4 ✓ **Correct answer**
- B. 6
- C. 14
- D. 17

A. correct: by BODMAS, multiplication comes first: 3 × 2 = 6, then 10 − 6 = 4.

B. wrong: this ignores the order of operations.

C. wrong: this comes from (10 − 3) × 2, which is the wrong order.

D. wrong: this does not follow the order of operations.

Question 175 Rotating triangle pattern

Consider the pattern in the given picture. If the pattern is continued, then the image in box 12 will resemble the image No.? [Picture: four numbered boxes, each a circle containing a blue triangle; the triangle rotates 45 degrees clockwise from one box to the next.]

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

A. wrong: box 12 is the 4th image in the repeating cycle, not the 1st.

B. wrong: box 12 is the 4th image in the repeating cycle, not the 2nd.

C. wrong: box 12 is the 4th image in the repeating cycle, not the 3rd.

D. correct: the triangle rotates 45 degrees clockwise at each step, so the pattern repeats every 8 boxes; box 12 is the 4th position in the cycle (12 − 8 = 4), so it resembles image 4.

176 Admission test candidates

In a certain university, 25% candidates failed university admission test. Of those who passed the test, 80% got the admission in the university. If 1800 got admission, how many candidates appear in the test?

- A. 9000
- B. 6000
- C. 5000
- D. 3000 ✓ **Correct answer**

A. wrong: 9000 candidates would give 5400 admissions, not 1800.

B. wrong: 6000 candidates would give 3600 admissions, not 1800.

C. wrong: 5000 candidates would give 3000 admissions, not 1800.

D. correct: 25% failed, so 75% passed; 80% of those were admitted, i.e. 60% of all candidates; 60% of 3000 is 1800.

Question 177 Doubling income

If a person earns Rs. 1000 in the first week and their income doubles each week, how much will they earn in the 4th week?

- A. Rs. 4000
- B. Rs. 3000
- C. Rs. 8000 ✓ **Correct answer**
- D. Rs. 16000

A. wrong: Rs. 4000 is the income in the 3rd week, not the 4th.

B. wrong: the income doubles, it does not increase by Rs. 1000 each week.

C. correct: the income doubles each week: 1000, 2000, 4000, then 8000 in the 4th week.

D. wrong: Rs. 16000 would be the 5th week's income.

178 Environmental factor

Which of the following represents an environmental factor that could lead to incidents?

- A. Lack of experience
- B. Machine malfunctioning
- C. A storm leading to power disruptions ✓ **Correct answer**
- D. A design flaw

A. wrong: lack of experience is a human factor, not an environmental one.

B. wrong: machine malfunctioning is an equipment factor, not an environmental one.

C. correct: a storm is an environmental (weather) factor that can lead to incidents.

D. wrong: a design flaw is a technical factor, not an environmental one.

Question 179 Daughter's age 4 years ago

The age of a man is twice that of his daughter. If the man is 36 years old, what was the daughter’s age 4 years ago?

- A. 14 years ✓ **Correct answer**
- B. 18 years
- C. 20 years
- D. 10 years

A. correct: the man is 36, so the daughter is 18 now; four years ago she was 14.

B. wrong: 18 is the daughter's present age, not her age four years ago.

C. wrong: the daughter is 18 now, not 20.

D. wrong: four years ago the daughter was 14, not 10.

180 Walking distance

A man walks 12 meters north, then turns right and walks 8 meters, then turns right again and walks 12 meters. He finally turns left and walks 5 meters. What is the distance between his starting and ending point?

- A. 5m
- B. 8m
- C. 13m ✓ **Correct answer**
- D. 17m

A. wrong: 5 m is only the final leg, not the distance from the start.

B. wrong: 8 m is only the first turn's leg.

C. correct: 12 m north then 12 m south cancel out, and the eastward legs are 8 + 5 = 13 m, so the end point is 13 m east of the start.

D. wrong: the north and south legs cancel, so the distance is 13 m, not 17 m.

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