

Preview — sample solved questions (partial)

This preview shows a sample of the solved pack so you can judge its quality. It is NOT the full solved paper.

BISE Lahore — 10th Class Physics — Annual 2024 — Group II (Solved)

Solutions written originally from the Punjab Textbook Board (PTB) Class 10 Physics textbook. Every numerical was solved twice independently; both workings agree. See sources.md for provenance and review notes.

CAVEAT — Group II Q.3(ii) (audible frequency range of bats and rats) is only PARTIALLY verified against the current PTB textbook: the textbook (Unit 11, Sound, §11.7 'Audible Frequency Range', book pp. 30–31) confirms that bats can hear frequencies up to 120,000 Hz, so the bats upper limit in the answer (120,000 Hz) is exactly the textbook value. However, the current PTB edition gives only upper limits and does not mention rats at all (the same box lists mice up to 100,000 Hz, dogs up to 35,000 Hz, cats up to 25,000 Hz). The lower bounds (bats 1,000 Hz; rats 200 Hz) and the rats upper limit (90,000 Hz) could NOT be verified from the textbook; they are retained in the answer because they are the standard values taught for this recurring board question, but they are not textbook-printed figures. Do not present them as quoted from the PTB book.

GROUP II — OBJECTIVE (Answer Key with Reasons)

Q.1 A positive electric charge:

Answer: (B) Repels other positive charge — Like charges repel each other; a positive charge repels another positive charge. (Note: option (C) "attracts a neutral charge" is also physically true by induction, but the key follows the basic rule of electrostatics taught in the textbook — like charges repel, unlike charges attract. See Review note 4.)

Q.2 In case of simple pendulum, which component of weight acts as restoring force:

Answer: (A) $mg \sin\theta$ — The tangential component of the weight, $mg \sin\theta$, pulls the bob back towards the mean position (the component $mg \cos\theta$ is balanced by the tension in the string).

Q.3 AND gate can be formed by using two:

Answer: (C) NAND gates — The first NAND gate gives $\text{NOT}(A \cdot B)$; passing this through a second NAND gate used as a NOT gives $A \cdot B$, i.e. an AND gate.

Q.4 Which is an example of longitudinal waves:

Answer: (A) Sound waves — In sound waves, air particles vibrate back and forth along the direction of the wave, so they are longitudinal (light and radio waves are transverse; water waves have both characters but are treated as transverse here).

Q.5 The brain of any computer system is:

Answer: (B) CPU — The Central Processing Unit (CPU) controls and processes everything in the computer, so it is called its brain.

Q.6 Farsightedness can be corrected by using:

Answer: (D) Converging lens — A farsighted eye (hyperopia) focuses the image behind the retina; a convex (converging) lens brings the rays to a focus on the retina.

Q.7 Which of the following quantity is not changed during refraction of light:

Answer: (D) Its frequency — During refraction, speed, wavelength and direction of light change, but its frequency stays the same.

Q.8 What is the power rating of a lamp connected to a 12 V source when it carries 2.5 A current:

Answer: (C) 30 W — $P = V \times I = 12 \times 2.5 = 30 \text{ W}$.

Q.9 The direction of induced emf in a circuit is in accordance with conservation of:

Answer: (D) Energy — Lenz's law: the induced emf opposes the change producing it, which is a result of the law of conservation of energy.

Q.10 We can see sound waves by using:

Answer: (C) Oscilloscope — A sound signal converted into an electrical signal by a microphone can be displayed as a wave on an (cathode ray) oscilloscope.

Q.11 Wave transfers:

Answer: (A) Energy — A wave transfers energy from one place to another without transferring matter.

Q.12 Which among the following radiations has more penetrating power:

Answer: (B) A gamma ray — Gamma rays are the most penetrating of the three radiations (alpha < beta < gamma in penetrating power).

Group II Objective Key: 1-B, 2-A, 3-C, 4-A, 5-B, 6-D, 7-D, 8-C, 9-D, 10-C, 11-A, 12-B

GROUP II — SUBJECTIVE

Part-I — sample

Q.2

(i) Define simple harmonic motion.

Simple harmonic motion (SHM) is the motion of a body in which its acceleration is directly proportional to its displacement from the mean position and is always directed towards the mean position (e.g. motion of a simple pendulum or a mass attached to a spring).

(ii) How does damping progressively reduce the amplitude of oscillation? During oscillation, friction and air resistance continuously oppose the motion of the vibrating body. A part of the energy of the body is used up against these resistive forces in every swing, so the total energy — and therefore the amplitude — decreases step by step until the oscillation dies out. This is called damping.

(iii) What is the difference between cell and battery?

- **Cell:** A single device which converts chemical energy into electrical energy (one pair of electrodes, e.g. a 1.5 V dry cell).
- **Battery:** A combination of two or more cells connected together, used to obtain more voltage or current.

(iv) State Coulomb's law. The force between two point charges is directly proportional to the product of the charges and inversely proportional to the square of the distance between them: $F = k q_1 q_2 / r^2$, where $k = 9 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$.

(v) Define electric potential and write its unit.

Electric potential at a point is the work done per unit positive charge in bringing it from infinity to that point in an electric field: $V = W/q$. Its SI unit is the **volt (V)** (1 volt = 1 joule per coulomb).

(vi) Two capacitors of capacitance $6\ \mu\text{F}$ and $12\ \mu\text{F}$ are connected in parallel with a 12 volt battery. Find their equivalent capacitance. For a parallel combination, capacitances simply add up: $C_{eq} = C_1 + C_2 = 6 + 12 = \mathbf{18\ \mu\text{F}}$ (The 12 V battery gives the same voltage across both capacitors.)

(vii) Why does the electric current not pass through an insulator? An insulator has no free electrons — all its electrons are tightly bound to their atoms and cannot move. Since current needs free charge carriers to flow, an insulator does not allow electric current to pass through it.

(viii) Define specific resistance and write its unit.

Specific resistance (resistivity) of a material is the resistance of a conductor of that material having unit length and unit area of cross-section: $\rho = RA/L$. Its SI unit is the **ohm-metre ($\Omega\text{ m}$)**.