Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. No credit will be awarded in case BUBBLES are not filled. Do not solve question on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) If velocity and mass of a moving object are doubled then K.E becomes:

(A) Double   (B) 4 times   (C) 6 times   (D) 8 times

(2) If a body is moving counter clockwise, then angular displacement is:

(A) Minimum   (B) Zero   (C) Negative   (D) Positive

(3) The direction of angular momentum $\vec{L} = \vec{r} \times \vec{p}$ is:

(A) Along the direction of $\vec{p}$

(B) Along the direction of $\vec{r}$

(C) Parallel to the plane containing $\vec{r}$ and $\vec{p}$

(D) Perpendicular to the plane containing $\vec{r}$ and $\vec{p}$

(4) Venturi relation is given by:

(A) $P_1 + P_2 = \frac{1}{2}\rho v_2^2$ (B) $P_1 - P_2 = \frac{1}{2}\rho v_2^2$ (C) $P_1 + P_2 = \frac{1}{2}\rho v_2$ (D) $P_1 - P_2 = \frac{1}{2}\rho^2 v_2$

(5) The frequency of the first pendulum is:

(A) 2.0 Hz   (B) 1.5 Hz   (C) 1.0 Hz   (D) 0.5 Hz

(6) Speed of sound in air at S.T.P is:

(A) 280 m/s   (B) 330 m/s   (C) 331 m/s   (D) 332 m/s

(7) When the stretched string is plucked from one quarter of length, then stretched string will vibrate in:

(A) One loop   (B) Two loops   (C) Three loops   (D) Four loops

(8) The regular array of atoms in a crystal forms a natural diffraction grating with spacing of the order of:

(A) $10^{-8} m$ (B) $10^{-9} m$ (C) $10^{-10} m$ (D) $10^{-11} m$

(9) Compound microscope consist of:

(A) Two convex lens

(B) Two concave lens

(C) Convex lens and concave mirror

(D) Concave lens and convex mirror

(10) If one mole of an ideal gas is heated at constant pressure; then:

(A) $Q_p = C_p \Delta T$ (B) $\Delta U = C_p \Delta T$ (C) $\Delta U = C_V \Delta T$ (D) $Q_p = C_V \Delta T$

(11) In carnot engine, each process is:

(A) Reversible   (B) Perfectly reversible   (C) Irreversible   (D) Perfectly irreversible

(12) The appropriate precision on addition of following masses 0.089, 2.189, 5.32, 11.8 in kg is:

(A) 19.398 kg   (B) 19.39 kg   (C) 19.4 kg   (D) 19.41 kg

(13) Dimension of coefficient of viscosity are:

(A) $[ML^{-1}T]$ (B) $[ML^{-1}T^{-1}]$ (C) $[ML^{-1}T^{-2}]$ (D) $[ML^2T^{-1}]$

(14) The resultant magnitude of two forces 6N and 8N acting at right angle to each other is:

(A) 10N   (B) 8N   (C) 6N   (D) 4N

(15) The angle between the vectors $\hat{i} + 3\hat{j} - 2\hat{k}$ and $\hat{i} - \hat{j} - \hat{k}$ is:

(A) $0°$ (B) $45°$ (C) $90°$ (D) $180°$

(16) When a shell explodes in mid-air, the total momentum of its fragments:

(A) Becomes zero   (B) Decreases   (C) Increases   (D) Remains constant

(17) An Un-powered and unguided missile is:

(A) Remote control   (B) Long range   (C) Powered   (D) Ballistic

PHYSICS PAPER-I INTERMEDIATE PART-I (11th CLASS)
GROUP-II MTN-42-21   TIME ALLOWED: 2.40 Hours
SUBJECTIVE   MAXIMUM MARKS: 68

NOTE: Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

2.   **Write short answers to any eight parts.** $8 \times 2 = 16$

(i)   Show that $T = 2\pi\sqrt{\dfrac{\ell}{g}}$ is dimensionally correct.

(ii)   Describe the principle homogeneity of dimensional analysis.

(iii)   Write the dimensions of   (i) Pressure   (ii) Density

(iv)   What are dimensions and units of G in the formula $F = G\dfrac{m_1 m_2}{r^2}$?

(v)   Can you add zero to null vector.

(vi)   Define Torque, give its units and dimensions.

(vii)   What is method to find the direction of cross product of two vectors, describe it.

(viii)   Define horizontal range and time of flight of projectile.

(ix)   Define impulse and show that how it is related to linear momentum.

(x)   What is isolated system, state law of conservation of linear momentum?

(xi)   Write down three equations of motion.

(xii)   State Bernoulli's theorem. Give its mathematical form.

3.   **Write short answers to any eight parts.** $8 \times 2 = 16$

(i)   Derive the relation of power in term of $P = \vec{F} \cdot \vec{V}$

(ii)   A person holds a bag of groceries while standing still, talking to a friend. A car is stationary with its engine running. From the stand point of work, how are these two situations similar?

(iii)   A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?

(iv)   What do you understand by real and apparent weight? Explain.

(v)   What is meant by angular momentum? Show angular momentum in mathematical form.

(vi)   A disc and a hoop start moving down from the top of an inclined plane at the same time. Which one will be moving faster on reaching the bottom?

(vii)   What should be the frequency of a simple pendulum whose period is one second at a place where $g = 9.8\,ms^{-2}$?

(viii)   If a mass-spring system is hung vertically and set into oscillations, why does the motion eventually stops.

(ix)   What is meant by phase angle? Does it define angle between maximum displacement and the driving force?

(x)   How much greater is the speed of sound in hydrogen to that of oxygen? Explain.

(xi)   What do you mean by quantization of frequency for stationary waves?

(xii)   How are beats useful in tuning musical instruments?

4.   **Write short answers to any six parts.** $6 \times 2 = 12$

(i)   What is meant by diffraction of light? Explain with an example.

(ii)   Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.

(iii)   Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?

P.T.O.

(iv) Define magnifying power and resolving power of optical instruments.

(v) A telescope is made of an objective of focal length 20 cm and an eye piece of 5 cm, both convex lenses. Find the angular magnification.

(vi) Can the mechanical energy be converted completely into heat energy? If so give an example.

(vii) A mechanical engineer develops an engine, working between 600k and 300k claims to have efficiency of 52%. Does he claim correctly? Explain.

(viii) Define molar specific heats of a gas at constant pressure and constant volume.

(ix) Why is the average velocity of the molecules in a gas zero but the average of the square of velocities is not zero?

SECTION-II

NOTE: **Attempt any three questions.** $3 \times 8 = 24$

5.(a) Differentiate between Elastic and Inelastic Collision. Derive the expressions for the velocities of two spherical bodies m_1 and m_2 after elastic collision in one dimension.   5

(b) Given that $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{B} = 3\hat{i} - 4\hat{k}$, find the projection of $\vec{A}$ on $\vec{B}$.   3

6.(a) Define gravitational field. Show that work done in gravitational field is independent of path followed.   5

(b) Find the temperature at which the velocity of sound in air is two times its velocity at $10^{o}C$.   3

7.(a) Define centripetal force and derive its relation for an object travelling with uniform speed V in a circle of radius r.   1 + 4

(b) What gauge pressure is required in the city mains for a stream from a fire hose connected to the mains to reach a vertical height of 15.0m.   3

8.(a) What is Carnot engine? Calculate the efficiency of Carnot engine.   5

(b) A block of mass 4.0kg is dropped from a height of 0.80m, on to a spring of spring constant $k = 1960 \, Nm^{-1}$. Find the maximum distance through which the spring will be compressed.   3

9.(a) Define pressure of gas. Derive relation of pressure of gas. Show that $P \propto <K.E>$ of gas molecules.   5

(b) An astronomical telescope having magnifying power 5. Consistants of two thin lenses, 20cm apart. Find the focal lengths of the lenses.   3

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