R.D. RAJPAL SCHOOL
SESSION 2024-25
REVISION EXAMINATION

CLASS: XI
TIME ALLOWED: 3HOURS

SUBJECT: PHYSICS (SET-B)
MAXIMUM MARKS: 70
NO. OF PAGES: 03

GENERAL INSTRUCTIONS: -

i) All questions are compulsory.
ii) The question paper has five sections and 33 questions. All questions are compulsory.
iii) Section-A has 16 questions of 1mark each; Section-B has 5 questions of 2 marks each; Section- C has 7 questions of 3 marks each; Section- D has 2 case-based questions of 4 marks each; and Section-E has 3 questions of 5 marks each.
iv) There is no overall choice.
v) Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION-A

Choose and write the correct option in the following questions

1. First law of thermodynamics corresponds to:
(a) conservation of energy (b) heat flow from hotter to colder body
(c) Direction of heat flow (d) none of these

2. A moving body of mass m and velocity 3 kmph collides with a rest body of mass 2m and sticks to it. Now the combined mass starts to move. What will be the combined velocity?
(a) 3kmph (b) 4 kmph (c) 1 kmph (d) 2 kmph

3. Which of the following is a non-conservative force?
(a) Interatomic force (b) Gravitational force (c) Electrostatic force (d)Viscous force

4. Two vectors are perpendicular if
(a) $\mathbf{A} \times \mathbf{B} = 0$ (b) $\mathbf{A} \cdot \mathbf{B} = 1$ (c) $\mathbf{A} \cdot \mathbf{B} = 0$ (d) $\mathbf{A} \cdot \mathbf{B} = AB$

5. A car travels from A to B at a speed of 20 kmph and returns at a speed of 30 kmph. The average speed of the car for the whole journey is
(a) 5 kmph (b) 24 kmph (c) 25 kmph (d) 50 kmph

6. If the radius of earth is doubled keeping its radius constant, then acceleration due to gravity g is
(a) 20 m/s^2 (b) 10 m/s^2 (c) 5 m/s^2 (d) 2.5 m/s^2

7. Two wires A and B of the same material have radii in the ratio 2:1 and lengths in the ratio 4:1. The ratio of the normal forces required to produce the same change in lengths of these two wires is
(a) 1:1 (b)2:1 (c) 1:2 (d) 1:4

8. The pressure inside the two bubbles is 1.01 and 1.02 atmosphere. The ratio of their respective volumes is
(a) 16 (b)8 (c)4 (d) 2

9. An incompressible fluid flows steadily through a cylindrical pipe which has a radius 2R at a point A and radius R at a point B farther along the flow direction. If the velocity at point A is v, its velocity at point B is

(a) 2v (b) v (c) v/2 (d) 4v

10. Internal energy of a gas depends on:

(a) Pressure (b) Volume (c) Temperature (d) Size of the molecule

11. Young's modulus of steel is 1.9×10^{11} N/m^2 . When expressed in cgs units of dynes/cm^2, it will be equal to

(a) 1.9×10^{10} (b) 1.9×10^{11} (c) 1.9×10^{12} (d) 1.9×10^{13}

12. The relation between Poiseuille and poise is

(a) 1 Poiseuille = 100 poise (b) 1 Poiseuille = 10 poise

(c) 1 Poiseuille = 10^5poise (d) none of these

For Questions 13 to 16, two statements are given- one labelled Assertion (A) and other Reason(R). Select the correct answer to these questions from the options given below

(a) If both assertion and reason are true and reason is the correct explanation of assertion

(b) If both assertion and reason are true but reason is not the correct explanation of assertion

(c) If assertion is true but reason is false

(d) If both assertion and reason are false

13. Assertion: The apparent weight of a man standing on a lift which is moving up with uniform speed increases.
Reason: During the upward motion of the lift, apparent weight is given by W = m(g-a)

14. Assertion: Gravitational potential is always negative.
Reason: Gravitational potential energy at infinity is assumed to be zero.

15. Assertion: If a liquid neither rises nor falls in a capillary tube, then angle of contact is 90^0
Reason: When angle of contact is greater than 90^0, liquid wets the glass tube.

16. Assertion: The centre of mass can be inside or outside the rigid body at which whole mass is assumed to be concentrated.
Reason: Position of centre of mass depends on the distribution of mass.

SECTION-B

17. Compute the bulk modulus of water from the following data: Initial Volume = 100.0 litre, pressure increase = 100.0 atm, final volume= 100.5 litre (1 atm = 1.013×10^5 Pa) .

18. A person of mass m is standing on a lift. Find his apparent weight when the lift is:
(i) moving upward with uniform acceleration a
(ii) moving downward with acceleration a < g

19. Define moment of inertia of a body. Give its units and dimensions. What is its physical significance? Name the factors on which it depends.

20. A pump on the ground floor of a building can pump up water to fill a tank of volume 30 m^3 in 15 min. If the tank is 40 m above the ground and efficiency of the pump is 30%, how much electric power is consumed by the pump?

21. Show that there are two angles of projection for which the horizontal range remains the same for a projectile projected with an angle θ with the ground.

SECTION-C

22. Torques of equal magnitudes are applied to hollow cylinder and a solid sphere, both having the same mass and same radius. The cylinder is free to rotate about its axis of symmetry and sphere is free to rotate about an axis passing through centre. Which of the two acquires greater angular speed after a given time?

23. Define Critical Velocity for the flow of a liquid. Derive an expression for critical velocity using the method of dimensions.

24. Obtain an expression for the escape velocity on earth. Why is that there is no atmosphere on moon? Explain.

25. Define terminal velocity and obtain expression for terminal velocity in case of a sphere falling through a viscous liquid. Also show graphically the variation of velocity with time.

26. State perpendicular axis theorem. Also calculate moment of inertia about a diameter if that of an axis perpendicular to the plane of the disc and passing through its centre is given by $\frac{1}{2} MR^2$.

27. A stone of mass 0.25 kg tied to the end of a string is whirled around in a circle of radius 1.5m with a speed of 40 rev/min in a horizontal plane. What is the tension in the string? What is the maximum speed with which the stone can be whirled around if the string can withstand a maximum tension of 200 N?

28. Define elastic collision and discuss it for two bodies in one dimension. show that the relative velocity of approach before a collision is equal to the relative velocity of separation after the collision.

SECTION-D

29. Mechanical energy exists in two forms: Kinetic energy and Potential energy. Kinetic energy is the energy possessed by a body by virtue of its motion. Potential energy is the energy possessed by a body by virtue of its position or configuration. These two forms of energy are interconvertible. If no other form of energy is involved in a process, the sum of kinetic energy and potential always remains constant.

(i) Two masses of 1 gm and 4 gm are moving with equal linear momenta. The ratio of their kinetic energy is:
(a) 4:1 (b) $\sqrt{2}$:1 (c) 1:2 (d) 1:16

(ii) If the linear momentum is increased by 50%, then KE will be increased by:
(a) 50% (b) 100% (c) 125% (d) 25%

(iii) Two particles of masses m1 and m2 have equal kinetic energies. What is the ratio of their linear momenta?
(a) $\sqrt{(m2/m1)}$ (b) $\sqrt{(m1/m2)}$ (c) m2/m1 (d) m1/m2

(iv) When a stone is dropped from a hill, the type of energy possessed by it is:
(a) KE (b) PE (c) both (d) none

30. Stoke's Law: A body falling through a viscous medium experiences a retarding force resulting in absorption of energy by the medium in the form of heat. The motion of the body produces a relative

motion between the different layers of fluid. Consequently, it experiences a force which tends to retard its motion. When a small spherical body is dropped in a viscous liquid such as glycerine, it accelerates first, but soon begins to experience a retarding force. George stokes found that a small spherical body of radius r moving with a uniform velocity v in a fluid of coefficient of viscosity η experiences a retarding force $F = 6\pi\eta rv$.

(i)The frictional force exerted by a viscous medium is called
(a) viscosity (b) terminal velocity (c) fluid gravity (d) capillarity

(ii) SI unit of coefficient of viscosity of a liquid is:
(a) Nm^2/s (b) $Nm^{-2}s$ (c) Nms (d) N/ms

(iii) The force(s) which act(s) on the small spherical body falling through a viscous medium is/ are
(a) Weight (b) Upward thrust (c) Viscous drag (d) All of these

(iv) The dimensional formula of coefficient of viscosity is
(a) MLT^{-1} (b) MLT^{-2} (c) $ML^{-1}T^{-1}$ (d) $ML^{-2}T^{-2}$

SECTION-E

31. (a)State the law of conservation of mechanical energy.
(b) Show that the total mechanical energy of a freely falling body under gravity is conserved.
(c)Plot graph between energy (k.e, p.e, total energy) and position of a freely falling body.

32. (a) State and prove Bernoulli's principle for the flow of a non-viscous, incompressible liquid in a streamlined flow.
(b) Give its limitations.
(c) Explain its application in the lift of an airplane.

33. (a) Derive an expression for the work done during adiabatic expansion of n moles of an ideal gas.
(b) A steam engine delivers 5.4×10^8 J of work per minute and services 3.6×10^9 J of heat per minute from its boiler. What is the efficiency of the engine? How much heat is wasted per minute?

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