INDIAN SCHOOL DARSAIT
ANNUAL EXAM-SAMPLE PAPER, FEBRUARY 2019
PHYSICS (042)

Class: XI   Max. Marks: 70
Date: Time: 3 hrs

General Instructions:
- *Attempt all the questions. There are 27 questions in total.*
- *Q 1 to 5 carries **1mark each**,*
- *Q 6 to 12 carries **2 marks each**,*
- *Q 13 to 24 carries **3 marks each***
- *Q 25 to 27 carries **5 marks each**.*
- *Internal choices have been provided in **two questions of 1 marks, two questions of 2 marks, four questions of 3 marks and all the three 5 marks questions.***
- *Use of calculators is not permitted. However, logarithm table can be used for calculations if necessary.*

SECTION A

1. How does kinetic energy of a body change when its momentum is doubled?   1

    OR

    What does the area under force-time graph indicate?

2. State Kepler's Law of Areas.   1

    OR

    Where does the body weigh more – at the surface of earth or in a mine?

3. Write equation of velocity of a body executing Simple Harmonic Motion if displacement   1
    of body is $x(t) = a \sin \omega t$

4. A lift performs the first part of its ascent with uniform acceleration 'a' and the remainder   1
    with uniform retardation '2a'. Draw corresponding v-t graph.

5. State the conditions for total internal reflection to occur.   1

SECTION B

6. Derive an expression for acceleration due to gravity at a height, h from the surface of the   2
    Earth.

7. (a) What is the basic principle of a thermometer?   2
    (b) What is meant by coefficient of linear expansion and coefficient of cubical expansion?
    Write the relation between the two.

    OR

Describe the anomalous expansion of water and hence explain the presence of underwater life in cold lakes and ponds.

8. Marching troop are asked to break their steps while crossing a suspended bridge. Why? 2

9. (a) State the theorem of perpendicular axes. 2
    (b) Write the expression for moment of inertia of a circular ring of mass, M and radius, R about an axis passing through its centre and perpendicular to its plane.

10. Explain the reason for dispersion of white light through a glass prism. Hence obtain the refractive index of material of prism in terms of angle of prism, A and minimum deviation. 2

11. Prove that if range and maximum height are equal, the angle of projection is $\tan^{-1}(4)$. 2

OR

The angle between $\vec{A}$ and $\vec{B}$ is 60°. What is the ratio of $\vec{A}.\vec{B}$ and $|\vec{A} \times \vec{B}|$?

12. Distinguish between elastic and inelastic collision giving one example for each. 2

SECTION C

11. Two heavy spheres each of mass 100 kg and radius 0.1 m are placed 1 m apart on a horizontal table. What is the gravitational potential at the midpoint of the line joining the center of the spheres? 3

12. (a) Define torque. What is SI unit of torque? 3

    (b) Obtain the relation between the torque and angular momentum for a rigid body.

OR

    (a) Name the physical quantity corresponding to product of moment of inertia and angular velocity.

    (b) Why does a ballet dancer stretch her hands out for slowing down? Name the physical quantity conserved?

13. What is the phenomenon of capillarity? Derive an expression for the rise of liquid in a capillary tube? 3

OR

Derive an expression for the excess of pressure inside a soap bubble.

14. Explain why Newton's second law is called the real law. 3

15. Check the correctness of the relation using dimensional analysis: 3

$$f = \frac{1}{2l}\sqrt{\frac{F}{m}}$$

where f is the frequency of a vibrating string, l is the length of the string, F is the load applied, m is the mass per unit length.

16. A balloon is ascending at the rate of 14m/s at a height of 98 m above the ground when a packet is dropped from the balloon. After how much time and with what velocity does it reach the ground?   3

17. Derive the lens formula.   3

OR

Draw a labeled diagram for the formation of image by a compound microscope. Derive an expression for its total magnification when the final image is formed at the near point.

18. A projectile has a range of 50 m and reaches a maximum height of 10 m. What is the elevation of the projectile?   3

19. Show that total mechanical energy of a freely falling body is conserved.   3

20. What do you mean by –   3
    (a) elastic limit
    (b) Young's modulus of elasticity
    (c) Poisson's ratio

21. Calculate the degrees of freedom for a diatomic gas and hence find the ratio of specific heat capacities for a diatomic gas.   3

OR

Define mean free path of a gas. Obtain the expression for mean free path of molecules for an ideal gas.

22. Deduce an expression for the time period of oscillations of a simple pendulum executing SHM.   3

SECTION D

24. (a) Describe the motion of a car on a banked circular road.   5
    (b) A 2000 kg car has to go over a turn whose radius is 750 m and the angle of slope is 5°. The coefficient of friction between the car wheels and the road is 0.5. What should be the maximum speed of the car so that it may go over the turn without slipping?

OR

(a) Consider a mass m attached to a string of length, ℓ performing vertical circular motion. Find the expression of (i) velocity and (ii) tension in string at the highest and lowest points on the vertical circle.

(b) A motor cyclist loops in a vertical loop of diameter 50 m, without dropping down even at the uppermost point. What is the minimum speed at the lowest and highest point of the loop?

25. (a) Explain the principle of refrigerator with a block diagram and hence write the expression for coefficient of performance of a refrigerator.   5

(b) Temperature inside an ideal refrigerator is 275 K. How much heat is delivered to room for every one joule of work done on working substance when room temperature is 315 K.

OR

(a) Explain working of Carnot engine using the pressure-volume graph and hence obtain the expression for efficiency of a Carnot engine.

(b) A Carnot engine operates between 500 K and 400 K. If it absorbs 6×10^5 cal heat at higher temperature, how much work per cycle can the engine perform?

26. (a) Explain Doppler Effect. Obtain the expression for apparent frequency of sound when observer moves away from source.   5

(b) If a train emitting sound of frequency 500Hz is moving towards an observer with velocity 30 m/s. And if the speed of sound is 330 m/s, what is the frequency as heard by the observer?

OR

(a) How is the displacement of a wave travelling in the positive x- direction represented?

(b) State the principle of superposition of waves.

(c) Give two differences between progressive wave and stationary wave.