Physics – First Year

PAPER – II (MAY – 2011)

Time : 3 Hours Max.Marks : 60

SECTION – A

Note : i) Answer **all** the questions. 10×2=20

ii) Every correct answer carries 2 marks.

iii) All are Very short answer type questions.

1. Write the dimensional formulae for (i) Energy, and (ii) Pressure.
2. State any two characteristics of Centre of mass.
3. If the resultant of two unit vectors $\hat{A}$ and $\hat{B}$ is also a unit vector $\hat{C}$, find the angle between $\hat{A}$ and $\hat{B}$.
4. Why does a car with flattened tyres stop sooner than the one with inflated tyres?
5. A Platinum wire is stretched by 0.1%, find the strain in the wire.
6. One end of a glass capillary tube is dipped vertically in a liquid at an angle of contact less than 90º. What happens to the liquid level in the capillary tube? What is the shape of the liquid meniscus in the tube?
7. When a tap is opened, water comes out in a stream and one would observe that the cross – section of water decreases as water descends. Why?
8. A brass disc is snugly fitted in the hole of a Steel plate. By what method, the disc is removed from the plate – by heating or cooling? Why?
9. State Boyle's law and mention the conditions under which it is obeyed by real gases.
10. What is the specific heat of a gas in –

    a) an isothermal process, and b) an adiabatic process ?

SECTION – B

Note : i) Answer any **six** questions. 6×4=24

ii) Every correct answer carries 4 marks.

iii) All are Short answer type questions.

11. Define Vector product and give an example. Write the properties of vector product.
12. Derive the equations for maximum height and range of a Projectile.
13. Show that two spheres of equal masses moving along a straight line exchange their velocities after a head – on elastic collision.

14. Define Kinetic and rolling frictions. State the laws of rolling friction.

15. A uniform rod of length L is held vertical on a horizontal floor. Fixing its lower end, the rod is allowed to fall onto the ground. Find the angular velocity of the rod, when it reaches the floor.

16. What is orbital velocity? Obtain an expression for it.

17. What is Triple point? Explain triple point of water using phase diagram.

18. A body cools from 60ºC to 40ºC in 20 minutes. Find the temperature of the body after the next 40 minutes, if the temperature of the surroundings is 10ºC.

SECTION – C

Note: i) Answer any **two** of the following questions. $2 \times 8 = 16$

ii) Every correct answer carries 8 marks.

iii) All are Long answer type questions.

19. State the law of conservation of energy and prove it in the case of a freely falling body.

A stone of mass 10 kg is dropped from a height of 10 m from the ground. Find its P.E. after 1 sec. of its free fall. (take $g = 10\,ms^{-2}$)

20. Define Simple Harmonic Motion. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period.

The length of a second pendulum at a place is 1.02 m. Find the time period of another simple pendulum of length 0.51 m at the same place.

21. Describe with necessary theory, an experiment to determine coefficient of apparent expansion of a liquid, using specific gravity bottle.

The coefficient of real expansion of mercury is 0.00018/ºC. Find the coefficient of apparent expansion of mercury in a glass bottle.

(Take coefficient of linear expansion of glass = $9 \times 10^{-6}\,/^{o}C$)