Physics – First Year

PAPER – I (MARCH – 2011)

Time : 3 Hours | Max.Marks : 60

SECTION – A

Note : i) Answer **all** the questions. $10\times2=20$

ii) Every correct answer carries 2 marks.

iii) All are Very short answer type questions.

1. What are the physical quantities having Joule/meter and Joule/meter^2 as units?
2. Define the coefficient of restitution. What are its practical values?
3. Is it necessary that mass should be present at the center of mass of the system? Why? Give examples?
4. Derive the relation between kinetic energy and momentum.
5. Hotter liquids flow faster than cold ones. Why?
6. Hydrogen is in abundance around the sun and less around the earth. Why?
7. The simple harmonic motion of a body is represented by the equation $y = 4\sin\left(2\pi t + \frac{\pi}{4}\right)$. Find:

   a) Initial displacement b) Maximum velocity
8. Can substances contract on heating? Give an example.
9. What is the specific heat of a gas in?

   a) Isothermal change b) An adiabatic change
10. The coefficient of linear expansion of a material is $9\times10^{-6}\ /^{o}C$. Find the coefficient of linear expansion in the Fahrenheit scale.

SECTION – B

Note: i) Answer any **six** questions. $6\times4=24$

ii) Every correct answer carries 4 marks.

iii) All are Short answer type questions.

11. Define scalar product and write its properties. Give two examples.
12. Define $S = ut + \frac{1}{2}at^2$ from the velocity – time graph.
13. Write the methods of minimizing friction.

14. Show that two spheres of equal masses moving along a straight line exchange their velocities after a head – on collision.

15. State and prove the Perpendicular Axes theorem.

16. Explain the behavior of a wire with an increasing load.

17. Show that $C_p - C_V = R$.

18. Explain Kirchhoff's law of radiation. Write two applications of the law.

SECTION – C

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

ii) Every correct answer carries 8 marks.

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

A man of mass 70 kg ascends a flight of 36steps each 20 cm high. What is the work the does against gravity?

20. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. Define a second's pendulum.

21. Describe with the necessary theory, the specific gravity bottle method to determine the coefficient of apparent expansion of a liquid.

In an experiment, the coefficient of apparent expansion of a liquid is determined as $0.0000824/^oC$. Find the coefficient of real expansion of the liquid if the coefficient of linear expansion of the material of the bottle is $0.000009/^oC$