Class: XI Time: 3 Hrs. F.M.: 75

Sub: Physics P.M. 30

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions

You may use the following values of physical constants where necessary

$g = 10 ms^{-2}$

Sp. Heat of iron = $0.1 cal\ g^{-1}\ {}^0c^{-1}$

Latent heat of fusion of ice = 80 cal/gm.

Group A

1. Answer in brief, **ANY SIX** questions [6×2=12]
   a. In the given equation y = a sin (wt-kx), find the dimensions of w and k, where y is the displacement, t is the time period and x is the displacement.
   b. A projectile moves in a parabolic path without air resistance. Is there any point at which acceleration is perpendicular to velocity?
   c. Why does furniture have four legs? Explain.
   d. If the momentum of a body increases by 50%, what would be % increase in its K.E?
   e. Small liquid drops are spherical in shape. Why?
   f. Why do spring balances show wrong readings after used for a long time?
   g. The wick of the Kerosene lamp burns although kerosene lies at the bottom of the bottle why?
   h. What will be the value of acceleration due to gravity at the equator if the earth stops rotating?
2. Answer in brief, **ANY TWO** questions [2×2=4]
   a. Water at 0^0C has greater heat energy than the ice of same temperature. If so, can water at 0^0C melt the ice at same temperature?
   b. Bare head feels colder than a person having thick hairs on head why?
   c. A clock which has a brass pendulum beats correctly at 30^0C will it run faster or slower if the temperature (a) decreases and (b) increases?
3. Answer in brief, **ANY ONE** question. [1×2=2]
   a. How is it possible to block the huge sun just with a small coin placed right in front of your eye?
   b. Why does the sky appear blue in a day?
4. Answer in brief **ANY ONE** question [1×2=2]
   a. Is dielectric constant, the same as dielectric strength? Explain.
   b. Why do you experience a slight shock when getting out of a car?

Group B

5. Answer **ANY THREE** questions [3×4=12]
   a. Define coefficient of friction and angle of repose. Hence obtain an expression to relate them.
   b. What is a conical pendulum? Show that the time period of conical pendulum is given by T = $2\pi\sqrt{\frac{l\cos\theta}{g}}$.
   c. Define torque and couple in rotational motion. Derive the expression of work done by couple.
   d. State and prove Bernoulli's theorem.
6. Answer **ANY TWO** questions [2×4=8]
   a. Define real and apparent expansivities. Derive the relation between them.
   b. Define Boyle's law and Charles law. Derive the expression of equation of state.
   c. Describe the working principle of petrol engine.
7. Answer **ANY ONE** question [1×4=4]
   a. Derive an expression for lens maker's formula.
   b. Describe the construction and working of a compound microscope and hence derive an expression for its magnifying power.
8 Answer **ANY ONE** question [1×4=4]
   a. State and explain Gauss theorem. Use it to calculate the electric field due to a linearly charged conductor.
   b. Derive the expression for energy stored in a charged capacitor and energy density as well.

Group C

9. Solve **ANY THREE** numerical questions [3×4=12]
   a. To a person going due east in a car with a velocity of 25km/hr, a train appears to move due north with a velocity $25\sqrt{3}$ km/hr. What is the actual velocity and direction of the motion of the train?
   b. A 550 N physics student stands on a bathroom scale in an elevator. As the elevator starts moving the elevator reads 450 N. Draw free body diagram of the problem and find the magnitude and direction of the elevator.
   c. Explorer-38, a radio-astronomy research satellite of mass 200 kg, circles the earth in an orbit of average radius $3\frac{R}{2}$, where R is the radius of the

earth. Assuming the gravitational pull on a mass of 1 kg at the earth's surface to be 10 N. Calculate the pull on the satellite.

d. A boy can lift a maximum load of 250 N of water. How many liters of mercury of density 13600 kg/m^3 can he lift if it is placed in the identical vessel?

10. Solve **ANY TWO** numerical questions [2×4=8]
    a. What is the result of mixing 100 g of ice at 0^0C into 100 g of water at 20^0C in an iron vessel of mass 100 g ?
    b. If the temperature of air is 16.5°C and dew point is 6.5^0C, find the percentage relative humidity of air (SVP at 6^0C, 7^0C, 16^0C and 17^0C are 7.05, 7.51, 13.62 and 14.42 mm respectively.)
    c. Calculate the change in internal energy of 1 gm of water when boiled at 100^0C at1 atmospheric pressure. The volume of steam at 100^0C is 1671cc and the latent heat of vaporization is 539 $calg^{-1}$.
11. A narrow beam of light incident normally on one face of an equilateral prism of refractive index 1.45 being surrounded by water if refractive index 1.33. At what angle the ray of light emerges out? 4
12. Two-point charges $+1\mu c$ and $+4\mu c$ are placed at a distance of 0.12m apart. Determine the point on the line joining two charges where net force acting on the unit positive charge is zero.
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