

Most Probable Questions

Physics 11

• Long Question(Derivation)

UNIT 1 MECHANICS

1. State the parallelogram law of vector addition. Derive the expression for the magnitude and direction of the resultant of two vectors inclined at an angle θ from each other.
2. State the principle of conservation of linear momentum. How does the Newton's third law of motion lead to the principle of conservation of linear momentum?
3. What do you understand by friction? Explain its cause. Show that the coefficient of static friction is equal to the angle of repose.
4. What is the principle of conservation of energy? Show that total mechanical energy of conserved when it moves under the action of gravitational field.
5. Define centripetal force. Calculate the force acting on a body moving with uniform speed along circular path.
6. What is escape velocity? Derive expression for it.
7. Define moment of inertia and angular momentum. Establish a relation between them. [2068]
8. What do you mean by elastic limit? Derive an expression for the energy stored in stretched wire. [2069]
9. Define Simple harmonic motion and obtain an expression of time period of a simple pendulum. [2069]
10. What is capillarity? Deduce an expression for the rise of a liquid in capillary tube.
11. Derive Bernoulli's equation from the work energy theorem. Explain why the equation valid only for steady, non-viscous and incompressible fluid.

Unit 2: Heat and Thermodynamics

1. Define coefficient of linear expansion. Obtain the relation between α and γ .
2. State and explain Newton's law of cooling and derive the expression for the specific heat of the liquid.
3. Use the kinetic theory of gases to derive an expression for the pressure exerted by a gas on the walls of its container.

4. Define thermal conductivity. Describe Searle's method of determination of thermal conductivity of good conductor.
5. Define tows specific heat capacity of the gas. Show that for an ideal gas $C_p - C_v = R$.
6. Define adiabatic process in thermodynamics. Show that: $PV^\gamma = \text{constant}$. Where symbols have their usual meanings.
7. Describe the working of petrol engine with the help of P-V diagram.

Unit 3: Geometric Optics

1. What is lateral shift? Derive an expression for it due to a parallel edged glass slab.
2. Derive an expression for lens maker's formula.
3. With the help of a labeled diagram. Explain the principle and working of a compound microscope. Derive an expression for the magnifying power.

Unit 4: Electrostatics

1. State Gauss Theorem. Use this theorem to find the electric field intensity due to a plane charged conductor.
2. Define electric potential. Derive an expression for the potential due to a point charge at any point in space.
3. What is capacitor? Find the energy stored in a charged capacitor.

short questions

Mechanics

1. What is principle of homogeneity of dimensions?
2. A swimmer wants to reach to a point just opposite on the other bank of the river. How should he swim and why?
3. Show that there are two angles of projection of a projectile for the same horizontal rang
4. The earth moving round the sun in an orbit is acted upon by a force; hence work must be done on the earth by this force. Do you agree with this statement?
5. Why are curved railway tracks banked?
6. It is easier to stand on two legs than on one leg. Explain.
7. Why is it harder to open and shut the door if we apply force near the hinge?
8. Why is it easier to open the cap of a pen with the help of two fingers than one finger?
9. What do you mean by 'Elastic after Effect'?
10. Can simple pendulum experiment to be done inside a satellite?
11. Railway tracks are laid on large sized wooden, iron or cement sleepers. Why?
12. It is better to wash clothes in hot soap solution. Why?
13. Why is the velocity of water in a river less on the bank but great at the middle?

Heat

14. Water pipes burst in winter, why?
15. What do you mean by the statement specific heat capacity of water is $4200\text{J kg}^{-1}\text{K}^{-1}$?
16. Why is latent heat of vaporization of a material greater than that of latent heat of fusion?
17. What is triple point? Show it in PV diagram.
18. "Ventilations are provided near the ceilings in a room" Explain.
19. What are the limitations of first law of thermodynamics?

Optics

20. When is formation of real image possible in a convex mirror?
21. What is the cause of dispersion?

Electrostatics

22. Electric shocks may be felt on touching a running motor car. Why?
23. What do you mean by equipotential surfaces?
24. Distinguish between polar and non-polar molecules.

Numericals

1. mechanics 3x4=12

- (a) A ball A of mass 0.1 kg moving with a velocity of 6m/s collides directly with a ball B of mass 0.2kg at rest. Calculate the common velocity if both balls move off together. If ball A had rebounded with a velocity of 2m/s in the opposite direction after collision, what would be the new velocity?
- (b) A canoe has a velocity of 0.4 m/s south east relative to the earth. The canoe is on a river that is flowing 0.5 m/s east relative to the earth. Find the magnitude and direction of the velocity relative to the river.
- (c) A projectile is fired from ground level with a velocity 500m/s at 30° to the horizontal. Find its horizontal range, the greatest height and the time to reach the greatest height
- (d) A train of mass 2×10^5 Kg moves at a constant speed of 72 Km/hr. up a straight incline against frictional force of 1.28×10^4 N. The incline is such that the train rises vertically 1m for every 100m traveled along the incline. Calculate
 - (i) The rate of increase per second of P.E of the train
 - (ii) The necessary power developed by the train.
- (e) An object of mass 8 kg is whirled round in a vertical circle of radius 2m with a constant speed of 6m/s. Calculate the maximum and the minimum tension in the string.
- (f) Calculate the period of revolution of a satellite revolving at a distance of 20 km above the earth's surface. (Radius of the earth = 6400km, acceleration due to gravity = 10m/s^2)
- (g) A particle of mass 0.3kg. Vibrates with a period of 2 seconds. If its amplitude is 0.5m what is its maximum kinetic energy?
- (h) Castrol oil at 20°C has coefficient of viscosity 2.42Nsm^{-2} and a density 940Kgm^{-3} . Calculate the terminal velocity of a steel ball of radius 2.0 mm falling under gravity in the oil.

2. heat 2x4 = 8

- (a) 25 g of water at 100°C is mixed with 25 g of ice at 0°C . Find the resulting temperature.
- (b) A copper vessel with a volume of exactly 1.80m^3 at a temperature 20°C is filled with glycerin. If the temperature rises to 30°C how much glycerin will spill out? (Given α for copper = $16.7 \times 10^{-6}/^\circ\text{C}$, γ for glycerin = $5.3 \times 10^{-4}/^\circ\text{C}$)
- (c) Assuming the density of Nitrogen at STP to be 1.251 kg/m^3 , find the RMS velocity of Nitrogen molecules at 127°C .

- (d) Calculate the quantity of heat conducted through an area 3m^2 of a brick wall 24cm thick in one hour if the temperature on one side is 7°C and on the other side is 25°C . Thermal conductivity of brick = $0.12\text{Wm}^{-1}\text{K}^{-1}$.
- (e) An ideal gas initially at 4 atmosphere and 350K is permitted to expand adiabatically to 1.5 times its initial volume. Find the final pressure and temperature to 1.5 times its initial volume. Find the final pressure and temperature if the gas is (i) monatomic and (ii) diatomic with $C_v = 5/2 R$

3 light 1x4=4

- A glass prism of angle A and refractive index 1.5 produces the angle of minimum deviation equal to 40° . Calculate the value of the angle of prism.
- Light from a luminous point on the lower face of a rectangular glass Slab, 2cm thick strikes the upper face and the totally reflected rays outline a circle of 3.2cm radius on the lower face. What is the Refractive index of the glass?
- Light from a passes through a thin convex lens, focal length 20cm placed 24cm from the object. It then passes through a thin concave lens of focal length 50cm and forms a real image 62.5cm from concave lens. Find the distance between the lenses and the magnification of final image.

4 electrostatic 1x3=4

- A hollow spherical conductor of radius 12cm is charged to $6 \times 10^{-6}\text{C}$. Find the electric field strength at the surface of sphere, inside the sphere at 8cm and at distance 15cm from the sphere.
- Two point charges $+1\ \mu\text{C}$ are placed at a distance of 0.12m apart. Determine the point on the line joining two charges where net forces acting on the positive charges is zero.