

**RESTD**  
**IMPORTANT QUESTIONS**

**(PHY-CL-IX)**

Chapter No	Questions/MCQs				
	Examples	MCQs	Short Questions	Comprehensive Questions	Numerical
1	1,4	All	5,6,7,9	2,3,4,6	7,8,9,10
2	5,10,11,12,13,14,15	-	3,4,5,6,11	5,6	1,2,3,4,5,6,8
3	2,3,6,7,8	-	6,7,10,13,19,20	2,3,4	5,8,9,10
4	3,6,	-	2,3,5,8,11,12,13	3,4,5,6,7,8	4,5,6,7,9
5	1,2	-	2,4,6,7,12,13,14,16,17	1,2,3,4	2,4,5,6,7,8,9,10
6	2,3,4,5,6,7	-	3,8,9,11,12,13,16	1,3,4,5,7	1,6,7,8,9
7	2,4,5,6,7	-	3,4,5,7,8,10,12,13,21	1,3,4,5,6,7,9	3,4,5,6,7,8,9,12
8	3,4,5,6,7	-	2,3,4,5,6,7,8,9,10,11	3,4,5,8	3,4,5,6,7,9,10
9	1	-	2,3,4,7,9,10,11	2,3,4,5	1,2

## Important Questions

### Chapter -1- Physical Quantities and Measurement

#### Objective (MCQs)

- The number of base units in SI are:  
(a) 3      (b) 6      (c) 7      (d) 9
- Which one of the following unit is not a derived unit?  
(a) Pascal   (b) kilogramme   (c) Newton   (d) Watt
- Amount of a substance in terms of numbers is measured in  
(a) Gram      (b) kilogramme      (c) Newton      (d) Mole
- An interval of 200 $\mu$ s is equivalent to  
(a) 0.2 s      (b) 0.02 s      (c)  $2 \times 10^{-4}$ s      (d)  $2 \times 10^{-6}$ s
- Which one of the following is the smallest quantity?  
(a) 0.01 g      (b) 2 mg      (c) 100  $\mu$ g      (d) 5000 ng
- Which instrument is most suitable to measure the internal diameter of a test tube?  
(a) Meter rule   (b) Vernier Callipers   (c) Measuring tap   (d) Screw Gauge

#### Examples

- Find the number of significant figures in each of the following values. Also express them in scientific notations:-
  - 100.8s
  - 0.00580km
  - 210.0g

#### Short Questions

- Estimate your age in seconds.
- What role SI units have played in the development of science?
- What is meant by Vernier Constant?

1.9 Why is the use of zero error necessary in a measuring instrument?

1.12 What is meant by significant figures of a measurement?

### **Long Questions**

Q1. What is the difference between base quantities and derived quantities? Give three examples in each case?

Q2. Describe the construction and working of vernier calipers, screw gauge and physical balance.

### **Numerical**

1.7 A screw gauge has 50 divisions on its circular scale. The pitch of the screw gauge is 0.5 mm. What is its least count?

1.8 Which of the following quantities have three significant figures?

(a) 3.0066 m (b) 0.00309kg (c)  $5.05 \times 10^{-27}$ kg (d) 301.0s

1.9 What are the significant figures in the following measurements?

(a) 1.009 m (b) 0.00450 kg (c)  $1.66 \times 10^{-27}$  kg (d) 2001 s

1.10 A chocolate wrapper is 6.7 cm long and 5.4 cm wide. Calculate its area upto reasonable number of significant figures.

## Chapter 2 – Kinematics

### Objective (MCQs)

1. A body has translatory motion if it moves along a  
(a) straight line (b) circle (c) line without rotation (d) curved path
2. The motion of a body about an VL axis is called  
(a) circular motion (b) rotatory motion (c) vibratory motion (d) random motion
3. Which of the following is a vector quantity?  
(a) speed (b) distance (c) displacement (d) power
4. If an object is moving with constant speed then its distance-time graph will be a straight line.  
(a) along time-axis (b) along distance-axis  
(c) parallel to time-axis (d) inclined to time-axis
5. A straight line parallel to time-axis on a distance-time graph tells that the object is  
(a) moving with constant speed (b) at rest  
(c) moving with variable speed (d) in motion
6. The speed-time graph of a car is shown in the figure, which of the following statement is true?  
(a) car has an acceleration of  $1.5 \text{ m}^{-2}$  (b) car has constant speed of  $7.5 \text{ m/s}$   
(c) distance travelled by the car is  $75 \text{ m}$  (d) average speed of car is  $15 \text{ m/s}$
7. By dividing displacement of a moving body with time, we obtain  
(a) speed (b) acceleration (c) velocity (d) deceleration
8. A ball is thrown vertically upward. Its velocity at the highest point is  
(a)  $-10 \text{ ms}^{-1}$  (b)  $10 \text{ ms}^{-2}$  (c) zero (d) none of these
9. A change in position is called  
(a) speed (b) velocity (c) displacement (d) distance
10. A train is moving at a speed of  $36 \text{ km/h}$ . Its speed expressed in  $\text{m/s}$  is

- (a) 10 m/s      (b) 20 m/s      (c) 25 m/s      (d) 30 m/s

11. A car starts from rest. It acquires a speed of 25 ms after 20 s. The distance moved by the car during this time is

- (a) 31.25 m      (b) 250 m      (c) 500 m      (d) 5000m

### **Examples**

- 2.5 Find the retardation produced when a car moving at a velocity of 30m/s slow down uniformly to 15m/s.
- 2.10 A car travelling at 10m/s accelerates uniformly at 2m/s. Calculate its velocity after 5s.
- 2.11 A train slows down from 80km/h with a uniform retardation of 2m/s. How long will it take to attain a speed of 20 km/h.
- 2.12 A bicycle accelerates at 1 m/s from an initial velocity of 4m/s for 10s. Find the distance moved by it during this interval of time.
- 2.13 A car travels with a velocity of 5m/s. It then accelerates uniformly and travels a distance of 50m. if the velocity reached is 15m/s, find the acceleration and the time to travel this distance.
- 2.14 A stone is dropped from the top of a tower. The stone hits the ground after 5 seconds. Find a) the height of the tower b) the velocity with which the stone hits the ground.
- 2.15 A boy throws a ball vertically up. It returns to the ground after 5 seconds. Find a) the maximum height reached by the ball. b) the velocity with which the ball is thrown up.

### **Short Questions**

- 2.3 Differentiate between the following:-
- (i) Rest and motion                      (ii) Circular motion and rotatory motion
- (iii) Distance and displacement      (iv) Speed and velocity
- (v) Linear and random motion      (vi) Scalars and vectors
- 2.4 Define the term speed, velocity and acceleration.
- 2.5 Can a body moving at a constant speed have acceleration?
- 2.6 How do riders in Ferris wheel possess translator motion but not rotatory motion?

2.11 Why vectors quantities cannot be added and subtracted like scalar quantities?

**Long Questions**

- Q.1 Derive equations of motion for uniformly accelerated rectilinear motion.
- Q.2 Sketch a distance-time graph for a body starting from rest. How will you determine the speed of a body from this graph?
- Q.3 Sketch a velocity - time graph for the motion of the body. From the graph explaining each step, calculate total distance covered by the body.
- Q.4 How can vector quantities be represented graphically?
- Q.5 How are vector quantities important to us in our daily life?

**Chapter -3 Dynamics****Objective(MCQs)**

1. Newton's first law of motion is valid only in the absence of:  
(a) force (b) net force (c) friction (d) momentum
2. Inertia depends upon  
(a) force (b) net force (c) mass (d) velocity
3. A boy jumps out of a moving bus. There is a danger for him to fall:  
(a) towards the moving bus (b) away from the bus  
(c) In the direction of motion (d) opposite to the direction of motion
4. A string is stretched by two equal and opposite forces 10 N each. The tension in the string is  
(a) Zero (b) 5N (c) 10N (d) 20N
5. The mass of a body:  
(a) decreases when accelerated (b) increases when accelerated  
(c) decreases when moving with high velocity (d) none of the above
6. Which of the following is the unit of momentum?  
(a) Nm (b)  $\text{kgms}^{-2}$  (c) Ns (d)  $\text{Ns}^{-1}$
7. When horse pulls a cart, the action is on the:  
(a) cart (b) Earth (c) horse (d) Earth and cart
8. Which of the following material lowers friction when pushed between metal plates?  
(a) water (b) fine marble powder (c) air (d) oil

**Examples**

- 3.2 A force acting on a body of mass 5 kg produces an acceleration of  $10 \text{ ms}^{-2}$ . What acceleration the same force will produce in a body of mass 8 kg?

- 3.3 A cyclist of mass 40 kg exerts a force of 200 N to move his bicycle with an acceleration of  $3 \text{ ms}^{-2}$ . How much is the force of friction between the road and the tyres?
- 3.6 A body of mass 5 kg is moving with a velocity of  $10 \text{ ms}^{-1}$ . Find the force required to stop it in 2 seconds.
- 3.7 A bullet of mass 20 g is fired from a gun with a muzzle velocity  $100 \text{ ms}^{-1}$ . Find the recoil of the gun if its mass is 5 kg.
- 3.8 A stone of mass 100 g is attached to a string 1m long. The stone is rotating in a circle with a speed of  $5 \text{ ms}^{-1}$ . Find the tension in the string.

### **Short Questions**

- 3.3 What is the difference between?
- (i) Mass and weight
  - (ii) Action and reaction
  - (iii) Sliding friction and rolling friction
- 3.6 Why does a passenger move outward when a bus takes a turn?
- 3.7 How can you relate a force with the change of momentum of a body?
- 3.8 What will be the tension in a rope that is pulled from its ends by two opposite forces 100 N each?
- 3.10 A horse pulls the cart. If the action and reaction are equal and opposite then how does the cart move?
- 3.11 What is the law of conservation of momentum?
- 3.12 Why is the law of conservation of momentum important?
- 3.13 When a gun is fired, it recoils. Why?
- 3.17 Why rolling friction is less than sliding friction?
- 3.18 What you know about the following:
- (i) Tension in a string
  - (ii) Limiting force of friction
  - (iii) Braking force
  - (iv) Skidding of vehicles
  - (v) Seatbelts
  - (vi) Banking of roads



(vii) Cream separator

3.19 What would happen if all friction suddenly disappears?

3.20 Why the spinner of a washing machine is made to spin at a very high speed?

### **Long Questions**

Q.1 Describe Newton's laws of motion with suitable examples?

Q.2 Explain vertical motion of two bodies attached to the ends of a string that passes over a frictionless pulley.

Q.3 Describe motion of two bodies attached to the ends of a string that passes over a frictionless pulley such that one body moves vertically and the other moves on a smooth horizontal surface.

Q.4 Describe two situations in which force of friction is needed.

Q.5 Describe the ways to reduce friction.

Q.6 Shows that the centripetal force needed by a body moving in a circle depends on the mass  $m$  of the body, square of its velocity  $v$  and reciprocal to the radius  $r$  of the circle.

### **Numerical**

3.5 A body has weight 20 N. How much force is required to move it vertically upward with an acceleration of  $2 \text{ ms}^{-2}$ ?

3.8 How much time is required to change 22 Ns momentum by a force of 20N?

3.9 How much is the force of friction between a wooden block of mass 5 kg and the horizontal marble floor? The coefficient of friction between wood and the marble is 0.6.

3.10 How much centripetal force is needed to make a body of mass 0.5kg to move in a circle of radius 50 cm with a speed 3 m/s.

**Chapter - 4 Turning Effect of Forces****Objective (MCQs)**

1. Two equal but unlike parallel forces having different line of action produce:  
(a) a torque (b) a couple (c) equilibrium (d) neutral equilibrium
2. The number of forces that can be added by head to tail rule are:  
(a) 2 (b) 3 (c) 4 (d) any number
3. The number of perpendicular components of a force is:  
(a) 1 (b) 2 (c) 3 (d) 4
4. A force of 10 N is making an angle of  $30^\circ$  with the horizontal. Its horizontal component will be:  
(a) 4 N (b) 5 N (c) 7 N (d) 8.7 N
5. A couple is formed by  
(a) two forces perpendicular to each other (b) two like parallel forces  
(c) two equal and opposite forces in the same line  
(d) two equal and opposite forces not in the same line
6. A body is in equilibrium when its:  
(a) acceleration is uniform (b) speed is uniform  
(c) speed and acceleration are uniform (d) acceleration is zero
7. A body is in neutral equilibrium when its center of gravity:  
(a) is at its highest position (b) is at the lowest position  
(c) keeps its height if displaced (d) is situated at its bottom
8. Racing cars are made stable by:  
(a) increasing their speed (b) decreasing their mass  
(c) lowering their center of gravity (d) decreasing their width

**Examples**

- 4.3 A mechanic tightens the nut of a bicycle using a 15 cm long spanner by exerting a force of 200 N. Find the torque that has tightened it.
- 4.6 A uniform rod of length 1.5 m is placed over a wedge at 0.5 m from its one end. A force of 100 N is applied at one of its ends near the wedge to keep it horizontal. Find the weight of the rod and the reaction of the wedge.

**Short Questions**

- 4.2 Define the following:  
(i) resultant vector (ii) torque (iii) centre of mass (iv) centre of gravity
- 4.3 Differentiate the following:  
(i) like and unlike forces (ii) torque and couple (iii) stable and neutral equilibrium
- 4.5 How can a force be resolved into its perpendicular components?
- 4.8 Why there is a need of second condition for equilibrium if a body satisfies first condition for equilibrium?
- 4.11 Think of a body which is at rest but not in equilibrium.
- 4.12 Why a body cannot be in equilibrium due to single force acting on it?
- 4.13 Why the height of vehicles is kept as low as possible?

**Long Questions**

- Q.1 Define and explain resolution of forces.
- Q.2 Determine a formula for a force by its perpendicular components.
- Q.3 Show that moment of the force or torque is determined by the product of force  $F$  and its moment arm  $L$ .
- Q.4 Explain center of gravity of a body. Find out center of gravity of an irregular shaped thin lamina.
- Q.5 Define couple of forces. Show that torque of a couple is equal to the product of one of the two forces and the perpendicular distance between them.
- Q.6 Explain what is meant by stable, unstable and neutral equilibrium. Give one example in each case.

**Numerical**

- 4.4 A force of 100 N is applied perpendicularly on a spanner at a distance of 10 cm from a nut. Find the torque produced by the force.
- 4.5 A force is acting on a body making an angle of  $30^\circ$  with the horizontal. The horizontal component of the force is 20N. Find the force.
- 4.6 The steering of a car has a radius 16 cm. Find the torque produced by a couple of 50 N.
- 4.7 A picture frame is hanging by two vertical strings. The tensions in the strings are 3.8 N and 4.4 N. Find the weight of the picture frame.
- 4.9 A nut has been tightened by a force of 200 N using 10 cm long spanner. What length of a spanner is required to loosen the same nut with 150 N force?

## Chapter -5 Gravitation

### Objective(MCQs)

1. Earth's gravitational force of attraction vanishes at  
(a) 6400 km (b) infinity (c) 42300 km (d) 1000 km
2. Value of  $g$  increases with the  
(a) increase in mass of the body (b) increase in altitude  
(c) decrease in altitude (d) none of the above
3. The value of  $g$  at a height one Earth's radius above the surface of the Earth is:  
(a)  $2g$  (b)  $\frac{1}{2}g$  (3)  $\frac{1}{3}g$  (4)  $\frac{1}{4}g$
4. The value of  $g$  on moon's surface is  $1.6 \text{ ms}^{-2}$ . What will be the weight of a 100 kg body on the surface of the moon?  
(a) 100 N (b) 160 N (c) 1000 N (d) 1600 N
5. The altitude of geostationary orbits in which communication satellites are launched above the surface of the Earth is:  
(a) 850 km (b) 1000 km (c) 6400 km (d) 42,300 km
6. The orbital speed of a low orbit satellite is:  
(a) zero (b)  $8 \text{ ms}^{-1}$  (c)  $800 \text{ ms}^{-1}$  (d)  $8000 \text{ ms}^{-1}$

### Examples

- 5.1 Two lead spheres each of mass 1000 kg are kept with their centers 1 m apart. Find the gravitational force with which they attract each other.
- 5.2 Calculate the value of  $g$ , the acceleration due to gravity at an altitude 1000 km. The mass of the Earth is  $6.0 \times 10^{24} \text{ kg}$ . The radius of the Earth is 6400 km.

### Short Questions

- 5.2 What is meant by the force of gravitation?
- 5.4 What is a field force?
- 5.6 How can you say that gravitational force is a field force?
- 5.7 Explain, what is meant by gravitational field strength?

- 5.12 Why does the value of  $g$  vary from place to place?
- 5.13 Explain how the value of  $g$  varies with altitude.
- 5.14 What are artificial satellites?
- 5.16 On what factors the orbital speed of a satellite depends?
- 5.17 Why communication satellites are stationed at geostationary orbits?

### **Long Questions**

- Q.1 Explain the law of gravitation.
- Q.2 How the mass of Earth can be determined?
- Q.3 How Newton's law of gravitation helps in understanding the motion of satellites?
- Q.4 Find out the orbital speed of the artificial satellite round the Earth at an altitude  $h$  in an orbit of radius  $r_0$  with orbital velocity  $v_0$ .

### **Numerical**

- 5.2 The gravitational force between two identical lead spheres kept at 1 m apart is 0.006673 N. Find their masses.
- 5.4 The acceleration due to gravity on the surface of moon is  $1.62 \text{ ms}^{-2}$ . The radius of moon is 1740 km. Find the mass of moon.
- 5.5 Calculate the value of  $g$  at a height of 3600 km above the surface of the Earth.
- 5.6 Find the value of  $g$  due to the Earth at geostationary satellite. The radius of the geostationary orbit is 48700 km.
- 5.7 The value of  $g$  is  $4.0 \text{ ms}^{-2}$  at a distance of 10000 km from the center of the Earth. Find the mass of the Earth.
- 5.8 At what altitude the value of  $g$  would become one fourth than on the surface of the Earth?
- 5.9 A polar satellite is launched at 850 km above Earth. Find its orbital speed.

**Chapter - 6 Work and Energy****Objective(MCQs)**

1. The work done will be zero when the angle between the force and the distance is  
(a)  $45^\circ$       (b)  $60^\circ$       (c)  $90^\circ$       (d)  $180^\circ$
2. If the direction of motion of the force is perpendicular to the direction of motion of the body, then work done will be  
(a) Maximum      (b) Minimum      (c) zero      (d) None of the above
3. If the velocity of a body becomes double, then its kinetic energy will  
(a) remain the same      (b) become double      (c) become four times  
(d) become half
4. The work done in lifting a brick of mass 2 kg through a height of 5 m above ground will be  
(a) 2.5 J      (b) 10 J      (c) 50 J      (d) 100 J
5. The kinetic energy of a body of mass 2 kg is 25 J. Its speed is  
(a) 5 ms<sup>-1</sup>      (b) 12.5 ms<sup>-1</sup>      (c) 25 ms<sup>-1</sup>      (d) 50 ms<sup>-1</sup>
6. Which one of the following converts light energy into electrical energy?  
(a) Electric bulb      (b) electric generator      (c) Photocell      (d) Electric cell
7. When a body is lifted through a height h, the work done on it appears in the form of its:  
(a) Kinetic energy      (b) Potential energy      (c) Elastic potential energy  
(d) Geothermal energy
8. The energy stored in coal is  
(a) heat energy      (b) kinetic energy      (c) chemical energy  
(d) nuclear energy
9. The energy stored in a dam is  
(a) electric energy      (b) potential energy      (c) kinetic energy  
(d) thermal energy

10. In Einstein's mass-energy equation,  $c$  is the  
(a) speed of sound      (b) speed of light      (c) speed of electron  
(d) speed of Earth
11. Rate of doing work is called  
(a) energy      (b) torque      (c) power      (d) momentum

### **Examples**

- 6.2 A stone of mass 500 g strikes the ground with a velocity of  $20\text{ms}^{-1}$ . How much is the kinetic energy of the stone at the time it strikes the ground?
- 6.4 A force of 200 N acts on a body of mass 20 kg. The force accelerates the body from rest until it attains a velocity of  $50\text{ms}^{-1}$ . Through what distance the force acts?
- 6.6 A man takes 80 s in lifting a load of 200 N through a height of 10 m. While another man M2 takes 10 s in doing the same job. Find the power of each.
- 6.7 Calculate the power of a pump which can lift 70 kg of water through a vertical height of 16 meters in 10 seconds. Also find the power in horse power.

### **Short Questions**

- 6.3 When does a force do work? Explain.
- 6.8 Why fossils fuels are called non- renewable form of energy?
- 6.9 Which form of energy is most preferred and why?
- 6.11 Name the five devices that convert electrical energy into mechanical energy.
- 6.12 Name a device that converts mechanical energy into electrical energy.
- 6.13 What is meant by the efficiency of a system?
- 6.15 What is meant by the term power?
- 6.16 Define watt.

### **Long Questions**

- Q.1 Define and explain work and write down its SI unit.
- Q.2 Define K.E. and derive its relation.



- Q.3 Define potential energy and derive its relation.
- Q.4 How is energy converted from one form to another? Explain.
- Q.5 Elaborate various forms of energy?
- Q.6 Explain Einstein's mass-energy equation.

### **Numerical**

- 6.1 A man has pulled a cart through 35 m applying a force of 300 N. Find the work done by the man.
- 6.6 A motor boat moves at a steady speed of  $4 \text{ ms}^{-1}$ . Water resistance acting on it is 4000 N. Calculate the power of its engine.
- 6.7 A man pulls a block with a force of 300 N through 50 m in 60 s. Find the power used by him.
- 6.8 A 50 kg man moved 25 steps up in 20 seconds. Find his power, if each step is 16 cm high.
- 6.9 Calculate the power of a pump which can lift 200 kg of water through a height of 6 m in 10 seconds.
- 6.10 An electric motor of 1hp is used to run water pump. The water pump takes 10 minutes to fill an overhead tank. The tank has a capacity of 800 liters and height of 15 m. Find the actual work done by the electric motor to fill the tank. Also find the efficiency of the system.

(Density of water =  $1000 \text{ kgm}^{-3}$ ) (Mass of 1 litre of water = 1 kg)

## Chapter -7 Properties of Matter

### Objective(MCQs)

1. In which of the following state molecules do not leave their position?  
 (a) solid                    (b) liquid                    (c) gas                    (d) plasma
2. Which of the substances is the lightest one?  
 (a) copper                    (b) mercury                    (c) aluminum                    (d) lead
3. SI unit of pressure is pascal, which is equal to:  
 (a)  $10^4 \text{ Nm}^{-2}$  (b)  $1 \text{ Nm}^{-2}$  (c)  $10^2 \text{ Nm}^{-2}$  (d)  $10^3 \text{ Nm}^{-2}$
4. What should be the approximate length of a glass tube to construct a water barometer?  
 (a) 0.5 m                    (b) 1 m                    (c) 2.5 m                    (d) 11 m
5. According to Archimedes, upthrust is equal to:  
 (a) weight of displaced liquid                    (b) volume of displaced liquid  
 (c) mass of displaced liquid                    (d) none of these
6. The density of a substance can be found with the help of:  
 (a) Pascal's law                    (b) Hooke's law  
 (c) Archimedes principle                    (d) Principle of floatation
7. According to Hooke's law  
 (a) stress x strain = constant                    (b) stress / strain = constant  
 (c) strain / stress = constant                    (d) stress = strain

### Examples

- 7.2 In a hydraulic press, a force of 100 N is applied on the piston of a pump of cross-sectional area  $0.01 \text{ m}^2$ . Find the force that compresses a cotton bale placed on larger piston of cross-sectional area  $1 \text{ m}^2$ .
- 7.3 A wooden cube of sides 10 cm each has been dipped completely in water. Calculate the upthrust of water acting on it.

- 7.4 The weight of a metal spoon in air is 0.48 N. its weight in water is 0.42 N. Find its density.
- 7.5 An empty meteorological balloon weighs 80 N. It is filled with  $10^3$  cubic metres of hydrogen. How much maximum contents the balloon can lift besides its own weight? The density of hydrogen is  $0.09 \text{ kgm}^{-3}$  and the density of air is  $1.3 \text{ kgm}^{-3}$ .
- 7.6 A barge, 40 meter long and 8 meter broad, whose sides are vertical, floats partially loaded in water. If 125000 N of cargo is added, how many meters will it sink?

### **Short Questions**

- 7.3 Does there exist a fourth state of matter? What is that?
- 7.4 What is meant by density? What is its SI unit?
- 7.5 Can we use a hydrometer to measure the density of milk?
- 7.7 Show that atmosphere exerts pressure.
- 7.8 It is easy to remove air from a balloon but it is very difficult to remove air from a glass bottle. Why?
- 7.10 Why water is not suitable to be used in a barometer?
- 7.12 Why does the atmospheric pressure vary with height?
- 7.13 What does it mean when the atmospheric pressure at a place fall suddenly?
- 7.21 Why does a piece of stone sink in water but a ship with a huge weight floats?

### **Long Questions**

- Q.1 State and explain Pascal's law.
- Q.2 Explain the working of hydraulic press.
- Q.3 What is meant by elasticity?
- Q.4 State Archimedes principle.
- Q.5 What is upthrust? Explain the principle of floatation.
- Q.6 Explain how a submarine moves up the water surface and down into water.
- Q.7 What is Hooke's law? What is meant by elastic limit?

**Numerical**

- 7.3 Calculate the volume of the following objects:
- (i) An iron sphere of mass 5 kg, the density of iron is  $8200 \text{ kgm}^{-3}$ .
  - (ii) 200 g of lead shot having density  $11300 \text{ kgm}^{-3}$ .
  - (iii) A gold bar of mass 0.2 kg. The density of gold is  $19300 \text{ kgm}^{-3}$ .
- 7.4 The density of air is  $1.3 \text{ kgm}^{-3}$ . Find the mass of air in a room measuring 8m x 5m x 4m.
- 7.5 A student presses her palm by her thumb with a force of 75 N. How much would be the pressure under her thumb having contact area  $1.5 \text{ cm}^2$ ?
- 7.6 The head of a pin is a square of side 10 mm. Find the pressure on it due to a force of 20 N.
- 7.7 A uniform rectangular block of wood 20 cm x 7.5 cm x 7.5 cm and of mass 1000g stands on a horizontal surface with its longest edge vertical. Find (i) the pressure exerted by the block on the surface (ii) the density of the wood.
- 7.8 A cube of glass of 5 cm side and mass 306 g has a cavity inside it. If the density of glass is  $2.55 \text{ gcm}^{-3}$ , find the volume of the cavity.
- 7.9 An object has weight 18 N in air. Its weight is found to be 11.4 N when immersed in water. Calculate its density. Can you guess the material of the object?
- 7.11 The diameter of the piston of a hydraulic press is 30 cm. How much force is required to lift a car weighing 20 000 N on its piston if the diameter of the piston of the pump is 3 cm?
- 7.12 A steel wire of cross-sectional area  $2 \times 10^{-5} \text{ m}^2$  is stretched through 2 mm by a force of 4000N. Find the Young's modulus of the wire. The length of the wire is 2 m.

**Chapter -8 Thermal Properties of Matter****Objective(MCQs)**

1. Water freezes at  
(a) 0°F (b) 32 °F (c) -273 K (d) 0 K
2. Normal human body temperature is  
(a) 15°C (b) 37°C (c) 37 °F (d) 98.6°C
3. Mercury is used as thermometric material because it has  
(a) Uniform thermal expansion (b) low freezing point  
(c) small heat capacity (d) all the above properties
4. Which of the following material has large specific heat?  
(a) Copper (b) ice (c) water (d) mercury
5. Which of the following material has large value of temperature coefficient of linear expansion?  
(a) Aluminum (b) gold (c) brass (d) steel
6. What will be the value of  $\beta$  for a solid for which  $\alpha$  has a value of  $2 \times 10^{-5} \text{K}^{-1}$ ?  
(a)  $2 \times 10^{-5} \text{K}^{-1}$  (b)  $6 \times 10^{-5} \text{K}^{-1}$  (c)  $8 \times 10^{-15} \text{K}^{-1}$  (d)  $8 \times 10^{-5} \text{K}^{-1}$
7. A large water reservoir keeps the temperature of nearby land moderate due to  
(a) low temperature of water (b) low specific heat of water  
(c) less absorption of heat (d) large specific heat of water
8. Which of the following affects evaporation?  
(a) Temperature (b) surface area of the liquid  
(c) Wind (d) all of the above

**Examples**

- 8.3 Convert 50°C on Celsius scale into Fahrenheit temperature scale.
- 8.4 Convert 100 °F into the temperature on Celsius scale.

- 8.5 A container has 2.5 litres of water at 20°C. How much heat is required to boil the water?
- 8.6 A brass rod is 1 m long at 0°C. Find its length at 30°C. (Coefficient of linear expansion of brass =  $1.9 \times 10^{-5} \text{K}^{-1}$ )
- 8.7 Find the volume of a brass cube at 100°C whose side is 10 cm at 0°C. (Coefficient of linear thermal expansion of brass =  $1.9 \times 10^{-5} \text{K}^{-1}$ ).

### **Short Questions**

- 8.2 Why does heat flow from hot body to cold body?
- 8.3 Define the terms heat and temperature.
- 8.4 What is meant by internal energy of a body?
- 8.5 How does heating affect the motion of molecules of a gas?
- 8.6 What is a thermometer? Why mercury is preferred as a thermometric substance?
- 8.10 Define latent heat of vaporization.

### **Long Questions**

- Q.1 Define specific heat. How would you find the specific heat of a solid?
- Q.2 What is thermal expansion? Explain linear thermal expansion in solids.
- Q.3 Explain the volumetric thermal expansion.
- Q.4 Define and explain latent heat of fusion.
- Q.5 What is meant by evaporation? On what factors the evaporation of a liquid depends? Explain how cooling is produced by evaporation.
- Q.6 Write down the consequences and applications of thermal expansion.

### **Numerical**

- 8.3 Calculate the increase in the length of an aluminum bar 2 m long when heated from 0°C to 20°C, If the thermal coefficient of linear expansion of aluminium is  $2.5 \times 10^{-5} \text{K}^{-1}$ .
- 8.4 A balloon contains 1.2 m<sup>3</sup> air at 15 °C. Find its volume at 40 °C. Thermal coefficient of volume expansion of air is  $3.67 \times 10^{-3} \text{K}^{-1}$ .

- 8.5 How much heat is required to increase the temperature of 0.5 kg of water from 10 °C to 65 °C?
- 8.6 An electric heater supplies heat at the rate of 1000 joule per second. How much time is required to raise the temperature of 200 g of water from 20 °C to 90 °C?
- 8.7 How much ice will melt by 50000 J of heat? Latent heat of fusion of ice = 336000 J kg<sup>-1</sup>.
- 8.8 Find the quantity of heat needed to melt 100g of ice at -10 °C into water at 10 °C.  
(Note: Specific heat of ice is 2100 Jkg<sup>-1</sup>K<sup>-1</sup>, specific heat of water is 4200Jkg<sup>-1</sup>K<sup>-1</sup>, Latent heat of fusion of ice is 336000 Jkg<sup>-1</sup>).
- 8.9 How much heat is required to change 100 g of water at 100°C into steam?  
(Latent heat of vaporization of water is 2.26x10<sup>6</sup> Jkg<sup>-1</sup>).
- 8.10 Find the temperature of water after passing 5 g of steam at 100 °C through 500 g of water at 10 °C. (Note: Specific heat of water is 4200 Jkg<sup>-1</sup>K<sup>-1</sup>, Latent heat of vaporization of water is 2.26 x10<sup>6</sup> Jkg<sup>-1</sup>).

## Chapter – 9 Transfer of Heat

### Objective(MCQs)

- In solids, heat is transferred by:  
(a) radiation (b) conduction (c) convection (d) absorption
- What happens to the thermal conductivity of a wall if its thickness is doubled?  
(a) becomes double (b) remains the same  
(c) becomes half (d) becomes one fourth
- Metals are good conductor of heat due to the:  
(a) free electrons (b) big size of their molecules  
(c) small size of their molecules (d) rapid vibrations of their atoms
- In gases, heat is mainly transferred by  
(a) molecular collision (b) conduction (c) convection (d) radiation
- Convection of heat is the process of heat transfer due to the:  
(a) random motion of molecules (b) downward movement of molecules  
(c) upward movement of molecules (d) free movement of molecules
- False ceiling is done to  
(a) lower the height of ceiling (b) keep the roof clean  
(c) cool the room (d) insulate the ceiling
- Rooms are heated using gas heaters by  
(a) Conduction only (b) Convection and radiation  
(c) Radiation only (d) Convection only
- Land breeze blows from  
(a) sea to land during night (b) sea to land during the day  
(c) land to sea during night (d) land to sea during the day
- Which of the following is a good radiator of heat?



- (a) a shining silvered surface    (b) a dull black surface  
 (c) a white surface                    (d) green coloured surface

### **Example**

9.1 The exterior brick wall of a house of thickness 25 cm has an area 20 m<sup>2</sup>. The temperature inside the house is 15°C and outside is 35°C. Find the rate at which thermal energy will be conducted through the wall, the value of k for bricks is 0.6 Wm<sup>-1</sup> K<sup>-1</sup>.

### **Short Questions**

- 9.2 Why metals are good conductors of heat?
- 9.3 Explain why:
- (a) A metal feels colder to touch than wood kept in a cold place?
- (b) Land breeze blows from land towards sea?
- (c) Double walled glass vessel is used in thermos flask?
- (d) Deserts soon get hot during the day and soon get cold after sunset?
- 9.4 Why conduction of heat does not take place in gases?
- 9.7 What is meant by convection current?
- 9.9 How does heat reach us from the Sun?
- 9.11 What is greenhouse effect?
- 9.00 How do thermals help birds to fly for hours without flapping their wings?

### **Long Questions**

- Q.1 Define thermal conductivity of a substance and derive its relationship.
- Q.2 What measures do you suggest to conserve energy in houses?
- Q.3 Why transfer of heat in fluids takes place by convection?
- Q.4 How various surfaces can be compared by a Leslie cube?
- Q.5 Explain the impact of greenhouse effect in global warming.
- Q.6 What are the consequences and application of radiation.

**Numerical**

- 9.2 How much heat is lost in an hour through a glass window measuring 2.0 m by 2.5 m when inside temperature is 25 °C and that of outside is 5°C, the thickness of glass is 0.8 cm and the value of k for glass is  $0.8\text{Wm}^{-1}\text{K}^{-1}$ ?