



## Physics

### ***Assignment-1 (UNITS AND MEASUREMENT)***

#### **Section-A (Very Short Answer Type)**

1. Define physical quantity and write steps for measurement.
2. What are fundamental units and derived units?
3. List the seven basic and two supplementary physical quantities, their units and symbol in S.I. system.
4. Define dimensions, dimensional formula and dimensional equation.
5. Name various applications of dimensional analysis.
6. State principle of homogeneity of dimensions.
7. Give limitations of method of dimensions.
8. Check the correctness of  $F = m.a$ .

#### **Section-B (Short Answer Type)**

9. Check the dimensional consistency of the equation,  $FS = \frac{1}{2}(mv^2) - mgh$ , where S is distance moved, and v is final velocity of body of mass m and F is the force acting on it.
10. Convert an acceleration of  $100 \text{ m/s}^2$  into  $\text{Km/hr}^2$ .
11. Convert a velocity of  $72 \text{ km/hr}$  into  $\text{m/s}$  with the help of dimensions.
12. Express the power of 100 watt in c.g.s.
13. Convert one joule into erg using the dimensional analysis.
14. Convert one Newton into dynes using the method of dimensions

#### **Section-C (Long answer Type)**

15. Write the dimensional formula of physical quantities viz. area, volume, velocity or speed, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity, stress and strain.
16. The time period of oscillation of a simple pendulum depends upon mass of bob (m); length of string (l); acceleration due to gravity (g). Derive a relation for the time period (t) by using the method of dimension.
17. Pressure (P) of a liquid filled in tank depends upon height of column (h), density of liquid ( $\rho$ ) and acceleration due to gravity (g). Derive a formula for pressure using the method of dimensions.



## Physics

### Assignment-2(MOTION IN A PLANE)

#### Section- A (Very Short Answer Type)

1. What is the difference between vector and scalar quantities?
2. Is the magnitude of  $(\vec{A} + \vec{B})$  same as that of  $(\vec{B} + \vec{A})$ .
3. Is the magnitude of  $(\vec{A} - \vec{B})$  same as that of  $(\vec{B} - \vec{A})$ .
4. Under what condition the sum and difference of two vectors will be equal in magnitude?
5. Force  $F$  and displacement  $s$  both are vector quantities. Which type is the quantity work?
6. Two non zero vectors  $\vec{A}$  and  $\vec{B}$  are such that (a)  $\vec{A} \cdot \vec{B} = 0$ , (b)  $\vec{A} \cdot \vec{B} = AB$ . What information do we get about  $\vec{A}$  and  $\vec{B}$  in each case?
7. When is the sum of two vectors maximum and when minimum.

#### Section- B (Short Answer Type)

8. A body, acted upon by a force of 50 Newton is displaced through a distance of 10 metre in a direction making an angle of  $60^\circ$  with the force. Calculate the work done by the force.
9. The sum and difference of two vectors  $A$  and  $B$  are mutually perpendicular to each other. Prove that both the vectors are equal in magnitude.
10. The sum and the difference of two vectors are equal in magnitude:  $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$ . Prove that the vectors  $A$  and  $B$  are perpendicular to each other.
11. Prove that vectors  $\vec{A} = i + 2j + 3k$  and  $\vec{B} = 2i - j$  are perpendicular to each other.
12. Two vectors  $\vec{A}$  and  $\vec{B}$  are added. Prove that the magnitude of the resultant vector cannot be greater  $(\vec{A} + \vec{B})$  and smaller than  $(\vec{A} - \vec{B})$  or  $(\vec{B} - \vec{A})$ .
13. Find the value of  $p$  such that the two vectors  $\vec{A} = 2i + 2j + pk$  and  $\vec{B} = 2i - 3j + k$  are mutually perpendicular.
14.  $\vec{A} = 3i + 4j$  and  $\vec{B} = 12i - 5j$ , determine (i) magnitude of  $\vec{A}$ , (ii) value of  $\vec{A} \cdot \vec{B}$ .
15. Find the unit vector parallel to the resultant of the vectors  $\vec{A} = 2i - 6j - 3k$  and  $\vec{B} = 4i + 3j - k$ .
16. Find the scalar and vector products of two vectors:  $\vec{A} = 3i - 4j + 5k$  and  $\vec{B} = -2i + j - 3k$ .
17. Show that the vectors  $\vec{A} = 4i - j + 2k$  and  $\vec{B} = i + 2j - k$  are perpendicular. Find also the vector product of these.
18. Find a unit vector perpendicular to both the vectors  $\vec{A} = 3i + j + 2k$  and  $\vec{B} = 2i - 2j + 4k$ .

19. Find a vector whose magnitude is 12 and which is perpendicular to each of the vectors,  $\vec{A}=2i+3j-2k$  and  $\vec{B}=6i+5j-2k$ .
20. Find out the area of a parallelogram whose adjacent sides are  $i+2j+3k$  and  $-3i-2j+k$ .
21. If  $\vec{A}=A_x i + A_y j + A_z k$  and  $\vec{B}=B_x i + B_y j + B_z k$ , then prove that  $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$ .

### Section- C (Long Answer Type)

22. What do you mean by scalar and vector quantities? Explain with examples.
23. What do you understand by scalar and vector product of two vectors? Write the formula, explaining the symbols used.
24. State and explain triangle law of vector addition.
25. State and explain parallelogram law of vector addition.
26. Define position, displacement, unit and zero vector with examples.

### Physics

#### **Assignment-3(LAWS OF MOTION)**

#### **Section-A (Very Short Answer Type)**

1. Why does the electric fan continue to rotate for some time after the current is switched off?
2. Which law of motion does give the measure of force.
3. A body is acted upon by four external forces. Can it remain at rest?
4. Define 1 Newton.
5. Define 1 dyne.
6. Define linear momentum. Write its unit.

#### **Section-B ( Short Answer Type)**

7. State Newton's three laws of motion.
8. Prove that Newton's second law is the real law of motion.
9. Explain the principle of conservation of linear momentum with its application.
10. Explain the term impulse of a force. Show that the impulse given to a body is equal to change in momentum.
11. A force acts upon a body of mass 20 kg, initially at rest, for 6 seconds after which the force ceases. Now the body describes the 60 m in the next 5 seconds. Find the magnitude of the force.
12. A bullet of mass 0.04 kg moving at 90 m/s speed strikes a heavy wooden block and travels inside it a distance of 60 cm before being stopped. Find the average resistive force on the bullet exerted by the block.
13. A constant force acting on a body of mass 3 kg changes its speed from 2 m/s to 3.5 m/s in 25 s. the direction of motion of the body remains unchanged. What is the magnitude and direction of the force?

14. A constant retarding force of 50 N is applied to a body of mass 20 kg moving initially with a speed of 15 m/s. How long does the body take to stop?
15. A rocket with a lift-off mass 20,000 kg is blasted upwards with an initial acceleration of  $5 \text{ m/s}^2$ . Find the initial thrust (force) of the blast.

### Section-C (Long Answer Type)

16. Explain the types of inertia with one example of each.
17. State Newton's second law of motion. How does it help to measure force? Define S.I. unit of force.
18. What are concurrent forces? State and explain the condition of equilibrium of these forces.

### Physics

#### Assignment-4

#### Section-A (Very Short Answer Type)

1. Which one is greatest: static friction, limiting friction or kinetic friction?
2. What type of friction arises when an axle rotates in the sleeve?
3. When the weight of the body placed on a surface is doubles, how the coefficient of friction changes?
4. What is the relation between coefficient of static friction and the angle of friction?
5. What is the angle of friction between two surfaces in contact having coefficient of friction  $1/\sqrt{3}$ .
6. Why are wheels circular?
7. It is easier to roll a barrel than to slide it on the road. Why?

#### Section-B ( Short Answer Type)

8. Distinguish between sliding friction and rolling friction.
9. Define limiting friction. State laws of limiting friction.
10. Friction is a necessary evil. Comment.
11. A force of 98 N is just able to move a block of mass 20 kg on a rough horizontal surface. Calculate the coefficient of friction and angle of friction.

### Section-C (Long Answer Type)

12. Explain with expression why it is easier to pull a roller than to push it.
13. Explain methods of reducing friction.

### Physics

#### Assignment-5

#### Section-A (Very Short Answer Type)

1. What are the factors on which the work done depends?
2. Under what conditions the work done by a force is maximum and minimum?
3. A person having a load on his head walking with uniform velocity on a horizontal road. Does he do any work?
4. Out of joule, calorie, kilowatt and electron-volt which one is not the unit of energy?
5. In which motion momentum changes but kinetic energy does not?
6. Define 1 joule.

#### Section-B (Short Answer Type)

7. What do you mean by power and energy? Give their units.
8. A light body and a heavy body have the same momentum ( $p$ ) which one has more kinetic energy?
9. A man weighing 70 kg carries a 30 kg box to the top of a building 20 m high. Calculate the work done by the man.
10. A man pulls a box on a horizontal floor through a distance of 20 m with a force of 30 N applied along a rope tied to the box and making an angle of  $60^\circ$  with the horizontal. Calculate the work done.

#### Section-C (Long Answer Type)

11. Explain what is meant by work? Obtain an expression for the work done by a constant force. What should be the angles between the force and the displacement for maximum and for minimum work?
12. What is meant by positive, negative and zero work? Give two examples of each.
13. Explain the meaning of kinetic energy. Obtain an expression for the kinetic energy of a body moving with uniform velocity.
14. State and explain work-energy theorem.
15. Explain the meaning of potential energy. Obtain an expression for the potential energy of an ideal spring.
16. State and prove principle of conservation of energy.
17. What is meant by collision? Give a brief account of elastic and inelastic collisions.

## Physics

### Assignment-6

#### Section-A (Very Short Answer Type)

1. How many times large is electrostatic force between two electrons, to gravitational force between them?
2. Does the value of  $g$  increase or decrease below the earth?
3. What is meant by escape velocity?
4. The escape velocity from earth for a piece of 1 g is  $11.2 \text{ kms}^{-1}$ . What would be it for a piece of 10 g?
5. What is the relationship of the orbital speed to the velocity required to send a body from the earth's surface into the space, never to return?

#### Section-B (Short Answer Type)

6. State Kepler's law of planetary motion.
7. Write down Newton's law of gravitation.
8. Define Universal gravitational constant.
9. What will be the effect on the time period of a simple pendulum on taking to a mountain?
10. Distinguish between mass and weight.

#### Section-C (Long Answer Type)

11. Distinguish between  $g$  and  $G$ . Obtain an expression for the acceleration due to gravity in terms of gravitational constant.
12. Explain how the knowledge of  $g$  helps us to find (i) mass of the earth and (ii) mean density of earth?
13. Discuss the variation of acceleration due to gravity ' $g$ ' on going above and below the earth's surface. How  $g$  and  $G$  are related?

14. Define gravitational potential. Derive an expression for the gravitational potential energy of a body on the surface of earth.

15. Define escape velocity. Derive the formula for escape velocity of a body from the surface of the earth and show that  $v_e = \sqrt{2}v_o$ . Where  $v_o$  is the orbital velocity of the body near the earth's surface.

## Physics

### **Assignment-7(MECHANICAL PROPERTIES OF SOLIDS)**

#### **Section-A (Very Short Answer Type)**

1. Define stress and strain.
2. State Hooke's law related to elasticity.
3. Obtain the units of Young's modulus of elasticity.
4. Define shearing stress and shearing strain.
5. What is called reciprocal of bulk modulus of elasticity?
6. What is the value of Young's modulus for a perfectly rigid body?
7. What is more elastic: water or air, why?

#### **Section-B (Short Answer Type)**

8. Explain deforming force and Elasticity.
9. Write copper, steel, glass and rubber in decreasing order of their modulus of elasticity.
10. What do you understand by limit of elasticity?
11. Define bulk modulus of elasticity and write its unit.
12. Define modulus of rigidity and write its unit.

#### **Section-C (Long Answer Type)**

13. Prove that on stretching a wire, the elastic potential energy per unit volume stored in the wire is  $\frac{1}{2}$  x stress x strain.

14. Define longitudinal strain, stress and Young's modulus.
15. What do you understand by Poisson's ratio?

## Physics

### **Assignment-8(MECHANICAL PROPERTIES OF FLUIDS)**

#### **Section-A (Very Short Answer Type)**

1. What is the value of 1 atmospheric pressure?
2. What is 1 bar of pressure?
3. Storage tank are made thicker near the bottom. Why?
4. A cork is floating in water. What is its apparent weight?
5. What is meant by 1 torr of pressure?

#### **Section-B (Short Answer Type)**

6. What is pressure? Give its units and dimensions. Is it a scalar or vector quantity?
7. Explain fluid thrust.
8. What is meant by streamline flow motion?
9. What is meant by turbulent flow motion?
10. Define coefficient of viscosity of a liquid and write its unit and dimensions.
11. What is meant by terminal velocity?

#### **Section-C (Long Answer Type)**

12. State and prove Pascal's law of fluid pressure. Illustrate it by two examples.
13. Obtain the expression for the pressure exerted by a liquid column.