



## UNIT 1: NATURE OF PHYSICAL WORLD &amp; MEASUREMENT

TIME: 1hr.45mins

+1 Physics

Max. Marks: 50

## Part - I

Choose the correct answer:

10 x 1 = 10

- One of the combinations from the fundamental physical constants is  $\frac{hc}{G}$ . The unit of this expression is ----  
 (a)  $\text{Kg}^2$  (b)  $\text{m}^3$  (c)  $\text{S}^{-1}$  (d) m
- If the length and time period of an oscillating pendulum have errors of 1% and 3% respectively then the error in measurement of acceleration due to gravity is  
 (a) 4% (b) 5% (c) 6% (d) 7%
- Which of the following has the either number of significant figures?  
 (a)  $0.007\text{m}^2$  (b)  $2.64 \times 10^{24}\text{kg}$  (c)  $0.0006032\text{m}^2$  (d)  $6.3200\text{J}$
- If  $\pi = 3.14$  then the value of  $\pi^2$  is  
 (a) 9.8596 (b) 9.860 (c) 9.86 (d) 9.9
- Which of the following pairs of physical quantities have same dimensions?  
 (a) Force and power (b) Torque and energy (c) Torque and power (d) Force and Torque
- The density of a material in CGS system of units is  $4\text{gcm}^{-3}$ . In a system of units in which unit of length is 10cm and unit of mass is 100g, then the value of density of material will be  
 (a) 0.04 (b) 0.4 (c) 40 (d) 400
- The dimensional formula of planck's constant h is  
 (a)  $[\text{ML}^2\text{T}^{-1}]$  (b)  $[\text{ML}^2\text{T}^{-3}]$  (c)  $[\text{ML}^3\text{T}^{-3}]$  (d)  $[\text{MLT}^{-1}]$
- If the error in the measurement of radius is 2% then the error in the determination of volume of the sphere will be  
 (a) 8% (b) 2% (c) 4% (d) 6%
- The length of a body is measured as 3.51 m, if the accuracy is 0.01 m, then the percentage error in the measurement is -----  
 (a) 351% (b) 1% (c) 0.28% (d) 0.035%
- Round off the following number 19.95 into three significant figures.  
 (a) 19.9 (b) 20.0 (c) 20.1 (d) 19.5

## Part - II

Answer all the questions:

4 x 2 = 8

- A RADAR signal is beamed towards a planet and its echo is received 7 minutes later. If the distance between the planet and the Earth is  $6.3 \times 10^{10}\text{m}$ . Calculate the speed of the signal?
- Write a short note on Rounding – off.
- Define Unit.
- Define I parsec.

## Part - III

Answer all the questions:

4 x 3 = 12

- Write a note on triangulation method to measure larger distances.
- What are the Limitations of dimensional analyses?
- The temperature of two bodies measured by a thermometer are  $t_1 = (20 + 0.5)^\circ\text{C}$ ,  $t_2 = (50 \pm 0.5)^\circ\text{C}$ .
- From a point on the ground, the top of a tree is seen to have an angle of elevation  $60^\circ$ . The distance between the tree and a point is 50 m. Calculate the height of the tree?

## Part - IV

Answer in briefly :

4 x 5 = 20

- Explain in detail the various types of errors.
- Convert 76 cm mercury pressure into  $\text{Nm}^{-2}$  using the 3 method of dimensions.
  - Check the correctness of the equation  $\frac{1}{2}mv^2 = mgh$  Using dimensional analysis method.
- Write the rules for determining significant figures with examples.
- Determination of distance of Moon from Earth.
  - Jupiter is at a distance of 824.7 million km from the Earth. Its angular diameter is measure to be  $35.72''$ . Calculate the diameter of Jupiter.



## Answer all the questions:

10 x 1=10

- Two objects of masses  $m_1$  and  $m_2$  fall from the heights  $h_1$  and  $h_2$  respectively. The ratio of the magnitude of their moments when they hit the ground is
  - $\sqrt{\frac{h_1}{h_2}}$
  - $\sqrt{\frac{m_1 h_1}{m_2 h_2}}$
  - $\frac{m_1}{m_2} \sqrt{\frac{h_1}{h_2}}$
  - $\frac{m_1}{m_2}$
- If one object is dropped vertically downward and another object is thrown horizontally from the same height, then the ratio of vertical distance covered by both objects at any instant is
  - 1
  - 2
  - 4
  - 0.5
- The direction of  $\vec{A} \times \vec{B}$  is given by
  - right hand screw rule
  - right hand thumb rule
  - both (a) and (b)
  - neither (a) and (b)
- If a particle has negative velocity and negative acceleration, its speed
  - increases
  - Decreases
  - remains same
  - Zero
- Norm of the vector represents
  - only magnitude
  - only direction
  - both magnitude and direction
  - either magnitude and direction
- Which one of the following physical quantities cannot be represented by a scalar?
  - Mass
  - Length
  - Momentum
  - Magnitude of acceleration
- The angle between  $(\vec{A} + \vec{B})$  and  $(\vec{A} - \vec{B})$  can be
  - Only  $0^\circ$
  - Only  $90^\circ$
  - between  $0^\circ$  and  $90^\circ$
  - between  $0^\circ$  and  $180^\circ$
- If the velocity is  $\vec{v} = 2\hat{i} + t^2\hat{j} - 9\hat{k}$ , then the magnitude of acceleration at  $t = 0.5$  s is
  - $1\text{ms}^{-2}$
  - $2\text{ms}^{-2}$
  - zero
  - $-1\text{ms}$
- Identify the unit vector in the following.
  - $\hat{i} + \hat{j}$
  - $\frac{\hat{i}}{\sqrt{2}}$
  - $\hat{k} - \frac{\hat{j}}{\sqrt{2}}$
  - $\frac{\hat{i} + \hat{j}}{2}$
- The angle between two vectors  $-3\hat{i} + 6\hat{k}$  and  $2\hat{i} + 3\hat{j} + \hat{k}$  is
  - $0^\circ$
  - $45^\circ$
  - $60^\circ$
  - $90^\circ$

## Part - II

## Answer all the questions:

4 x 2=8

- What is the difference between velocity and average velocity?
- Consider two trains A and B moving along parallel tracks with the same velocity in the same direction. Let the velocity of each train be  $50\text{ kmh}^{-1}$  due east. Calculate the relative velocities of the trains.
- Define acceleration.
- Two vectors are given as  $\vec{r} = 2\hat{i} + 3\hat{j} + 5\hat{k}$  and  $\vec{F} = 3\hat{i} - 2\hat{j} + 4\hat{k}$ . Find the resultant vector  $\vec{r} = \vec{r} \times \vec{F}$ .

## Part - III

## Answer all the questions:

4x3=12

- The velocity of three particles A, B, C are given below. Which particle travels at the greatest speed  
 $\vec{V}_A = 3\hat{i} - 5\hat{j} + 2\hat{k}$ ,  $\vec{V}_B = \hat{i} + 2\hat{j} + 3\hat{k}$ ,  $\vec{V}_C = 5\hat{i} + 3\hat{j} + 4\hat{k}$
- Explain the motion in one, two and three dimensions.
- Derive the expression for total acceleration in the non uniform circular motion.
- An iron ball and a feather are both falling from a height of 10m.
  - What are the time taken by the iron ball and feather to reach the ground?
  - What are the velocities of iron ball and feather when they reach the ground?  
 (Ignore air resistance and take  $g = 10\text{ms}^{-2}$ )

**Part - IV**

**Answer in briefly :**

**4x5=20**

- 19. (i) Discuss the properties of scalar product of two vectors.  
(ii) Given two vectors  $\vec{A} = 2\hat{i} + 4\hat{j} + 5\hat{k}$  and  $\vec{B} = \hat{i} + 3\hat{j} + 6\hat{k}$ . Find the product  $\vec{A} \cdot \vec{B}$  and the magnitudes of  $\vec{A}$  and  $\vec{B}$ . What is the angle between them?
- 20. Derive the equation of motion and maximum height reached by the particle thrown at an oblique angle  $\theta$  with respect to the horizontal direction.
- 21. Derive the kinematic equations of motion for constant acceleration.
- 22. Explain in detail the triangle law of addition.

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