

Question Bank For Semester Examination

SECTION - A

Q1][MCQs] [1 Marks Questions]

(1) Which of the following is not a fundamental unit?

- (A) cm (B) kg (C) centigrade (D) volt

(2) S.I. unit of energy is joule and it is equivalent to

- (A) 10^6 erg (B) 10^7 erg (C) 10^7 erg (D) 10^5 erg

(3) $[L^1M^1T^{-2}]$ is the dimensional formula for

- (A) velocity (B) acceleration (C) force (D) work

(4) Dimensions of kinetic energy are the same as that of

- (A) force (B) acceleration (C) work (D) pressure

(5) Which of the following is a vector?

- (A) speed (B) mass (C) displacement (D) time

(6) If \hat{n} is the unit vector in the direction of \vec{A} then,

- (A) $\hat{n} = \vec{A} / |\vec{A}|$ (B) $\hat{n} = \vec{A} |\vec{A}|$ (C) $\hat{n} = |\vec{A}| / \vec{A}$ (D) $\hat{n} = \hat{n} \times \vec{A}$

(7) The magnitude of scalar product of the vectors $\vec{A} = 2\hat{i} + 5\hat{j}$ and $\vec{B} = 3\hat{i} + 4\hat{j}$ is

- (A) 20 (B) 22 (C) 26 (D) 29

(8) The resultant of two forces of 3 N and 4 N is 5 N, the angle between the forces is

- (A) 30° (B) 60° (C) 90° (D) 120°

(9) A projectile is thrown with an initial velocity of 50 m/s. The maximum horizontal distance which this projectile can travel is

- (A) 64 m (B) 128 m (C) 5 m (D) 255 m

(10) The time period conical pendulum

- (A) $\sqrt{l \cos \theta / g}$ (B) $2\pi \sqrt{l \sin \theta / g}$ (C) $2\pi \sqrt{l \cos \theta / g}$ (D) $\sqrt{l \sin \theta / g}$

- (11) For a particle having a uniform circular motion, which of the following is constant
 (A) Speed (B) Velocity (C) Acceleration (D) Displacement
- (12) The bob of a conical pendulum undergoes
 (A) Rectilinear motion in horizontal plane (B) Uniform motion in a horizontal circle
 (C) Uniform motion in a vertical circle (D) Rectilinear motion in vertical circle
- (13) In case of elastic collision, which is true?
 (A) Momentum and K.E. is conserved. (B) Momentum conserved and K.E. not conserved.
 (C) Momentum not conserved and (D) Momentum and K.E. both not conserved. K.E. conserved
- (14) If m is the mass of a body and E its K.E., then its linear momentum is
 (A) $m\sqrt{E}$ (B) $2\sqrt{m} E$ (C) $\sqrt{m} E$ (D) $\sqrt{2mE}$
- (15) Torque applied is maximum when the angle between the directions of r and F is
 (A) 90° (B) 180° (C) 0° (D) 45°
- (16) What force will change the velocity of a body of mass 1 kg from 20 m/s to 30 m/s in two seconds?
 (A) 1N (B) 5N (C) 10N (D) 25 N
- (17) Inside a bar magnet, the magnetic field lines
 (A) are not present (B) are parallel to the crosssectional area of the magnet
 (C) are in the direction from N pole to S pole (D) are in the direction from S pole to N pole
- (18) The geometric length of a bar magnet having half magnetic length 5 cm is _____ cm.
 (A) 12 (B) 10 (C) 6 (D) 4.2
- (19) The angle of dip at the equator is
 (A) 90° (B) 45° (C) 30° (D) 0°
- (20) A place where the vertical components of Earth's magnetic field is zero has the angle of dip equal to
 (A) 0° (B) 45° (C) 60° (D) 90°

Q2] Answer in one Sentence.

[1 Marks Question]

- (1) What are the dimensions of power?
- (2) What is personal error?
- (3) Define mean absolute error.
- (4) State the order of magnitude of electron of mass 9.1×10^{-31} kg.
- (5) Define the term equal vectors.
- (6) Explain unit vector.
- (7) Find $\vec{P} \cdot \vec{Q}$ where $\vec{P} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{Q} = \hat{i} - \hat{j} + 2\hat{k}$
- (8) Define resolution of vector.
- (9) Define Horizontal range of projectile:
- (10) A man throws a ball to maximum horizontal distance of 80 m. Calculate the maximum height reached.
- (11) A particle moves in a circle with constant speed of 15 m/s. The radius of the circle is 2 m. Determine the centripetal acceleration of the particle.
- (12) Define conical pendulum.
- (13) Define the term inelastic collision.
- (14) Define the term couple.
- (15) Define centre of mass of a body.
- (16) Write the C.G.S unit for force.
- (17) State the expression for the magnetic field at any point along the equator of a very short bar magnet.
- (18) A bar magnet of magnetic moment 5.0 Am^2 has the poles 20 cm apart. Calculate the pole strength.
- (19) Define the term magnetic equator.
- (20) What is a geographic meridian?

SECTION - B

[2 Marks Question]

- (1) If the formula for a physical quantity is $X = a^4 b^3 / c^{1/3} d^{1/2}$ and if the percentage error in the measurements of a, b, c and d are 2%, 3%, 3% and 4% respectively. Calculate percentage error in X.
- (2) State the limitations of dimensional analysis.
- (3) The masses of two bodies are measured to be 15.7 ± 0.2 kg and 27.3 ± 0.3 kg. What is the total mass of the two and the error in it?
- (4) Find unit vector parallel to the resultant of the vectors $\vec{A} = \hat{i} + 4\hat{j} - 2\hat{k}$ and $\vec{B} = 3\hat{i} - 5\hat{j} + \hat{k}$.
- (5) If $\vec{V}_1 = 3\hat{i} + 4\hat{j} + \hat{k}$ and $\vec{V}_2 = \hat{i} - \hat{j} - \hat{k}$, determine the magnitude of $\vec{V}_1 + \vec{V}_2$.
- (6) Find the scalar product of the two vectors $\vec{V}_1 = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{V}_2 = 3\hat{i} + 4\hat{j} - 5\hat{k}$
- (7) A car moves in a circle at the constant speed of 50 m/s and completes one revolution in 40s. Determine the magnitude of acceleration of the car.
- (8) A projectile is projected at an angle of 60° . If its time of flight is 16 sec, calculate its horizontal range.
- (9) Obtain an expression for the horizontal range of a projectile.
- (10) A force $\vec{F} = 3\hat{i} + \hat{j} - 4\hat{k}$ is applied at a point (3, 4, -2). Find its torque about the point (-1, 2, 4).
- (11) The mass of moon is 0.0123 times the mass of the earth and separation between them is 3.84×10^8 m. Determine the location of C.M as measured from the centre of the earth.
- (12) Define coefficient of restitution. State its value in case of a elastic, perfectly elastic and perfectly inelastic collision.

(13) A bullet leaves the rifle of mass one kg and the rifle recoils thereby with a velocity of 30 cm/s. If the mass of bullet is 3 g find the velocity of the bullet.

(14) State properties of magnetic lines of force.

(15) Define magnetic flux. State its SI unit.

(16) A short bar magnet has a dipole moment of 2 Am^2 . Find the magnetic field at a point on its axis at a distance of 20 cm from its centre in air. [$\mu_0/4\pi = 10^{-7} \text{ Wb/Am}$]

SECTION –C

[3 Marks Questions]

(1) Define dimensions and dimensional formula of physical quantities. Give two examples of dimensional formula.

(2) Time period of a simple pendulum depends upon the length of pendulum (l) and acceleration due to gravity (g). Using dimensional analysis, obtain an expression for time period of a simple pendulum.

(3) In Ohm's experiments, the values of the unknown resistances were found to be 6.12Ω , 6.09Ω , 6.22Ω , 6.15Ω . Calculate the (mean) absolute error, relative error and percentage error in these measurements.

(4) State and prove parallelogram law of vector addition. Determine magnitude and direction of resultant vector.

(5) What are rectangular components of vectors? Explain their uses.

(6) A body is projected with a velocity of 30 m/s at an angle of 30° with the vertical. Find the

(i) maximum height (ii) time of flight (iii) the horizontal range

(7) Derive an expression for centripetal acceleration of a particle performing uniform circular motion.

(8) A truck of mass 5 ton is travelling on a horizontal road with 36 km/hr, stops on traveling 1 km after its engine fails suddenly. What fraction of its weight is the frictional force exerted by the road? If we assume that the story repeats for a car of mass 1 ton i.e., car moving with same speed stops at similar distance, how much will the fraction be?

(9) Define coefficient of restitution and obtain its value for an elastic collision and a perfectly inelastic collision.

(10) In case of an elastic head on collision between two bodies, derive an expression for the final velocities of the bodies in terms of their masses and velocities before collision.

(11) Derive an expression for the magnetic field due to a bar magnet at an arbitrary point.

(12) Two small and similar bar magnets have magnetic dipole moment of 1.0 Am^2 each. They are kept in a plane in such a way that their axes are perpendicular to each other. A line drawn through the axis of one magnet passes through the centre of other magnet. If the distance between their centres is 2 m, find the magnitude of magnetic field at the midpoint of the line joining their centres.

(1) Time period of a simple pendulum depends upon the length of pendulum (l) and acceleration due to gravity (g). Using dimensional analysis, obtain an expression for time period of a simple pendulum.

(2) Explain the terms:

- i. Arithmetic mean
- ii. Absolute error
- iii. Mean absolute error
- iv. Relative error
- v. Percentage error

(3) What is triangle law of vector addition?

Find 'a' if $\vec{A} = 3\hat{i} - 2\hat{j} + 4\hat{k}$ and $\vec{B} = a\hat{i} + 2\hat{j} - \hat{k}$ are perpendicular to one another.

(4) Define and explain vector product of two vectors with suitable examples.

State any two characteristics of the vector product (cross product) of two vectors.

(5) Show that the path of a projectile is a parabola.

(6) What is a conical pendulum? Show that its time period is given by $2\pi\sqrt{l\cos\theta/g}$ where l is

the length of the string, θ is the angle that the string makes with the vertical and g is the acceleration due to gravity.

(7) Explain the terms inertial and non-inertial frame of reference.

Write a note on electromagnetic (EM) force.

(8) Distinguish between elastic and inelastic collision.

Distinguish between moment of a force and moment of a couple.

(9) Show that the magnitude of magnetic field at a point on the axis of a short bar magnet is twice the magnitude of magnetic field at a point on the equator at the same distance.

A short bar magnet has a magnetic moment of 0.48 J/T . Give the direction and magnitude of the magnetic field produced by the magnet at a distance of 10 cm from the centre of the magnet on (i) the axis (ii) the equatorial lines (normal bisector) of the magnet.

(10) Define magnetic declination. How does the declination vary with latitude? Where is it minimum?

.A bar magnet has magnetic moment 3.6 Am^2 and pole strength 10.8 Am . Determine its magnetic length and geometric length.