

Q.No.1. Choose the correct answer for each from the given options.

1. **Al-Shifa an encyclopedia of philosophy was written by -----**
(a) Al-eruni (b) Ibn-e-Sina (c) Ibn-ul-Haitham (d) Al-Razi
2. **Pound is the unit of:**
(a) Mass (b) Energy (c) Weight (d) Torque
3. **The dot product between two identical unit vectors is equal to -----.**
(a) i (b) Zero (c) One (d) 2i
4. **The components of a vector are such as x is +ve and y is -e then vector lies in ----- quadrant.**
(a) 1st (b) 2nd (c) 3rd (d) 4th
5. **The dimensions of angular velocity, frequency is:**
(a) $M^0 L^1 T^1$ (b) $M^1 L^1 T^1$ (c) $M^0 L^0 T^{-1}$ (d) $M^1 L^1 T^{-2}$
6. **----- of the following is one dimensional motion.**
(a) The wheels of a moving train (b) The earth revolving round the sun
(c) A train running on a straight track (d) Electron moving around the nucleus
7. **The speed of projectile v at any instant is equal to -----.**
(a) $(v_x^2 + v_y^2)$ (b) $(v_x^2 + v_y^2)^2$ (c) $(v_x^2 + v_y^2)^{1/2}$ (d) $(v_x + v_y)^2$

8. It is assumed that in projectile motion the acceleration along vertical direction will -----
(a) Decrease (b) Increase
(c) Remain the same (d) None of these
9. The time period of rotating body is given by:
(a) $T = 2\pi\omega$ (b) $T = 4\pi^2\omega$ (c) $T = 4\pi^2\omega^2$ (d) $T = \frac{2\pi}{\omega}$
10. A person whose weight is 150 pound on the earth, on the moon his weight will be approximately -----.
(a) 20 pounds (b) 30 pounds (c) 120 pounds (d) 150 pounds
11. The term torque is synonymous with -----.
(a) Moment of force (b) Moment of inertia
(c) Angular momentum (d) Linear momentum
12. The moon complete one revolution around the earth in -----.
(a) 365.3 days (b) 29.5 days (c) 27.3 days (d) 30 days
13. The KWh is the unit of -----.
(a) Work (b) Power (c) Pressure (d) None of these
14. When the length of pendulum doubled, its time period becomes -----.
(a) Halved (b) 1.41 times (c) Doubled (d) Remain same

15. A form of energy that produced sensation in our auditory system is known as -----.
- (a) Phase (b) Wave front
(c) Sound (d) Sensational energy
16. E-rays are not diffracted though grating because X-rays having -----.
- (a) Very short frequency (b) Very short wavelength
(c) Large Amplitude (d) None of these
17. The erect image by convex lens is possible when distance of object is ----.
- (a) Less than focal length (b) Equal to focal length
(c) Greater than focal length (d) Equal to double the focal length
18. The author of Kitab-ul-Masoodi was -----.
- (a) Al-Beruni (b) Ibn-e-Sina (c) Ibn-ul-Haitham (d) Al-Razi
19. Light year is the unit of -----.
- (a) Light (b) Distance (c) Time (d) None of these
20. The division of a vector $\vec{A}$ by a positive number n is given by $\vec{B} = \frac{1}{n}\vec{A}$ where $m = 1/n$ the direction of $\vec{B}$ is -----.
- (a) Same as $\vec{A}$ (b) Opposite to $\vec{A}$
(c) Perpendicular to itself (d) None of these
21. If resultant of two forces having magnitudes 13N and 13N acting on a point is 13N, then angle between two forces is -----.
- (a) 0° (b) 60° (c) 90° (d) 120°

22. If 1 kg and 1 gm Massive bodies are dropped from the same height simultaneously then ----- (Assume friction is zero).

- (a) 1kg will reach the ground earlier (b) 1gm will reach the ground earlier
(c) Both will reach the ground at the same time
(d) Depends upon nature of the mass

23. The property of matter by virtue of which it remains or tries to remain in its original state is known as -----.

- (a) Force (b) Inertia (c) Friction (d) Viscosity

24. The velocity of projectile is maximum at -----.

- (a) Target (b) Point of projection
(c) Both (a) & (b) (d) Highest point

25. Centripetal force and centrifugal force are always -----.

- (a) Parallel to each other (b) Anti parallel to each other
(c) Perpendicular to each other (d) None of these

26. The S.I unit of Angular momentum is -----.

- (a) N.S (b) J.S (c) J.m (d) N.m

27. The dimensions of gravitational constant are -----.

- (a) $L^3 M^{-1} T^{-2}$ (b) $L^2 M^2 T^{-1}$ (c) $L^1 M^1 T^1$ (d) $L^1 M^2 T^{-3}$

28. If the velocity of body "A" is double than body "B" both having same mass then the ratio of K.E of both is -----.

- (a) 1 : 2 (b) 2 : 21 (c) 4 : 21 (d) 1 : 4

29. A body executes S.H.M having maximum velocity -----.

- (a) $v_0 = x \sqrt{\frac{k}{m}}$ (b) $v_0 = x_0 \omega$ (c) $v_0 = x \frac{v_x}{\sqrt{x^2 - x_0^2}}$ (d) All of these

SECTION-B
(SHORT QUESTIONS)

NOTE: Answer any SEVEN of the following questions. Each question carries 05 marks.

- Q.2. Prove that the formula $S = \frac{1}{2}at^2$ is dimensionally correct. Where s is distance, a is acceleration and t is time.
- Q.3. What is the relation between angular and linear quantities?
- Q.4. At what condition direction of torque be reverse?
- Q.5. Prove the law of conservation of momentum.
- Q.6. How the mass of earth determined?
- Q.7. What are the conditions for interference of light?
- Q.8. Why the amplitude of simple pendulum kept small?
- Q.9. Find the unit vector parallel to vector $\vec{A} = 4\hat{i} + 7\hat{j} + 4\hat{k}$.
- Q.10. A boy throws a ball upward with speed of 14.7 m/s. How long the ball rises?
- Q.11. An ambulance travels to observer with speed 80 km/h, its siren emits sound at frequency of 2000 Hz what frequency will be detected by stationary observer?

SECTION-C
(DESCRIPTIVE QUESTIONS)

NOTE: Answer any TWO of the following questions. Each question carries 09 (5+4) marks.

- Q.12. (a) State and explain product of two vectors. Show that dot product is commutative.
(b) What is projectile motion? Derive the formula for its maximum range.
- Q.13. (a) What are characteristics of simple harmonic motion? Prove that the motion of mass-spring system is simple harmonic motion.
(b) How the magnitude and direction of resultant can obtain by addition of vectors by rectangular component method.
- Q.14. Write notes on any TWO of the following:
- | | |
|----------------------------------|--------------------------------|
| (a) Thin lens formula | (b) Simple pendulum |
| (c) Universal law of Gravitation | (d) Michelson's interferometer |

Section-A

Multiple Choice Questions (MCQ's)

Q.1 Choose the correct answer for each from the given options:

(1) Time period is reciprocal of:

- (a) Frequency (b) Wave length (c) Velocity (d) Distance

(2) If mass is attached to a spring then its time period is:

- (a) Increases (b) Decreases (c) Remains constant
(d) None of these

(3) In double slits experiment for constructive interference the condition is:

- (a) $d \sin \theta = m\lambda$ (b) $d \sin \theta = (m + \frac{1}{2})\lambda$
(c) $2d \sin \theta = m\lambda$ (d) $2d \sin \theta = (m + \frac{1}{2})\lambda$

(4) In Michelson's interferometer, the wave length of light is given as:

- (a) $\lambda = \frac{x}{m}$ (b) $\lambda = \frac{2x}{m}$ (c) $\lambda = \frac{x}{2m}$ (d) mx^2

(5) Who proposed wave theory of light:

- (a) Kepler (b) Huygens (c) Galelio (d) Issac Newton

(6) The sound waves having frequency less than 20Hz is called:

- (a) Infrasonic (b) ultrasonic (c) audiable (d) None of these

(7) The unit of power of lens is:

- (a) Hertz (b) Bell (c) Dyne (d) Dioeters

(8) The unit of power of lens is:

- (a) Hertz (b) Bell (c) Dyne (d) Dipoters

- (9) The power of a lens be one meter the focal length will be:
(a) 2.5 m (b) 1 diopter (c) 3 dipoter (d) 4 dipoter
- (10) Simple microscope consists of:
(a) One convex lens (b) two convex lens
(c) One concave lens (d) Two concave lens
- (11) Torque is also called:
(a) Moment of force (b) Momentum (c) Moment arm
(d) None of these
- (12) It is the perpendicular distance from the axis of rotation to the direction of force, is called _____.
(a) Moment arm (b) Moment of force (c) Angular momentum
(d) None of these
- (13) The magnitude of angular momentum is:
(a) $e F \sin \theta$ (b) $F d \sin \theta$ (c) $r P \sin \theta$ (d) $F v \sin \theta$
- (14) The weight of an object would be minimum, when it is placed at the:
(a) Surface of earth (b) Centre of earth
(c) Equator (d) Pole
- (15) The approximate value of the average density of earth is:
(a) $5.5 \times 10^3 \text{ Kg/m}^3$ (b) $6.5 \times 10^3 \text{ Kg/m}^3$
(c) $7.5 \times 10^5 \text{ Kg/m}^3$ (d) $8.5 \times 10^3 \text{ Kg/m}^2$
- (16) The value fo gravitational constant G is:
(a) $6.63 \times 10^{-34} \text{ N.m}^2/\text{Kg}^2$ (b) $6.2 \times 10^{-24} \text{ Nm}^2/\text{Kg}^2$
(c) $6.67 \times 10^{-11} \text{ N.m}^2/\text{Kg}^2$ (d) $6.67 \times 10^{11} \text{ Nm/Kg}^2$
- (17) Pull of the earth on mass of 20 Kg on the surface fo earth is:
(a) 20N (b) 19.6 N (c) 196 N (d) 1.96 N

- 13) Power is defined as, the rate of doing work and is expressed as :
- (a) $P \times W \times t$ (b) $P = \frac{\Delta W}{\Delta t}$ (c) $P = F \cdot V$ (d) Both (a) (c)
- 19) $\frac{1}{2}$ horse power = _____
- (a) 746 Watts (b) 726 Watts (c) 373 Watts (d) 363 Watts
- 21) S.I Unit of work is:
- (a) It possesses maximum P.E (b) Newton second
(c) Newton cm (d) None of these
- 21) A body is performing SHM, at the mean position:
- (a) It possesses maximum P.E (b) Its acceleration is maximum
(c) Its acceleration is zero (d) Its velocity is zero
- 22) Acceleration due to gravity near the earth surface is _____ if air friction is ignored.
- (a) 980 cm/sec^2 (b) 32 ft/sec^2 (c) 9.8 m/sec^2
(d) All of these
- 23) S.I Unit of momentum is:
- (a) Joule (b) Watt (c) Kg m/sec (d) Newton
- 24) Self adjusting force is:
- (a) Friction (b) Gravity (c) Centripetal force
(d) Weight
- 25) In the absence of air resistance the horizontal component of velocity _____ during projectile motion:
- (a) Increases (b) Decreases (c) Remains constant
(d) None of these
- 26) To get maximum horizontal range, the projective must be launched at an angle of:
- (a) 15° (b) 45° (c) 60° (d) 90°

(27) One radian is the angle subtended at the centre by an arc exactly the same length as the radius.

- (a) Half of the circumference of circle (b) Diameter of circle
(c) Circumference of circle (d) Radius of circle

(28) The projectile moves with uniform velocity, then the distance-time graph is:

- (a) Hyperbola (b) Parabola (c) curve (d) straight line

(29) Which of the following types of force cannot do work on a body?

- (a) centripetal force (b) Elastic force (c) Gravitational force
(d) Coulomb force

(30) When a body moves along a circular path its velocity:

- (a) Remains same (b) becomes zero (c) sometimes changes
(d) changes continuously

(31) The force needed to move a body around a circular path is called:

- (a) Centripetal force (b) Centripetal acceleration
(c) Centrifugal force (d) Gravitational force

(32) The turning effect of force is called:

- (a) Angular momentum (b) Torque (c) Linear momentum (d) Work

(33) The branch of physics which deals with the atomic nuclei is called:

- (a) Solid state physics (b) Medical physics
(c) Nuclear physics (d) None of these

(34) Dimensions of work are:

- (a) MLT^2 (b) M^2LT^2 (c) ML^2T^2 (d) $ML^{-2}T^2$

(35) The vector product of two equal vectors is:

- (a) A vector (b) Null vector (c) square of vector
(d) Unit vector

- (36) MT^2L^2 is the dimensions of :
 (a) Velocity (b) Momentum (c) Power (d) Torque
- (37) If $A = 10\text{ N East}$, then $-A$ is :
 (a) West (b) North (c) South (d) None of these
- (38) The scalar product of two vectors A and B can be written as:
 (a) $A \cdot B = AB \cos \theta$ (b) $A \cdot B = AB \sin \theta$ (c) $A \cdot B = AB \cos \theta$ (d) None of these
- (39) Null vector is a vector having zero magnitude and:
 (a) Specific direction (b) Arbitrary direction
 (c) No director (d) Opposite director
- (40) The magnitude of vector $2\hat{i} + 3\hat{j} + 6\hat{k}$ is:
 (a) 11 (b) 35 (c) 7 (d) 9
- (41) If $A = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$ and $B = B_x\hat{i} + B_y\hat{j} + B_z\hat{k}$, then:
 (a) $A \times B = A_x B_y - A_y B_x - A_z B_z$ (b) $A \times B = A_x B_x + A_y B_y + A_z B_z$
 (c) $A \times B = A_x B_y + A_y B_z + A_z B_x$ (d) $A \times B = A_x B_z + A_y B_x + A_z B_y$
- (42) In vector product, a vector multiplied with itself will in a _____ magnitude.
 (a) Double (b) Zero (c) Half (d) None of these
- (43) The weight of a body falling freely will be _____.
 (a) mg (b) Zero (c) $mg - 6\pi\eta r$ (d) $mg +$

Section-B

Short Answer

Note: Answer any SIX of the following questions.

- Q.2 What is equilibrium, state any one condition of equilibrium.
- Q.3 Prove that vector product does not obey the Commutative Law.
- Q.4 Find the work done in moving an object a vector $r = 3i + 2j - 5k$ if the applied force is $r = 3i + 2j - 5k$ if applied force is $F = 2i + j - k$.
- Q.5 Calculate the average density of earth.
- Q.6 State and prove the Law of Conservation of Energy.
- Q.7 State the basic of second pendulum.
- Q.8 Find the length of second pendulum.
- Q.9 An object is placed at a distance of 30 cm from a convex lens of focal 10cm. Find the position of image.
- Q.10 How far apart are the diffracting planes in a NaCl crystal for which x-rays of wave length $1.54 \text{ \AA}$ make glancing angle of 15° - 54° 1st order?

Section-C

(Descriptive Answer)

Note: Answer any TWO of the following questions.

Q.11 Two unequal masses are attached to a string which passes over a frictionless pulley. If the bodies are moving vertically. Find the expression for acceleration and tension in the string.

Q.12 What is simple pendulum? Show that the motion of simple pendulum is SHM. Drive the expression for its time period.

Q.13 Write a note on any ONE of the following:

Compound Microscope

Michelson's Interferometer

Centripetal acceleration

Section-A

Multiple Choice Questions (MCQ's)

Q.1: Choose the correct answer for each from the given options:

- (i) Scalar product of two vectors obeys:
(a) Snell's law (b) Commutative law (c) Associative law
(d) Both (b) and (c)
- (ii) Inertia of a body is measured in terms of its:
(a) Weight (b) Applied force (c) Mass (d) Reaction
- (iii) Presence of moisture in air:
(a) Increases the speed of sound (b) Decreases the speed of sound
(c) May increase or decrease the speed of sound
(d) Does not have any effect on speed of sound
- (iv) The weight of an object would be minimum when it is placed at:
(a) North pole (b) 10 m/s (c) 20 m/s (d) 55 m/s
- (v) A body of 5 kg mass possesses a momentum of 50 N.s, when it moves with the speed of:
(a) 5 m/s (b) 10 m/s (c) 20 m/s (d) 55 m/s
- (vi) The dot product of $\mathbf{i}$ and $\mathbf{j}$ is:
(a) k (b) one (c) Zero (d) None of these
- (vii) The rate of change of momentum is equal to:
(a) Force (b) Torque (c) Impulse (d) Energy
- (viii) _____ is a self adjusting force.
(a) Weight (b) Gravity (c) Friction (d) None of these

- (ix) Significant figures in 0.00460 are:
 (a) 6 (b) 5 (c) 4 (d) 3
- (x) The resultant force acting on a body of mass 10 kg moving with uniform velocity of 2 m/s is:
 (a) 5N (b) 12N (c) 20 N (d) Zero
- (xi) Centripetal and tangential accelerations are _____ to each other.
 (a) Parallel (b) Perpendicular (c) Opposite (d) None of these
- (xii) The dot product of force and velocity is:
 (a) Moment of force (b) Momentum (c) Work (d) Power
- (xiii) If $|\vec{A} \cdot \vec{B}| = |\vec{A} \times \vec{B}|$ then angle between $\vec{A}$ and $\vec{B}$ is:
 (a) 0° (b) 45° (c) 60° (d) 90°
- (xiv) If the focal length of a convex lens is 25cm then its power in diopress will be:
 (a) 2 (b) 3 (c) 4 (d) 5
- (xv) Which one of the following always forms virtual image.
 (a) Convex lens (b) Concave lens (c) Concave mirror
 (d) Spherical mirror
- (xvi) Velocity of sound in vacuum in m/s is:
 (a) Zero (b) 332 (c) 1100 (d) 3×10^8
- (xvii) For a vector _____, we have:
 (a) $\vec{A} \cdot \vec{A} = 0$ (b) $\vec{A} \cdot \vec{A} = 1$ (c) $\vec{A} \cdot \vec{A} = A$ (d) $\vec{A} \cdot \vec{A} = A^2$

Section-B
(Short Answer)

Note: Answer any EIGHT of the following questions. Each question carries 05 marks.

- Q.2: Show that the equation $T = 2\pi \sqrt{\frac{l}{g}}$ is dimensionally correct.
- Q.3: Show that vector addition obeys associative law.
- Q.4: Find projection of $\vec{A} = 3\hat{i} - 4\hat{j} + 7\hat{k}$ onto the direction of $\vec{B} = 2\hat{i} - \hat{j} + 4\hat{k}$
- Q.5: Is it possible for a body to have acceleration when moving with
(a) constant speed (b) constant velocity? Explain.
- Q.6: Why the sounds produced by the explosions going on the sun are not heard on the earth?
- Q.7: Show that power is the dot product of force and velocity.
- Q.8: Calculate the gravitational acceleration at a distance twice the radius of the earth above the surface of the earth.
- Q.9: What are the conditions for obtaining interference of light?
- Q.10: Why is a convex lens of small focal length preferred for a magnifying glass?
- Q.11: Show that cross product of two vectors does not obey commutative law.
- Q.12: Why a bomber does not drop the bomb when it is vertically above the target?
- Q.13: A ball is dropped from the top of a tower. If it takes 5 seconds to reach the ground, find height of the tower and the velocity with which it hits the ground?

Section-C

(Descriptive Answer)

Note: Answer any TWO of the following questions.

- Q.14(a): Two vectors are acting at a point along different directions. Determine magnitude and direction of their resultant by rectangular component method.
- (b): State Newton's law of gravitation. How would you determine the mass and average density of earth with the help of this law?
- Q.15(a): When ever there is a relative motion between a source of sound and a listener, frequency of the note of sound apparently changes; explain this statement. Determine listener and (ii) the listener moves towards the stationary source of sound.
- (b) Describe the construction and working of an astronomical telescope with the help of a ray diagram and derive its magnifying power.
- Q.16: Write notes on any TWO of the following:
- | | |
|-------------------------------------|---|
| (i) Law of conservation of momentum | (ii) Centripetal force |
| (iii) Work-Energy Equation | (iv) Diffraction of X-rays through crystals |