PHYSICS

1. If at same temperature and pressure, the densities for two diatomic gases are d_1 and d_2 respectively, then the ratio of velocities of sound in these gases will be

(A) $\sqrt{\frac{d_2}{2d_1}}$ (B) $\sqrt{\frac{d_2}{d_1}}$ (C) $\sqrt{\frac{2d_1}{d_2}}$ (D) $\sqrt{\frac{d_1}{d_2}}$

2. Which of the following physical quantity has the dimensions of $[ML^2T^{-3}]$?

(A) Pressure (B) Work (C) Impulse (D) Power

3. A man waves his arms while walking. This is

(A) to keep constnat velocity (B) to ease the tension

(C) to increase the velocity (D) to blance the effect of earth's gravity

4. Three different objects m_1, m_2 and m_3 are allowed to fall from rest and from the same point O along three different frictionless paths. the speeds of the three objects, on reaching the ground, will be in the ratio of

(A) $m_1 : m_2 : m_3$ (B) 1 : 1 : 1

(C) $m_1 : 2m_2 : 3m_3$ (D) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

5. Which of the following is constant in a projectile motion ?

(A) Velocity of projection (B) Horizontal component of the velocity

(C) Vertical component of the velocity (D) all of these

(D) either A or B.

6. Angle between two vectors of magnitudes 12 and 18 units, when their resultant is 24 units is

(A) 52º 31' (B) 63º51' (C) 59º16' (D) 75º52'

7. If the radii of circular path of two particles of same mass are in the ratio 1 : 2, then to have a constant centripetal force, their velocities should be in a ratio of

(A) 4 : 1 (B) $1:\sqrt{2}$ (C) 1 : 4 (D) $\sqrt{2}:1$

8. A boy of mass 40 kg is standing in a lift, which is moving downwards with an acceleration 9.8 m/s^2. The apparent weight of the boy is (Take g = 9.8 m/s^2)

(A) 40 × 9.8 N (B) 0 N (C) (40/9.8)N (D) 40 N

9. Which of the following is a non-conservative force ?

(A) electrostatic force (B) viscous force (C) interatomic force (D) gravitational force

10. A molecule of mass m of an ideal gas collides with the wall of a vessel with a velocity v and returns back with the same velocity. The change in the linear momentum of the molecule is

(A) 2 mv (B) 4 mv (C) 5 mv (D) 10 mv

11. The angular velocity of rotation of a star (of mass M and radius r) at which the star starts to escape

from its equator, is

(A) $\sqrt{\frac{2GM}{R}}$ (B) $\sqrt{\frac{2GR}{M}}$ (C) $\sqrt{\frac{2GM^2}{R}}$ (D) $\sqrt{\frac{2GM}{R^3}}$

12. When the axis of rotation passes through its centre of mass, then the moment of inertia of a thin rigid rod is

(A) reduced to its minimum value (B) zero

(C) increased to its maximum value (D) infinity

13. If the radius of earth shrinks by one percent and its mass remaining the same, then acceleration due to gravity on the earth's surface will

(A) remain constant (B) decrease (C) increase (D) either (b) or (c)

14. All the known planets move in

(A) elliptical path (B) straight path (C) hyperbolic path (D) circular path

15. A stretched rubber has

(A) increased kinetic energy (B) increased potential energy

(C) decreased kinetic energy (D) decreased potential energy

16. Which of the following affects the elasticity of a substance ?

(A) impurity of substance (B) Hammering and annealing

(C) Change in temperature (D) All of these

17. The potential energy possessed by a soap bubble, having surface tension equal to 0.04 N/m of diameter 1 cm, is

(A) $6\pi \times 10^{-6}$ J (B) $2\pi \times 10^{-6}$ J (C) $8\pi \times 10^{-6}$ J (D) $4\pi \times 10^{-6}$J

18. Extra pressure inside a soap bubble of radius (r) is proportional to

(A) r^2 (B) r (C) $1/r^2$ (D) 1/r

19. On increasing the temperature of a substance gradually, its colour becomes

(A) yellow (B) red (C) white (D) green

20. Ratio of the amount of heat radiation, transmitted through the body to the amount of heat radiation incident on it, is known as

(A) transmittance (B) conductance (C) absorbance (D) inductance.

21. The temperature of a gas is held constant, while its volume is decreased. The pressure exerted by the gas on the wall of the container increases, because its molecules.

(A) strike the walls more frequently

(B) strike the walls with higher velocities

(C) are in contact with the walls for a shorter time

(D) strike the walls with larger force

22. The volume of a gas expands by 0.25 m^3 at a constant pressure of 10^3 N/m^2. the work done is equal

to

(A) 250 watt (B) 2.5 erg (C) 250 newton (D) 250 joule

23. A gas behaves as an ideal gas at

(A) high pressure and low temperature (B) low pressure and high temperature

(C) high pressure and high temperature (D) low pressure and low temperature.

24. Approximately, the temperature corresponding to 1 eV energy, is

(A) 7.6×10^2 K (B) 7.7×10^3 K (C) 7.1×10^{-2} K (D) 7.2×10^3 K

25. A lightly damped oscillator with a frequency (ω) is set in motion by harmonic driving force of frequency (n). When $n < \omega$, then response of the oscillator is controlled by

(A) oscillator frequency (B) spring constant

(C) damping coefficient (D) inertia of the mass

26. If a spring of mass 30 kg has spring constant of 15 N/m, then its time period, is

(A) 2π sec (B) $2\sqrt{2\pi}$ sec (C) $2\sqrt{2}$ sec (D) $2\pi\sqrt{2}$ sec

27. The tension in piano wire is 10 N. What should be the tension in the wire to produce a note of double the frequency ?

(A) 40 N (B) 5 N (C) 80 N (D) 20 N

28. Three blocks of masses 2 kg, 3 kg and 5 kg are connected to each other with light st ring and are then placed on a friction less surface as shown in the figure. The system is pulled by a force F = 10 N, then tension T_1 =

(A) 1 N (B) 5 N (C) 8 N (D) 10 N

29. Which of the following pairs have identical dimensions ?

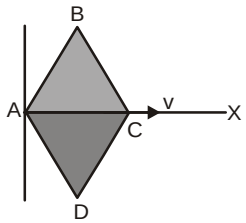
(A) Momentum and force

(B) Pressure and surface tension

(C) Moment of force and angular momentum

(D) Surface tension and surface energy

30. Four rods each of length l have been hinged to form a rhombus. Vertex A is fixed to a rigid support, vertex C being pulled to the right along X-axis with a uniform speed v as shown in fig. The speed with which vertex B moves towards C at the moment the rhombus takes the shape of a square is

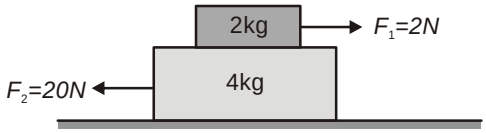


(A) v/4 (B) v/2 (C) $v/\sqrt{2}$ (D) v

31. A train 100 m long travelling at 40 m/s starts overtaking another train 200 m long travelling at 30 m/s. the time taken by the first train to pass the second train completely is

(A) 30 s (B) 40 s (C) 50 s (D) 60 s

32. In the arrangement shown in fig. coefficient of friction between the two blocks is μ =1/2. The force of friction acting between the two blocks is close to



(A) 6 N (B) 4 N (C) 8 N (D) 10 N

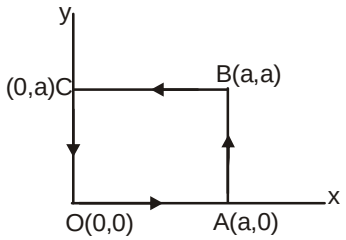
33. A spring of constant 5×10^3 N/m is stretched initially by 5 cm from the unstretched position. Then the work required to be done to stretch it further by another 5 cm is

(A) 6.25 Nm (B) 12.5 Nm (C) 18.75 Nm (D) 25.00 Nm

34. If an artificial satellite is moving in a circular orbit around the earth with a speed equal to half the magnitude of the escape velocity from the earth, the height of the satellite above the surface of the earth is

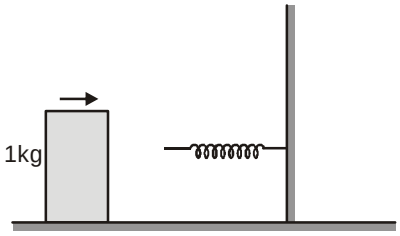
(A) 2R (B) $\frac{R}{2}$ (C) R (D) $\frac{R}{4}$

35. The work done by the force $\vec{F} = x^2\hat{i} + y^2\hat{j}$ around the path shown in the fig. is



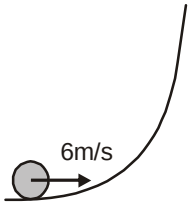
(A) 2/3 a^3 (B) a^3 (C) zero (D) 4/3 a^3

36. A 1.0 kg block collides with a horizontal weightless spring of force constant 2.75 Nm^{-1} as shown in Fig. The block compresses the spring 4.0 m from the rest position. If the coefficient of kinetic friction between the block and horizontal surface is 0.25 the speed of the block at the instant of collision is



(A) 0.4 ms^{-1} (B) 4 ms^{-1} (C) 0.8 ms^{-1} (D) 8 ms^{-1}

37. A disc of radius 0.1 m rolls without sliding on a horizontal surface with a velocity of 6 m/s. It then ascends a smooth continuous track as shown in fig. The height upto which it will ascend is (g = 10 m/s^2)

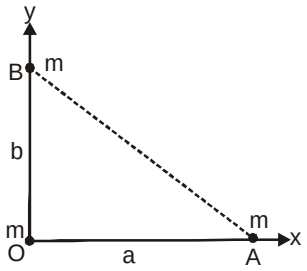


(A) 2.4 m (B) 2.7 m (C) 2.9 m (D) 2.8 m

38. The least coefficient of friction for an inclined plane inclined at angle α with horizontal in order that a solid cylinder will roll down it without slipping is

(A) $\frac{2}{3}\tan\alpha$ (B) $\frac{2}{7}\tan\alpha$ (C) $\frac{1}{3}\tan\alpha$ (D) $\frac{5}{7}\tan\alpha$

39. Three particles, each of mass m are placed at the corners of a right angled triangle as shown in fig. If OA = a and OB = b, the position vector of the centre of mass is

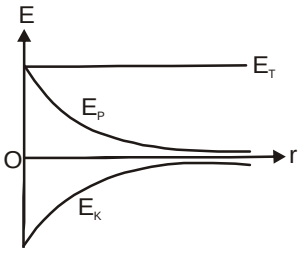


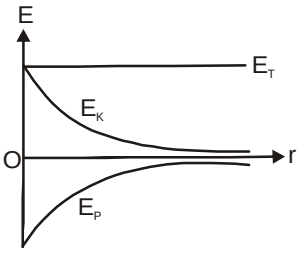
(A) zero (B) $\frac{1}{3}(a\hat{i}+b\hat{j})$ (C) $\frac{1}{3}(a\hat{i}-b\hat{j})$ (D) $\frac{2}{3}(a\hat{i}+b\hat{j})$

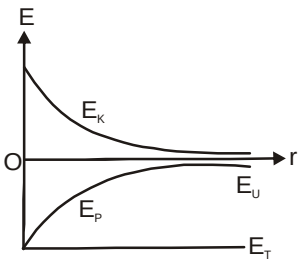
40. A particle of mass m is at a distance d from one end on the axis of a uniform rod of length L and mass M. The gravitational force F on the particle due to the rod is

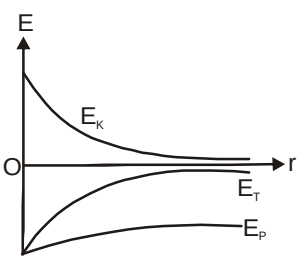
(A) $\frac{GM\,m}{d^2}$ (B) $\frac{GM\,m}{(d+L/2)^2}$ (C) $\frac{GM\,m}{(d+L)^2}$ (D) $\frac{GM\,m}{d(L+d)}$

41. The correct graph representing the variation of Total energy (E_T), Kinetic energy (E_K) and Potential energy (E_P) of a satellite with its distance (r) from the centre of earth is

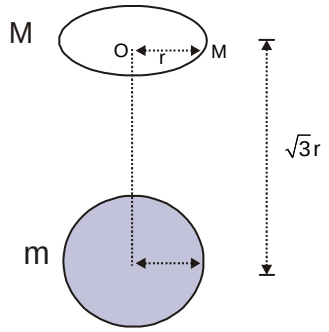
(A)


(B)


(C)


(D)


42. A uniform ring of mass M and radius r is placed directly above a uniform sphere of mass m and of equal radius r. The centre of the ring is at a distance $\sqrt{3}\,r$ from the centre of the sphere of radius r as shown in fig. The gravitational force exerted by sphere on the ring will be

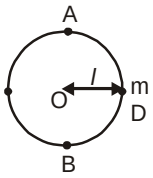


(A) $\frac{GM\,m}{4r^2}$ (B) $\frac{GM\,m}{8r^2}$ (C) $\frac{\sqrt{3}\,GM\,m}{8r^2}$ (D) $\frac{\sqrt{6}\,GM\,m}{8r^2}$

43. A body cools from 60º to 50ºC in 10 min. If room temp. is 25ºC, temperature of body at the end of next 10 min. will be

(A) 38.5ºC (B) 40ºC (C) 45ºC (D) 42.8ºC

44. A particle of mass m attached with a string of length l is just revolving in the vertical circle without slacking of the string. If v_A, v_B and v_D are speeds at position A, B and D, then which of the following is not correct



(A) $v_B > v_D > v_A$ (B) tension in string at D = 3 mg

(C) $v_D = \sqrt{3gl}$ (D) $v_A = 0$

45. Two linear S.H.Ms of equal amplitud and same angular frequencies are impressed on a particle along the axes x and y respectively. if the initial phase difference between them is $\pi/2$, the resultant path followed by the particle is :

(A) straight line (B) symmetrical ellipse of unequal axes

(C) circle (D) assymmetrical ellipse of unequal axes

ANSWERS KEY

[PHYSICS]

1.	(B)	2.	(D)	3.	(D)	4.	(B)	5.	(B)	6.	(D)	7.	(B)
8.	(B)	9.	(B)	10.	(A)	11.	(D)	12.	(B)	13.	(C)	14.	(A)
15.	(B)	16.	(D)	17.	(D)	18.	(D)	19.	(C)	20.	(A)	21.	(A)
22.	(D)	23.	(B)	24.	(B)	25.	(B)	26.	(D)	27.	(A)	28.	(C)
29.	(D)	30.	(C)	31.	(A)	32.	(C)	33.	(C)	34.	(C)	35.	(C)
36.	(D)	37.	(D)	38.	(C)	39.	(B)	40.	(D)	41.	(D)	42.	(C)
43.	(D)	44.	(D)	45.	(C)								