EXAMINATION PAPER, 2020
Jharkhand Academic Council, Ranchi
PHYSICS-XI

me : 1 Hour.] [*Full Marks* : 40

1. Which of the following is the dimensional formula of pressure ?
   (a) $[MLT^{-2}]$
   (b) $[ML^{-2}T^{-2}]$
   (c) $[ML^{-1}T^{-2}]$
   (d) $[ML^{-1}T^{-1}]$

2. 1 metre is equivalent to :
   (a) $10^{10}\,Å$
   (b) $10^{8}\,Å$
   (c) $10^{6}\,Å$
   (d) $10^{5}\,Å$

3. The unit of torque is :
   (a) N-m
   (b) $kg\ m^2\ s^{-1}$
   (c) $kg\ m\ s^{-1}$
   (d) $kg^2\ m^2\ s^{-1}$

4. The dimensional formula of gravitational constant is :
   (a) $[M^{-2}L^{3}T^{-2}]$
   (b) $[M^{-2}L^{2}T^{-1}]$
   (c) $[M^{-1}L^{3}T^{-2}]$
   (d) $[ML^{2}T^{-1}]$

5. Which of the following is not a vector quality ?
   (a) Displacement
   (b) Force
   (c) Angular momentum
   (d) Electric current

6. Maximum range of a projectile is :
   (a) $\dfrac{u^2}{g}$
   (b) $\dfrac{u^2}{2g}$
   (c) $\dfrac{u^2}{3g}$
   (d) $\dfrac{2u^2}{g}$

7. Area under velocity-time curve gives :
   (a) Acceleration
   (b) Displacement
   (c) Uniform Velocity
   (d) None of these

8. A ball is dropped from the top of a tower and reaches the ground in 4 seconds. The height of the tower is :
   $(g = 10m/s^2)$
   (a) 40 m
   (b) 60 m
   (c) 80 m
   (d) 100 m

9. A force of 0.04 newton acts on a body of mass 1 kg. The acceleration of the body is :
   (a) $0.04\ Nkg^{-1}$
   (b) $0.4\ Nkg^{-1}$
   (c) $0.02\ Nkg^{-1}$
   (d) $0.2\ Nkg^{-1}$

10. The frictional force acting between two bodies is :
    (a) directly proportional to the normal reaction
    (b) inversely proportional to the normal reaction
    (c) directly proportional to mass
    (d) inversely proportional to mass

11. The centripetal force acting on a body undergoing circular motion is :
    (a) $\dfrac{mw^2}{r}$
    (b) mwr
    (c) $\dfrac{mv^2}{r}$
    (d) $mv^2\,r$

12. In the motion of rocket, the physical quantity conserved is :

   (a) Angular momentum   (b) Linear momentum   (c) Force   (d) Work

13. A cyclist is moving in a circular path of radius 80 m with a velocity of 10m/s. His angle of bend with vertical is ($g = 10 m/s^2$)

   (a) $\tan^{-1}(4)$ (b) $\tan^{-1}\left(\dfrac{1}{8}\right)$ (c) $\tan^{-1}\left(\dfrac{1}{4}\right)$ (d) $\tan^{-1}(2)$

14. A body of mass m collides against a wall with velocity v and rebonds with the same speed. Its change in momentum is :

   (a) $2\,mv$ (b) mv (c) $-mv$ (d) zero

15. Work is represented by

   (a) $W = \vec{F} \times \vec{S}$ (b) $W = \vec{S} \times \vec{F}$ (c) $W = \vec{F} \cdot \vec{S}$ (d) none of these

16. A body is constrained to move in Y-direction. It is acted upon by a force $\vec{F} = (-2\,\hat{i} + 15\,\hat{j} + 6\,\hat{k})$ N. The work done by the force in moving the body through a distance of 10 m along Y-direction is :

   (a) 190 J   (b) 160 J   (c) 150 J   (d) 20 J

17. Two bodies of masses m_1 and m_2 have equal kinetic energies. The ratio of their linear momentum is :

   (a) $m_1 : m_2$ (b) $m_2 : m_1$ (c) $\sqrt{m_1} : \sqrt{m_2}$ (d) $\sqrt{m_2} : \sqrt{m_1}$

18. The stored potential energy of a spring when stretched by 2 cm is u. If it is stretched by 8 cm, the potential energy stored is :

   (a) $\dfrac{u}{4}$ (b) $4u$ (c) $8u$ (d) $16u$

19. A box is pushed through 4 m on a floor offering a resistance of 100 N. The work done by the resisting force is :

   (a) 400 J   (b) -400 J   (c) 25 J   (d) -25 J

20. Analogue of force in rotational motion is :

   (a) Moment of inertia   (b) Torque   (c) Radius of gyration   (d) Angular momentum

21. Moment of inertia of a solid sphere of mass M and radius R about the diameter is :

   (a) $\dfrac{2}{5}$ MR²   (b) $\dfrac{2}{3}$ MR²   (c) $\dfrac{7}{5}$ MR²   (d) $\dfrac{5}{3}$ MR²

22. When a torque acting on a system is zero, which of the following is constant ?

   (a) Force   (b) Linear momentum   (c) Impulse   (d) None of these

23. The value of g at the centre of the earth is :

   (a) zero   (b) $\dfrac{g}{4}$ (c) $\dfrac{g}{2}$ (d) g

24. The escape velocity from the surface of the earth is (R_e is radius of earth) :

   (a) $\sqrt{gR_e}$ (b) $\sqrt{2gR_e}$ (c) $\sqrt{3gR_e}$ (d) $\sqrt{4gR_e}$

25. Kepler's third law is also known as :

   (a) Law of orbits   (b) Law of areas   (c) Law of periods   (d) None of these

26. Gravitational potential at a distance r from a body of mass M is :

   (a) $G\,\dfrac{M}{r}$ (b) $G\,\dfrac{M}{r^2}$ (c) $-G\,\dfrac{M}{r}$ (d) $-G\,\dfrac{M}{r^2}$

27. Within the elastic limit the relation between stress and strain is :

   (a) stress = strain   (b) stress $\propto$ strain   (c) stress $\propto \dfrac{1}{\text{strain}}$ (d) stress $= \dfrac{1}{\text{strain}}$

28. A force of 60 N is applied on the tip of a nail of cross section $0.001 cm^2$. The pressure on the tip of nail is :
   (a) $6 \times 10^8 Pa$ (b) $6 \times 10^{-8} Pa$ (c) $6 \times 10^4 Pa$ (d) $6 \times 10^{-4} Pa$

29. The molar specific heat at constant pressure of an ideal gas is (7/2) R. The ratio of specific heat at constant pressure to that at constant volume is :
   (a) $\frac{9}{7}$ (b) $\frac{7}{5}$ (c) $\frac{8}{7}$ (d) $\frac{5}{7}$

30. The temperature of a body in Celsius scale is 40° C. The temperature in Farenheit scale is :
   (a) 32° F   (b) 72° F   (c) 104° F   (d) none of these

31. A gas is compressed isothermally to half of its volume. By what factor does the pressure of the gas increase ? ($\gamma = 1.4$)
   (a) 2   (b) 2.8   (c) 0.7   (d) 0.5

32. Energy associated with each degree of freedom per molecule is (K_B is Boltzmann constant) :
   (a) $\frac{3}{2} K_B T$ (b) $\frac{1}{2} K_B T$ (c) $K_B T$ (d) zero

33. The temperature of an ideal gas is increased from 120 K to 480 K. The rms velocity of gas molecules become :
   (a) Half   (b) Double   (c) Quadrupled   (d) Cannot say

34. The kinetic energy of one mole of an ideal gas is $E = \frac{3}{2} RT$. The value if C_p is :
   (a) 0.5 R   (b) 0.1 R   (c) 1.5 R   (d) 2.5 R

35. Oxygen and hydrogen gas are at same temperature and pressure. The mass of oxygen molecules are 16 times more than the mass of hydrogen molecules. The ratio of their rms speeds is :
   (a) 2   (b) $\frac{1}{4}$ (c) 4   (d) 16

36. Avogadro's number is the number of molecules in :
   (a) one litre of a gas   (b) one mole of a gas   (c) one gram of a gas   (d) one kg of a gas

37. The frequency of a second pendulum is :
   (a) 0.5 Hz   (b) 1 Hz   (c) 0.25 Hz   (d) 2 Hz

38. A progressive wave is represented by $y = 5 \sin (100 \pi t - 2 \pi x)$ where x and y are in metre and t in second. The maximum particle velocity is :
   (a) 100π m/s   (b) 200π m/s   (c) 400π m/s   (d) 500π m/s

39. The Doppler's effect is applicable for :
   (a) Sound waves only   (b) Light waves only
   (c) Both for sound waves and light waves   (d) None of these

40. Speed of sound wave in air :
   (a) is independent of temperature   (b) increases with increase in pressure
   (c) increases with the increase in humidity   (d) decreases with the increase in humidity

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