Sample Paper-04

Class 11th NEET (2024)

PHYSICS

SECTION-A

1. A physical quantity P is described by the relation $P = a^{1/2}b^2c^3d^{-4}$. If the relative errors in the measurement of a, b, c and d respectively, are 2%, 1%, 3% and 5%, then the relative error in P will be;

(1) 8 % (2) 12 %

(3) 32 % (4) 25 %

2. 20 gm ice at –10°C is mixed with m gm steam at 100°C. The minimum value of m so that finally all ice and steam converts into water is:

(Use, specific heat and latent heat as C_{ice} = 0.5 Cal/gm °C, C_{water} = 1 cal/gm °C, L_{melt} = 80 cal/gm and L_{vapor} = 540 cal/gm]

(1) $\frac{185}{27}$gm (2) $\frac{185}{17}$gm

(3) $\frac{85}{32}$gm (4) $\frac{113}{17}$gm

3. μ_1, μ_k and μ_s represent the coefficients of rolling friction, kinetic and static friction, then:

(1) $\mu_1 = \mu_s = \mu_k$

(2) $\mu_r > \mu_k > \mu_s$

(3) $\mu_r < \mu_s < \mu_k$

(4) $\mu_r < \mu_k < \mu_s$

4. If the density of a small planet is the same as that of earth, while the radius of the planet is 0.2 times that of the earth, the gravitational acceleration on the surface of the planet is:

(1) 0.2 g

(2) 0.4 g

(3) 2g

(4) 4 g

5. On the horizontal surface of truck a block of mass 5 kg is placed and coefficient of friction between the block and surface is μ = 0.4. Maximum acceleration of truck for which the block will not move over the surface of truck is:

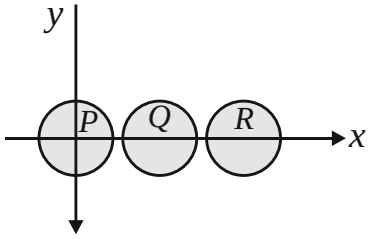
(1) 6 ms^{-2}

(2) 5 ms^{-2}

(3) 4 ms^{-2}

(4) 8 ms^{-2}

6. Three identical spheres, each of mass 1kg are kept as shown in figure, touching each other, with their centres on a straight line. If their centres are marked P, Q, R respectively, the distance of centre of mass of the system from P is:



(1) $\frac{PQ+PR+QR}{3}$ (2) $\frac{PQ+PR}{3}$

(3) $\frac{PQ+QR}{3}$ (4) $\frac{PR+QR}{3}$

7. A particle moves under the effect of a force $F = cx$ from $x = 0$ to $x = x_1$, the work done in the process is:

(1) cx_1^2 (2) $\frac{1}{2}cx_1^2$

(3) $2\ cx_1^2$ (4) zero

8. The fundamental frequency of a closed end organ pipe is n. Its length is doubled and radius is halved. Its frequency will become nearly.

(1) $n/2$ (2) $n/3$

(3) n (4) $2\ n$

9. A convex lens forms a real image of a point object placed on its principal axis. If the upper half of the lens is painted black, the image will.

(1) Be shifted downwards

(2) Be shifted upwards

(3) Not be shifted

(4) Shift on the principal axis

10. A point initially at rest moves along x-axis. Its acceleration varies with time as $a = (6t + 5)$ m/s^2. If it starts from origin, the distance covered in 2s is:

(1) 20 m (2) 18 m

(3) 16 m (4) 25 m

11. A spring of force constant 800 N/m has an extension of 5 cm. The work done in extending it from 5 cm to 15 cm is:

(1) 16 *J* (2) 8 *J*
(3) 32 *J* (4) 24 *J*

12. A satellite of mass *m* is put into a circular orbit of height *h* from the surface of the earth (mass = M_e, radius = R_e) The orbital speed of satellite is:

(1) $\sqrt{\frac{2GM_eh}{R_e(R_e+h)}}$ (2) $\sqrt{\frac{2GM_e}{R_e+h}}$

(3) $\sqrt{\frac{GM_e}{(R_e+h)}}$ (4) $\sqrt{\frac{GM_e}{2(R_e+h)}}$

13. A diametrical tunnel is dug across the earth. A ball is dropped into the tunnel from one side. The velocity of the ball when it reaches the centre of the earth is (Given: gravitational potential at the centre of earth $\frac{3}{2}\frac{GM}{R}$).

(1) $\sqrt{R}$ (2) $\sqrt{gR}$
(3) $\sqrt{2.5gR}$ (4) $\sqrt{7.1gR}$

14. A steel wire having a radius of 2.0 mm, carrying a load of 4kg, is hanging from a ceiling. Given that $g = 3.1\ \pi\ ms^{-2}$, what will be the tensile stress that would be developed in the wire?

(1) $6.2 \times 10^6\ Nm^{-2}$
(2) $5.2 \times 10^6\ Nm^{-2}$
(3) $3.1 \times 10^6\ Nm^{-2}$
(4) $4.8 \times 10^6\ Nm^{-2}$

15. Three masses are placed on the *x*-axis, mass of 300 g at origin, 500 g at x = 40 cm and 400 g at x = 70 cm. The distance of the centre of mass from the origin is:

(1) 40 cm (2) 45 cm
(3) 50 cm (4) 30 cm

16. A balloon contains 1500 m^3 of helium at 27°C and 4 atmospheric pressure. The volume of helium at –3°C temperature and 2 atmospheric pressure will be:

(1) 1500 m^3 (2) 1700 m^3
(3) 1900 m^3 (4) 2700 m^3

17. If *c*, the velocity of light, *g* the acceleration due to gravity and *P* the atmospheric pressure be the fundamental quantities in MKS system, then the dimensions of length will be same as that of:

(1) $\frac{c}{g}$ (2) $\frac{c}{P}$

(3) Pcg (4) $\frac{c^2}{g}$

18. A body having initial velocity of 10 m/s moving on a rough surface comes to rest after moving 50 m. What is coefficient of friction between the body and surface? (g = 10 m/s^2).

(1) 0.5 (2) 0.2
(3) 0.3 (4) 0.1

19. A sonometer wire supports a 4 kg load and vibrates in fundamental mode with a tunning fork of frequency 416 Hz. The length of the wire between the bridges is now doubled. In order to maintain fundamental mode, the load should be changed to:

(1) 1 kg (2) 2 kg
(3) 4 kg (4) 16 kg

20. A mass is tied to a string and rotated in a vertical circle. The minimum velocity of the body at the top is:

(1) $\sqrt{gr}$ (2) g/r

(3) $\left(\frac{g}{r}\right)^{3/2}$ (4) gr

21. A car moves on a circular road. It describes equal angles about the centre in equal intervals of time. Which of the following statements about the velocity of the car is true?

(1) Magnitude of velocity is not constant
(2) Both magnitude and direction of velocity change
(3) Velocity is directed towards the centre of the circle
(4) Magnitude of velocity is constant but direction changes

22. A disc is rolling on the inclined plane, what is the ratio of its rotational KE to the total KE?

(1) 1 : 3 (2) 3 : 1
(3) 1 : 2 (4) 2 : 1

23. Two circular discs are of the same thickness. The diameter of *A* is twice that of *B*. The moment of inertia of *A* as compared to that of *B* is:

(1) 2 times (2) 4 times
(3) 8 times (4) 16 times

24. A particle of mass m is projected with a velocity v making an angle of 45° with the horizontal. The magnitude of the angular momentum of the projectile about the point of projection when the particle is at its maximum height h is:

(1) zero (2) $\frac{mv^3}{4\sqrt{2}g}$

(3) $\frac{mv^3}{\sqrt{2}g}$ (4) $m\sqrt{2gh^3}$

25. If a particle moves in the x-y plane, the resultant angular momentum has:

(1) Only x-component
(2) Only y-component
(3) Both x and y components
(4) Only z-component

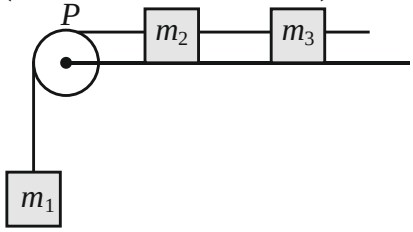
26. Turpentine oil is flowing through a tube of length l and radius r. The pressure difference between the two ends of the tube is P. The viscosity of oil is given by $\eta = \frac{P(r^2 + x^2)}{4vl}$ where v is the velocity of oil at a distance x from the axis of the tube. The dimensions of η are:

(1) $[M^0L^0T^0]$ (2) $[MLT^{-1}]$
(3) $[M^0L^2T^{-2}]$ (4) $[ML^{-1}T^{-1}]$

27. A ship A is moving Westwards with a speed of 10 km h^{-1} and a ship B 100 km South of A, is moving Northwards with a speed of 10 km h^{-1}. The time after which the distanced between them becomes shortest, is:

(1) $5\sqrt{2}\,h$ (2) $10\sqrt{2}\,h$
(3) $0\,h$ (4) $5\,h$

28. A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m is: (Assume $m_1 = m_2 = m_3 = m$)



(1) $\frac{g(1-g\mu)}{9}$ (2) $\frac{g\mu}{3}$

(3) $\frac{g(1-2\mu)}{3}$ (4) $\frac{g(1-2\mu)}{2}$

29. Two metal rods 1 and 2 of same lengths have same temperature difference between their ends. Their thermal conductivities are K_1 and K_2 and cross-sectional areas A_1 and A_2, respectively. If the rate of heat conduction in 1 is 6 times that in 2, then;

(1) $K_1A_1 = 6K_2A_2$ (2) $K_1A_1 = 2K_2A_2$
(3) $4K_1A_1 = K_2A_2$ (4) $K_1A_1 = K_2A_2$

30. Two open organ pipes of fundamental frequencies n_1 and n_2 are joined in series. The fundamental frequency of the new pipe so obtained will be:

(1) $n_1 + n_2$ (2) $\frac{n_1n_2}{(n_1 + n_2)}$

(3) $\sqrt{n_1n_2}$ (4) $\sqrt{(n_1^2 + n_2^2}$

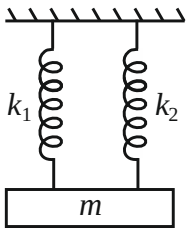
31. Each of the two strings of length 51.6 cm and 49.1 cm are tensioned separately by 20 N forces. Mass per unit length of both the strings is same and equal to 1 g/m. When both the strings vibrate simultaneously the number of beats is:

(1) 7 (2) 8
(3) 3 (4) 5

32. A monoatomic gas at a pressure P, having a volume V expands isothermally to a volume $2V$ and then adiabatically to a volume $16V$. The final pressure of the gas is (Take $\gamma = 5/3$):

(1) $64P$ (2) $32P$
(3) $P/64$ (4) $16P$

33. A mass is suspended separately by two different springs in successive order then time periods are t_1 and t_2 respectively. If it is connected by both springs as shown in figure then time period is t_0, the correct relation is:



(1) $t_0^2 = t_1^2 + t_2^2$ (2) $t_0^{-2} = t_1^{-2} + t_2^{-2}$
(3) $t_0^{-1} = t_1^{-1} + t_2^{-1}$ (4) $t_0 = t_1 + t_2$

34. **Assertion (A):** C_P is always greater than C_V in gases.
Reason (R): Work done at constant pressure is more than at constant volume.
(1) Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true and **Reason (R)** is false.
(4) **Assertion (A)** is false and **Reason (R)** is true.

35. **Assertion (A):** During rapid pumping of air in tyres, air inside the tyre is hotter than atmospheric air.
Reason (R): Adiabatic process occurs at very high rate.
(1) Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true and **Reason (R)** is false.
(4) **Assertion (A)** is false and **Reason (R)** is true.

SECTION-B

36. 100 g of water is heated from 30ºC to 50ºC. Ignoring the slight expansion of the water, the change in its internal energy is (Specific heat of water is 4184 J/kg K).
(1) 8.4 kJ (2) 84 kJ
(3) 2.1 kJ (4) 4.2 kJ

37. Water rises up to a height h_1 in a capillary tube of radius r. The mass of the water lifted in the capillary tube is M. If the radius of the capillary tube is doubled, the mass of water that will rise in the capillary tube will be.
(1) M (2) $2M$
(3) $M/2$ (4) $4M$

38. A liquid A and a suitably prepared mixture solution B have the same values of surface tension but their densities are in the ratio 2:3. Two capillary tubes, having diameters in the ratio 5:4, are dipped in the two containers of A and B respectively. If the angle of contact can be taken as zero for both cases then the heights to which the liquids will rise are in the ratio:
(1) 6 : 5 (2) 5 : 6
(3) 15 : 8 (4) 8 : 15

39. The area of a cross-section of steel wire is 0.1 cm^2 and Youngs's modulus of steel is 2×10^{11} N m^{-2}. The force required to stretch by 0.1% of its length is:
(1) 2000 N (2) 1000 N
(3) 1500 N (4) 1700 N

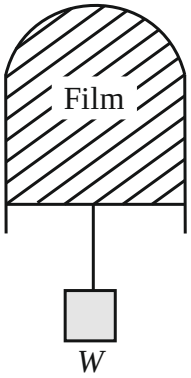
40. At what speed the velocity head of water is equal to pressure head of 40 cm of Hg?
(1) 10.3 m/s
(2) 2.8 m/s
(3) 5.6 m/s
(4) 8.4 m/s

41. A steel rod of length ℓ, cross sectional area A, Young's modulus of elasticity Y, and thermal coefficient of linear expansion ' α' is heated so that its temperature increases by t°C. Work that can be done by rod on heating will be.
(1) $(YA\alpha t) \times (\ell \alpha t)$
(2) $\frac{1}{2}(YA\alpha t) \times (\ell \alpha t)$
(3) $\frac{1}{2}(YA\alpha t) \times (1/2)(\ell \alpha t)$
(4) $2(YA\alpha t) \times (\ell \alpha t)$

42. The rods of length L_1 and L_2 are made of materials whose coefficients of linear expansion are α_1 and α_2 respectively. If the difference between the two length is independent of temperatures, then:
(1) $\frac{L_1}{L_2} = \frac{\alpha_1}{\alpha_2}$
(2) $\frac{L_1}{L_2} = \frac{\alpha_2}{\alpha_1}$
(3) $L_1^2\alpha_1 = L_2^2\alpha_2$
(4) $\alpha_1^2 L_1 = \alpha_2^2 L_2$

43. A glass flask is filled up to a mark with 50 cc of mercury at 18°C. If the flask and content are heated to 38°C, how much mercury will be above the mark?
(α for glass is 9×10^{-6}/°C and coefficient of real expansion of mercury is 180×10^{-6}/°C)
(1) 0.85 cc (2) 0.46 cc
(3) 0.153 cc (4) 0.05 cc

44. A thin liquid film formed between a *U*-shaped wire and a light slider supports a weight of 1.5×10^{-2} *N* (see figure). The length of the slider is 30 cm and its weight negligible. The surface tension of the liquid film is:



(1) 0.0125 Nm^{-1}
(2) 0.1 Nm^{-1}
(3) 0.05 Nm^{-1}
(4) 0.025 Nm^{-1}

45. A phase difference between two points separated by 0.8 m in a wave of frequency 120 Hz is $\pi/2$. The wave velocity is
(1) 384 m/s
(2) 768 m/s
(3) 250 m/s
(4) 154 m/s

46. A simple pendulum is executing simple harmonic motion with a time period *T*. if the length of the pendulum is increased by 21% then the increase in the time period of the pendulum duo to increased length is
(1) 50% (2) 30%
(3) 21% (4) 10%

47. A bag of mass *M* hangs by a long thread and a bullet (mass *m*) comes horizontally with velocity *V* and gets caught in the bag. Then for the combined (bag + bullet) system:
(1) Momentum $= \frac{mvM}{M+m}$
(2) Kinetic energy $= \frac{mV^2}{2}$
(3) Momentum $= \frac{mV(M+m)}{M}$
(4) Kinetic energy $= \frac{m^2v^2}{2(M+m)}$

48. A block of mass 60 kg just slides over a horizontal distance of 0.9 m. If the coefficient of friction between their surface is 0.15 then work done against friction will be.
(1) 79.4 J (2) 97.54 J
(3) 105.25 J (4) None of these

49. A projectile is projected at an angle of 45° with speed *u*. The radius of curvature of its trajectory at the maximum height is:
(1) $\frac{u^2}{g}$ (2) $\frac{u^2}{4g}$
(3) $\frac{2u^2}{g}$ (4) $\frac{u^2}{2g}$

50. The position *x* of a particle at time *t* is given by $x = \frac{V_0}{a}(1-e^{-at})$, where V_0 is constant and $a > 0$.
The dimensions of V_0 and *a* are respectively.
(1) $[M^0 LT^{-1}]$ and $[T^{-1}]$
(2) $[M^0 L T^0]$ and $T[^{-1}]$
(3) $[M^0 L T^{-1}]$ and $[L T^{-2}]$
(4) $[M^0 L T^{-1}]$ and [T]