Solution

NEET PHYSICS SAMPLE PAPER - 01

NEET-UG - Physics

1.

(c) $[ML^{-1}T^{-1}]$

Explanation: [coefficient of viscosity] = $[ML^{-1}T^{-1}]$

2.

(b) Pascal

Explanation: Pascal

3.

(d) Both A and R are false.

Explanation: The displacement of a body moving in straight line with constant acceleration is given by, $s = ut + \frac{1}{2}at^2$. This is a equation of a parabola, not straight line. Therefore the displacement-time graph is a parabola. The displacement time graph will be straight line, if and only if acceleration of body is zero or body is moving with uniform velocity.

4.

(d) greater than v

Explanation: As they are moving in the same direction, the relative velocity of ball w.r.t. Tom or Dick will be

$v = v_B - v_{Tom}$

or $v = v_B - v_{Dick}$

$\therefore v_B = v + v_{Tom} = v + v_{Dick}$

For Sam, the speed of the ball will be greater than v.

5.

(d) 20 ms^{-1}

Explanation: time of flight (t) is $=\frac{2u}{g}$,here u is the initial velocity

thus $4 = \frac{2u}{10}$

hence u = 20 m/s

6.

(b) Both A and R are true but R is not the correct explanation of A.

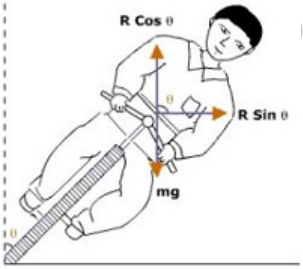
Explanation: A negative acceleration of a body is the rate of decrease of velocity, i.e. if a body is slowing down then it has negative acceleration which is called retardation when final velocity is smaller than initial velocity of body.

7.

(d) to supply the sidewise (centripetal) acceleration required to make the direction change.

Explanation: In order to make a safe turn, the cyclist has to bend a little from his vertical position. In this case, a component of the reaction provides the required centripetal force.

If θ is an angle made by the cyclist with the vertical then



N cosθ = mg ....(1)

N sinθ = $\frac{mv^2}{r}$.....(2)

Dividing (2) by (1), we get

$\tan\theta = \frac{v^2}{rg}$

$\Rightarrow \theta = tan^{-1}(\frac{v^2}{rg})$

In actual practice, the value of θ is slightly less because the force of friction also contributes towards the centripetal force.

8.

(c) $\frac{a^2}{2a}$

Explanation: y = ax - bx^2

For maximum y,

$\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} < 0$

$\frac{dy}{dx}$ = a - 2bx = 0

or x = $\frac{a}{2b}$

$\frac{d^2y}{dx^2}$ = -2b < 0

$\therefore$ For x = $\frac{a}{2b}$, y is maximum

$\therefore y_{max.} = a\left(\frac{a}{2b}\right) - b\left(\frac{a}{2b}\right)^2 = \frac{a^2}{4b}$

9.

(c) A is true but R is false.

Explanation: A is true but R is false.

10.

(b) 1.6 cm/s

Explanation: Mass of shell, m = 0.02kg

Mass of gun, M = 100kg

Speed of shell, v = $80ms^{-1}$

Let V be the recoil speed of the gun. According to the law of conservation of momentum,

Initial momentum = Final momentum

0 = mv + MV

$V = -\frac{mv}{M} = -\frac{0.02\times80}{100}$

recoil speed of the gun is ,$V = -0.016ms^{-1} = -1.6cms^{-1}$

A negative sign indicates that the gun moves backward as the bullet moves forward.

11.

(b) The reading of spring balance will increase and the physical balance will remain in equilibrium.

Explanation: The reading of spring balance will increase and the physical balance will remain in equilibrium.

12.

(c) A is true but R is false.

Explanation: A is true but R is false.

13.

(b) 8.1×10^{-2} J

Explanation: $W = -\int F\,dx = \int_{0.1}^{0.2} (5x + 16x^3)\,dx$

$= \left[\frac{5x^2}{2} + 4x^4\right]_{0.1}^{0.2}$

$= \frac{5}{2}(0.2^2 - 0.1^2) + 4(0.2^4 - 0.1^4)$

$= \frac{5}{2} \times 0.3 \times 0.1 + 4(0.0016 - 0.0001)$

$= 7.5 \times 10^{-2} + 0.0060$

$= 7.5 \times 10^{-2} + 0.6 \times 10^{-2} = 8.1 \times 10^{-2}$ J

14. **(a)** $\frac{1}{2}mv^2 \times \frac{m}{(m+M)}$

Explanation: Initial momentum of the system, p_1 = mv

Let V be the velocity of the composite system

Final momentum os system, p_2 = (m + M)V

By conservation of momentum, mv = (m + M)V

$\therefore V = \frac{mv}{m+M}$

Kinetic energy of composite block, K = $\frac{1}{2}$(M + m)V^2 = $\frac{1}{2}$(M + m)$\left(\frac{mv}{m+M}\right)^2$ = $\frac{1}{2}mv^2 \times \frac{m}{(m+M)}$

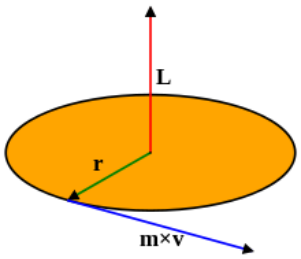
15. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.
Explanation: In a quick collision, time t is small. As F $\times$ t = constant. Therefore, force involved is large, i.e., collision is more violent in comparison to slow collision.

16. **(c)** $\frac{L^2}{mr^3}$
Explanation: $L = mvr \Rightarrow v = \frac{L}{mr}$
$F_c = \frac{mv^2}{r} = \frac{m}{r}\left(\frac{L}{mr}\right)^2 = \frac{L^2}{mr^3}$

17. **(b)** straight line
Explanation: $\vec{v}_{\text{com}} = \frac{m_1\vec{v_1}+m_2\vec{v_2}}{m_1+m_2}$
$\frac{\vec{v_1}+\vec{v_2}}{2} = (\hat{i}+\hat{j})\text{m/s}$
Similarly, $\vec{a}_{\text{com}} = \frac{\vec{a_1}+\vec{a_2}}{2} = \frac{3}{2}(\hat{i}+\hat{j})\text{m/s}^2$
Since, $\vec{v}_{\text{com}}$ is parallel to $\vec{a}_{\text{com}}$ the path will be a straight line.

18. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.
Explanation: Assertion and reason both are correct statements and reason is correct explanation for assertion.

19. **(d)** along the position vector of the point of application of the force with respect to the fixed point
Explanation:



The motion of a particle under a central force **F** always remains in the plane defined by its initial position and velocity. This may be seen by symmetry. Since the position **r**, velocity **v,** and force **F** all lie in the same plane, there is never an acceleration perpendicular to that plane, because that would break the symmetry between "above" the plane and "below" the plane.
To demonstrate this mathematically, it suffices to show that the angular momentum of the particle is constant. This angular momentum **L** is defined by the equation
L = r $\times$ p = r $\times$ mv
as angular momentum is conserved, the torque vanishes as F is zero or along r
$\frac{dL}{dt} = r \times F = 0$
central forces always satisfy this condition. A central force is always directed towards the center.

20. **(d)** 30 kg-wt
Explanation: 30 kg-wt

21. **(b)** $(1.52)^{3/2} \times 365$
Explanation: According to Kepler's third law
$\frac{T_M^2}{T_E^2} = \frac{R_{MS}^3}{R_{ES}^3}$
where R_{MS} is the mars-sun distance and R_{ES} is the earth-sun distance.
$\therefore \quad T_M = \left(\frac{R_{MS}}{R_{ES}}\right)^{3/2} T_E$
= $(1.52)^{3/2} \times 365$

22. **(b)** Both A and R are true but R is not the correct explanation of A.

Explanation: Both A and R are true but R is not the correct explanation of A.

23.

(d) 1.074×10^{-2} m

Explanation: given length of wire L = 1.0 m

area A = $0.50 \times 10^{-2}cm^2 = 0.5 \times 10^{-6}m^2$

mass suspended = 100g = 0.1 kg

using standard value for young modulus of steely = $2.0 \times 10^{11}N/m^2$

depression at midpoint $x = l(\frac{Mg}{YA})^{1/3}$

$x = 0.5(\frac{0.1 \times 10}{(2 \times 10^1 1)(0.50 \times 10^{-6})})^{1/3}$

x = 1.074×10^{-2} m

24.

(d) |Hydraulic stress| or |hydraulic strain|

Explanation: If graph is linear and X-axis represents depth, with increasing depth, hydraulic pressure on the ball would increase. This pressure equals hydraulic stress on the ball. Hence, hydraulic stress vs depth would be a graph with linear nature.

For a given substance, bulk modulus is constant.

i.e., |Bulk modulus| = $|\frac{\text{hydraulicstress}}{\text{hydraulic strain}}|$ = constant

This means,

|hydraulic stress| $\propto$ |hydraulic strain|

Though increasing stress (pressure) would cause decrease in the volume, the stress-strain will share linear relation. Hence, if hydraulic strain is plotted against height, it too would give a plot of linear nature.

25. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation: Bulk modulus measures the tendency of a body to regain its original volume on being compressed. It represents the incompressibility of the material.

26.

(d) rh = constant

Explanation: h = $\frac{2\sigma \cos\theta}{r\rho g}$

For a given liquid-solid pair,

hr = $\frac{2\sigma \cos\theta}{\rho g}$ = constant

27.

(c) < 90^o

Explanation: < 90^o

28.

(b) < 90^o

Explanation: < 90^o

29.

(c) Assertion is correct statement but reason is wrong statement.

Explanation: The motion of the liquid disappears due to forces of viscosity.

30.

(b) $\Delta Q = mL$

Explanation: $\Delta Q = mL$

31.

(b) 100°C

Explanation: The heat required by ice to convert totally into the water at 100°C,

$Q_1 = 1 \times 80 + 1 \times 1 \times 100 = 180cal$

Heat supplied by steam if it was to condense totally and convert into the water at 100°C,

$Q_2 = 1 \times 540 = 540$ cal

As of $Q_2 > Q_1$, the entire steam will not condense, and final temperature = 100°C

Both water and steam will exist together in equilibrium at 100°C

32.

(d) 80.08 cm

Explanation: The 80 cm mark on the aluminium rod is really at a greater distance from the zero position than indicated because of the increase in temperature $\Delta\theta = 40^oC$. The increased length is:

$\Delta L = \alpha_{Al} L_{Al} \Delta\theta = (2.50 \times 10^{-5})(80)(40) = 0.08$ cm

The correct length of the line is:

L = 80 + 0.08 = 80.08 cm

33.

(c) A is true but R is false.

Explanation: On adding soap, surface tension of water decreases, the spraying of water becomes easy.

34.

(d) $\mu RT \log \frac{V_2}{V_1}$

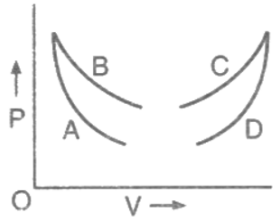
Explanation: $\mu RT \log \frac{V_2}{V_1}$

35.

(d) A and B respectively

Explanation:

We have given the graphs →



As, $\frac{\text{Slope of Adiabatic}}{\text{Slope of Isothermal}} = \Upsilon$

$\Rightarrow$ Where $\Upsilon = \frac{C_P}{C_V}$

So, A → Adiabatic process.

B → Isothermal process.

Hence, A and B respectively.

36.

(d) Both A and R are false.

Explanation: When the door of refrigerator is kept open, heat rejected by the refrigerator to the room will be more than the heat taken by the refrigerator from the room (by an amount equal to work done by the compressor). Therefore, temperature of room will increase and so it will be warmed gradually. As according to 2^{nd} law of thermodynamics, heat cannot be transferred on its own, from a body at lower temperature to another at higher temperature.

37.

(c) 200 J

Explanation: At constant volume,

Q = 500 J

$Q = nC_P\Delta T$

$500 = 1 \times 2.5 \times 8.31\Delta T$

$\Delta T = 24.06$

work done on gas is $W = nR\Delta T = 1 \times 8.31 \times 24.06 = 200$ J

38.

(c) 1.65

Explanation: 1 mole of hydrogen = 2 g

$\therefore n_1$ = 6 g of hydrogen = 3 moles

Also,

22.4 litres of helium = 1 mole of helium

$\therefore$ n_2 = 33.6 litres of helium = 1.5 moles

Adiabatic constant of hydrogen (diatomic),

γ_{H_2} = 1.4

Adiabatic constant of helium (mono-atomic),

γ_{H_e} = 1.6

$\frac{n_1+n_2}{(\gamma-1)} = \frac{n_1}{(\gamma_1-1)} + \frac{n_2}{(\gamma_2-1)}$

$\therefore \frac{3+1.5}{(\gamma-1)} = \frac{3}{(1.4-1)} + \frac{1.5}{(1.6-1)}$

$\therefore \frac{4.5}{(\gamma-1)} = \frac{3}{0.4} + \frac{1.5}{0.6}$

$\therefore \frac{4.5}{(\gamma-1)}$ = 10

$\therefore \gamma$ = 1.45

39. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.
Explanation: Assertion and reason both are correct statements and reason is correct explanation for assertion.

40.
(b) $\left(\frac{k_2}{k_1}\right)^{1/2}$
Explanation: For equal maximum velocities,

$\omega_1 A_1 = \omega_2 A_2$

$\sqrt{\frac{k_1}{m}} \cdot A_1 = \sqrt{\frac{k_2}{m}} \cdot A_2$

or $\frac{A_1}{A_2} = \left(\frac{k_2}{k_1}\right)^{1/2}$

41.
(b) simple harmonic with amplitude $\sqrt{a^2+b^2}$
Explanation: Amplitude of resultant SHM,

R = $\sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos 90^\circ}$

R = $\sqrt{A_1^2 + A_2^2}$

= $\sqrt{a^2+b^2}$

42.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
Explanation: In SHM, P.E. = K.E.

$\Rightarrow \frac{1}{2}m\omega^2y^2 = \frac{1}{2}m\omega^2\left(a^2-y^2\right)$

$\Rightarrow$ y^2 - a^2 - y^2

$\Rightarrow y = \pm\frac{a}{\sqrt{2}}$

43.
(b) 50 cm
Explanation: The fundamental frequency of open pipe $= \frac{v}{2L}$

350 = $\frac{350}{2L}$

$L = \frac{1}{2}$ m = 50 cm

44. **(a)** seventh harmonic
Explanation: seventh harmonic

45. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Both A and R are true and R is the correct explanation of A.