Solution

NEET UG SAMPLE PAPER - PHYSICS - 11TH - 05

NEET-UG - Physics

Section A

1.

(b) $[L^3]$

Explanation: [b] = [K] = $[L^3]$

2.

(c) $\frac{t_1t_2}{t_1+t_2}$

Explanation: $t = \frac{l}{u+v} = \frac{l}{\frac{l}{t_1}+\frac{l}{t_2}}$

or $\frac{1}{t} = \frac{1}{t_1} + \frac{1}{t_2}$ or $t = \frac{t_1t_2}{(t_1+t_2)}$

3.

(d) $10\sqrt{2}$kg

Explanation: $|\vec{F}| = \sqrt{6^2 + 8^2 + 10^2} = \sqrt{200}$

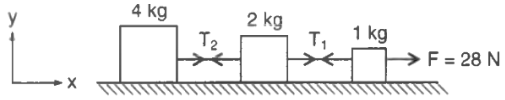
As mass is the ratio of F and a

m = $\frac{F}{a} = \frac{10\sqrt{2}\text{N}}{1}$ = $10\sqrt{2}$kg

4.

(c) 4 m/s^2

Explanation:



Let a be the acceleration of each block and T_1 and T_2 be the tensions, in the two strings as shown in the figure given below;

Taking the three blocks and the two strings as the system, we can write:

$\sum F_x = ma_x$

or 28 = (4 + 2 + 1)a

or $a = \frac{28}{7} = 4\text{m/s}^2$

5.

(d) $\frac{mv^2}{r} \geq \mu mg$

Explanation: $\frac{mv^2}{r} \geq \mu mg$

6.

(d) - 0.3 m/s and 0.5 m/s

Explanation: Both balls are identical and the collision is elastic. Therefore, velocities will be exchanged after the collision.

v_A = -0.3 ms^{-1} and v_B = 0.5 ms^{-1}

7. **(a)** $\frac{m_2}{m_1}$

Explanation: Let u_1, u_2 be velocities of m_1, m_2, before the collision, and υ_1, υ_2 be their respective velocities after the collision.

In every collision.

final momentum = initial momentum

$m_1\upsilon_1 + m_2\upsilon_2 = m_1u_1 + m_2u_2$

$\therefore m_1(\upsilon_1 - u_1) = m_2(u_2 - \upsilon_2)$

or $\frac{v_1 - u_1}{u_2 - v_2} = \frac{m_2}{m_1}$

8.

(d) 4 sin θ ms^{-1}

Explanation: $T\cos\theta = Mg$ ...(i)

$T\sin\theta = \frac{Mv^2}{r} = Mr\omega^2$ ...(ii)
$= M(L\sin\theta)\omega^2$
$\therefore \quad T = ML\omega^2 = ML(2\pi n)^2 = 4\pi^2 MLn^2$
$= 4\pi^2 ML\left(\frac{2}{\pi}\right)^2 = 16ML$
$= 16 \times 10^{-1} \times 1 = 1.6\text{N}$
$\omega = \frac{2}{\pi}\text{rev/sec} = \frac{2}{\pi} \times 2\pi = 4\text{rad/sec}$
Linear velocity
$v = r\omega = (L\sin\theta)\omega = \sin\theta \times 4 = 4\sin\theta\text{ms}^{-1}$

9. **(a)** 18 m
Explanation: For the same gain of P.E in both cases
$mg_Ah_A = mg_Bh_B$
$9g_B \times 2 = g_B \times h_B$
h_B = 18 m

10. **(b)** depends on the end positions
Explanation: A conservative force is a type of force wherein there is no net work done during its motion in any closed loop. When we throw a ball up there is negative work done as it moves against the force of gravity and during the fall the gravity is in a positive direction. The resultant work done is zero and the force of gravity is path independent. Thus, the gravitational field is a conservative field and work done depends on the endpoints only.

11. **(d)** (b)
Explanation: Solids are least compressible whereas gases are most compressible. Gases are about a million times compressible than solids. All other statements are correct.

12. **(a)** x =12.5 cm
Explanation: Let original length of spring = l
As mg = Kx
hence, K $\times$ (60) = K_2(l- 60) = Kl ...(1)
$\therefore$mg = $K_1 \times 7.5$ ...(2)
According to the question,
mg = $K_2 \times 5.0$ ...(3)
According to eqn. (1):
$K_1 = \frac{Kl}{60}, \quad K_2 = \frac{KI}{l-60}$ ...(4)
$\therefore \quad \frac{K_1}{K_2} = \frac{5.0}{7.5} = \frac{l-60}{60}$ [From eqns. (2), (3) and (4)]
or $\frac{2}{3} = \frac{l-60}{60}$ or l = 100 cm
Now mg - Kx - $K_1 \times 7.5$
$Kx = \frac{KI}{60} \times 7.5$
or $x = \frac{100}{60} \times 7.5 = \frac{75}{6}$
= 12.5 cm

13. **(d)** Only ii
Explanation: add explanation

14. **(d)** 12.5×10^{-2}m
Explanation: Weight of liquid column, W = 2πrT cos θ
For water, θ = 0
$\therefore$ W = 2πrT
or $2\pi r = \frac{W}{T} = \frac{75 \times 10^{-4}}{6 \times 10^{-2}}$ = 12.5×10^{-2}m

15.

(b) 100° C

Explanation: Density of water is maximum at 4°C. Volume decreases between 0°C and 4°C. So, the coefficient of cubical expansion of water is zero at 4°C and -ve between 0°C and 4°C.

16.

(b) 98^oC

Explanation: Using, $\frac{100-60}{60-0} = \frac{150-x}{x-20}$

or 40 (x - 20) = 60 (150 - x)

$\therefore$ x = 98^oC

17. **(a)** 30 kJ

Explanation: When a current I is flowing through a wire, then heat produced is,

$\Delta Q = I^2R\Delta t = 1^2 \times 100 \times 5 \times 60$

= 30,000 J = 30 kJ

Therefore, change in internal energy is 30 kJ. [$\because \Delta W = 0$,hence $\Delta Q = \Delta U$]

18.

(c) γ

Explanation: isothermal process: PV = constant

Differentiating, we get PdV + VdP = 0

$\Rightarrow$ Slope of isothermal curve $\left(\frac{dP}{dV}\right)_{iso} = \frac{-P}{V}$ ...(1)

Adiabtic process: PV^γ = constant

Differentiating, we get $P\gamma V^{\gamma-1}dV + V^\gamma dP$

$\Rightarrow$ Slope of adiabatic curve $\left(\frac{dP}{dV}\right)_{adi} = \frac{-\gamma P}{V}$ ...(2)

$\Rightarrow$ Ratio of slopes $\frac{\left(\frac{dP}{dV}\right)_{adi}}{\left(\frac{dP}{dV}\right)_{iso}} = \frac{(-\gamma P/V)}{-P/V} = \gamma$

19.

(b) 10.35×10^{-21} J

Explanation: 10.35×10^{-21} J

Explanation:

The average K.E of a gas molecules at temperature T is given by K = (3/2)k_BT

Now, T1 = 27^oC = 300K

$K_1 = 6.21 \times 10^{-21}$ J,

T2 = 227^oC = 500 K, K_2 = ?

We have,

$\frac{K_1}{K_2} = \frac{T_1}{T_2} \Rightarrow K_2 = \frac{T_2}{T_1} \times K_1$

$= \frac{500}{300} \times 6.21 \times 10^{-21}$

= 10.35×10^{-21} J

20.

(d) Straight line

Explanation: Straight line

21.

(d) $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

Explanation: $I = l_1 + l_2 + l_3$

$n_{string} = \frac{1}{2l} \times \sqrt{\frac{T}{m}}$

So, $n \propto \frac{1}{l}$

$\therefore l \propto \frac{1}{n}$

Hence, $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

22.

(c) 0.12 metre

Explanation: Given: phase difference δ = 60^o = $\frac{\pi}{3}$, v = 360 m/s $\nu = 500\ Hz$

So, wavelength of wave $\lambda = \frac{v}{\nu} = \frac{360}{500} = 0.72m$

Distance between two points $\Delta x = \frac{\lambda}{2\pi} \times \delta$

$\therefore \Delta x = \frac{0.72}{2\pi} \times \frac{\pi}{3}$ = 0.12m

23. **(a)** Sound waves in air are longitudinal while light waves transverse.

Explanation: Not only in air, but in any medium, sound waves are always longitudinal. Light waves are electromagnetic waves and are always transverse.

24.

(b) $2\sqrt{2}$ m/s

Explanation: Let x be the extension in the spring when 2 kg block leaves the contact with the ground. Then,

Kx = 2g

or x = $\frac{2g}{K} = \frac{2 \times 10}{40} = \frac{1}{2}m$

Now, from conservation of mechanical energy,

mgx = $\frac{1}{2}Kx^2 + \frac{1}{2}mv^2$

or v = $\sqrt{2gx - \frac{Kx^2}{m}}$

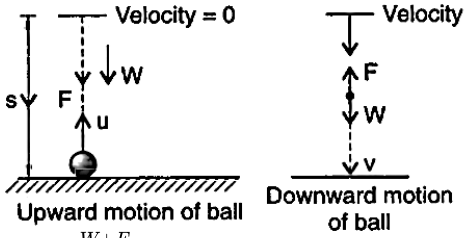
= $\sqrt{2 \times 10 \times \frac{1}{2} - \frac{40}{4 \times 5}}$

= $2\sqrt{2}$ m/s

25.

(c) $u\sqrt{\frac{W-F}{W+F}}$

Explanation: It is clear from figure, that **during upward motion of the ball.**



$a = -\frac{W+F}{m}$

Now, $v^2 - u^2 = 2as$

or, $0 - u^2 = 2\left[-\left(\frac{W+F}{m}\right)\right]s$

During downward motion of the ball

$a' = \frac{W-F}{m}$

Now, $v^2 - u^2 = 2a's$

or, $v^2 - 0 = 2a's = 2\left[\frac{W-F}{m}\right]\left[\frac{mu^2}{2(W+F)}\right]$

$\therefore v = u\sqrt{\frac{W-F}{W+F}}$

26.

(b) $\frac{4M_0G}{D_0^2}$

Explanation: Mass of the planet is M_0

diameter is D_0

radius R = $\frac{D_0}{2}$

g = $\frac{GM_0}{R^2}$

g = $\frac{GM_0}{\left(\frac{D_0}{2}\right)^2}$

G = $\frac{4M_0G}{D_0^2}$

Section B

27.

(d) A is false but R is true.

Explanation: If the frame of reference is rotated or translated, the vector does not change but its components may change.

28.

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

Explanation: According to the definition, displacement = velocity $\times$ time. Since displacement is a vector quantity so its value is equal to the signed sum of the area under the velocity-time graph.

When considering the signed sum areas above the X-axis are considering positive and areas below the X-axis are considering negative.

29.

(c) A is true but R is false.

Explanation: If a physical quantity is a vector, it must have a direction but converse may or may not be true. It means if a physical quantity has direction it may or may not be vector e.g. pressure, surface tension, current, etc. have direction but are not vectors.

30.

(c) A is true but R is false.

Explanation: A is true but R is false.

31. **(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.

32.

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

Explanation: At sufficiently high speed (comparable to the speed of light) the law of newtonian mechanics are no longer precisely correct but must be replaced by the more general relations predicted by the special relativity. The relativistic kinetic energy K is given by:

K = $\frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}} - mc^2$

The expression becomes very large as v becomes equal to c and predicts an infinitely large energy at v = c. This suggest physically would require an infinite quantity of energy which is not possible.

33.

(c) A is true but R is false.

Explanation: The assertion is true but the reason is false. The work done by a centripetal force is zero because it acts perpendicular to the circular path.

34.

(d) A is false but R is true.

Explanation: A carpenter drives large screws in hardwood. Therefore the torque required is large, which is obtained by increasing the radius of the handle. The watchmaker requires small torque and a smaller handle.

35.

(c) A is true but R is false.

Explanation: The centre of mass of a system of particles depends only on the masses of particles and the position of the particles. For calculating the centre of mass of a body or a system, a reference frame is fixed, The location of reference frame will not affect the location of centre of mass.

36. **(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.

37. **(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.

38.

(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.

39. **(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.

40.

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

Explanation: When the animals feel cold, they curl their bodies into a ball so as to decrease the surface area of their bodies. As total energy radiated by body varies directly as the surface area of the body, the loss of heat due to radiation would be reduced.

41.

(d) Both A and R are false.

Explanation: Specific heat of a body is the amount of heat required to raise the temperature of unit mass of the body through unit degree. When mass of a body is less than unity, then its thermal capacity is less than its specific heat and vice-versa.

42.

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

Explanation: Mean free path of molecules is given by

$\lambda = \frac{1}{\sqrt{2}n\pi d^2}$

where n is number of molecules per unit volume, d is diameter of molecules. From this $n = \frac{N}{V} = \frac{N}{m}\rho$. Therefore $\lambda \propto \frac{1}{\rho}$, mean free path is inversely proportional to the density of gas molecules.

43.

(d) A is false but R is true.

Explanation: As $v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$.

At same temperature, v_{rms} oc $\frac{1}{\sqrt{M}}$,

i.e., at the same temperature root-mean square speed of molecules of lighter gases will be more.

44.

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

Explanation: $v_{\text{rms}} = \sqrt{\frac{3KT}{M}}$ and $v_{\text{max.}} = \sqrt{\frac{2KT}{M}}$

$\therefore v_{rms} > v_{max}$. Most probable speed is that v^hich is possessed by the large number of molecules in the given system. There are other molecules whose speed is greater than this speed and some other, whose speed is less than this value. That is why root mean square speed of all the molecules become greater than the most probable speed.

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

Explanation: In a freely falling lift, a = g, so

$T = 2\pi\sqrt{\frac{l}{g-a}} = 2\pi\sqrt{\frac{l}{g-g}} = \infty$

46.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

Explanation: Assertion and reason both are correct statements but reason is not correct explanation for assertion.

47.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

Explanation: $T = 2\pi\sqrt{\frac{l}{g}}$

The value of g is less on moon, so T is large.

48.

(c) A is true but R is false.

Explanation: A is true but R is false.

49.

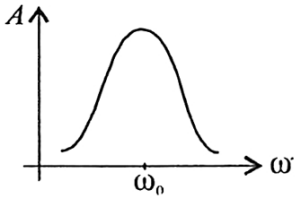
(b) Both A and R are true but R is not the correct explanation of A.

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

50.

(c) A is true but R is false.

Explanation: Resonance occurs when the frequency of the applied force becomes nearly equal to the natural frequency of vibration of the body. During resonance, the amplitude of the forced vibration reaches its maximum value.



So, if we increase further the frequency of the externally impressed periodic force, the amplitude of the forced vibrations does not increase but it decreases. So the given reason is false.