NEET ANSWER KEY & SOLUTIONS

SUBJECT :- PHYSICS

CLASS :- 11th **PAPER CODE :- CWT-4**

CHAPTER :- NEWTON'S LAWS OF MOTION

ANSWER KEY

1.	(C)	**2.**	(A)	**3.**	(C)	**4.**	(C)	**5.**	(D)	**6.**	(B)	**7.**	(D)
8.	(B)	**9.**	(C)	**10.**	(A)	**11.**	(B)	**12.**	(D)	**13.**	(D)	**14.**	(D)
15.	(A)	**16.**	(B)	**17.**	(C)	**18.**	(B)	**19.**	(A)	**20.**	(B)	**21.**	(B)
22.	(D)	**23.**	(B)	**24.**	(B)	**25.**	(D)	**26.**	(C)	**27.**	(C)	**28.**	(D)
29.	(C)	**30.**	(D)	**31.**	(D)	**32.**	(B)	**33.**	(B)	**34.**	(B)	**35.**	(C)
36.	(A)	**37.**	(B)	**38.**	(C)	**39.**	(A)	**40.**	(B)	**41.**	(C)	**42.**	(A)
43.	(B)	**44.**	(D)	**45.**	(B)	**46.**	(A)	**47.**	(B)	**48.**	(A)	**49.**	(C)
50.	(C)												

SOLUTIONS

SECTION-A

1. (C)

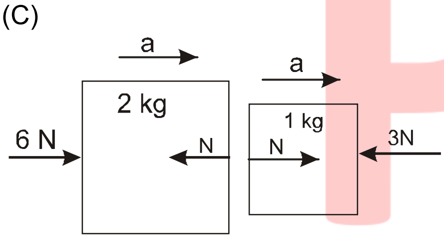
2. (A)

3. (C)

Sol. While the horse pulling a cart, the horse exerts a force on the ground, therefore from the third law of newton, the ground will also exerts a force on the horse that causes the horse to move forward.

4. (C)

Sol.



Both blocks are constrained to move with same acceleration.

6 – N = 2a [Newtons II law for 2 kg block]

N – 3 = 1a [Newtons II law for 1 kg block]

$\Rightarrow$ N = 4 Newton

5. (D)

Sol. v = u + at

$\Rightarrow 30 = 0 + \frac{F}{m} \times t$

$\Rightarrow 30 = \frac{6}{1} \times t$

$\Rightarrow$ t = 5 sec.

6. (B)

Sol. When bird starts flying in the cage, the weight of the bird is not measured. Therefore, weight of the bird cage assembly is now 1.5 kg or 1500 g.

7. (D)

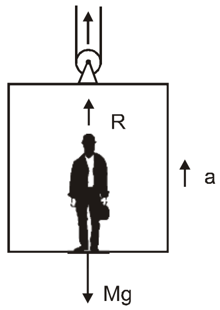
Sol. when acclerated upward N – mg = ma

$\Rightarrow$ N = m (g + a)

8. (B)

Sol. **Key Idea :** When lift is moving upwards, it weighs more than actual weight of man by a factor of ma.

Mass of man M = 80 kg



acceleration of lift, a = 5 m/s^2

When lift is moving upwards, the reading of weighing scale will be equal to R. The equation of motion gives

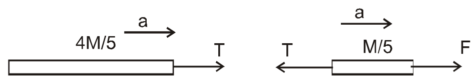
R – Mg = Ma

or R = Mg + Ma = M (g + a)

$\therefore$ R = 80 (10 + 5) = 80 × 15 = 1200 N

9. (C)

Sol.



Equation of motion

$F - T = \frac{M}{5} \times a$ ....(1)

$T = \frac{4M}{5} \times a$ ....(2)

Solving (1) and (2)

T = 4 N

10. (A)

Sol $(a)_{system} = \frac{20-10}{3} = \frac{10}{3} = \frac{g}{3}$

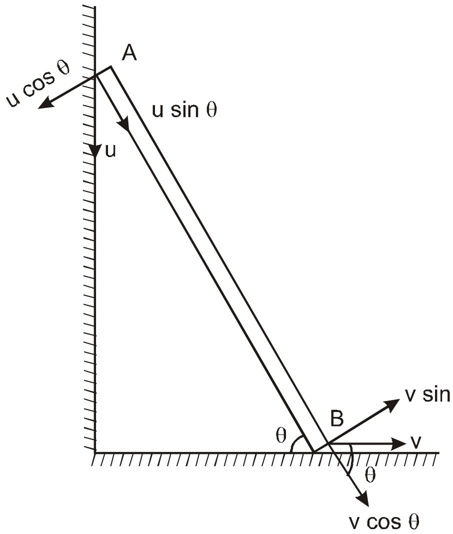
11. (B)

Sol. Since rod is rigid, its length can't increase.

$\therefore$ velocity of approach of A and B point of rod is zero.

$\Rightarrow$ $u \sin\theta - v\cos\theta = 0$

$\Rightarrow$ $v = u \tan\theta$



12. (D)

sol. $F = \frac{dp}{dt} = 0 + 2yt$

So, F is proportional to t

13. (D)

Sol. $P_L = 25$, $P_f = 0$, $\Delta t = 0.05$

$F = \frac{\Delta P}{\Delta t} = \frac{25}{0.05} = \frac{2500}{5} = 500\text{ N}$

14. (D)

Sol. Here : Mass of ship $m = 2 \times 10^7$ kg,

Force F - 25×10^5 N

Displacement s = 25 m

According to the Newton's second law of motion

$F = ma$

or $a = \frac{F}{m} = \frac{25\times10^5}{2\times10^7}$

The relation for final velocity is

$v^2 = u^2 + 2as$

or $v^2 = 0 + 2 \times (12.5 \times 10^{-2}) \times 25$

or $v^2 = \sqrt{6.25} = 2.5$ m/s

15. (A)

Sol. $F = ma = m \times \frac{\Delta v}{\Delta t}$

$= 0.1 \times \frac{10}{0.1} = 10\text{ N}$

16. (B)

Sol. $F = u\left(\frac{dm}{dt}\right) = 400 \times 0.05 = 20\text{ N}$

17. (C)

Sol. Key Idea : The force imparted (or impulse) by the ball to the hands of the player equal to the rate of change of linear momentum.

Force imparted = Rate of change of momentum

or $F = \frac{\Delta p}{\Delta t}$

or $F = \frac{p_1 - p_2}{\Delta t}$

or $F = \frac{m(v_1 - v_2)}{\Delta t}$

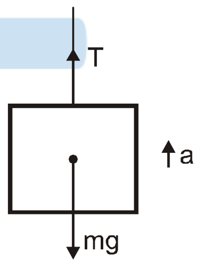
Here m = 0.150 kg, v_1 = 20 m/s v_2 = 0

$\Delta t = 0.1$ s

$\therefore$ $F = \frac{0.150\times(20-0)}{0.1} = 30\text{ N}$

18. (B)

Sol. Key Idea : The tension in the string during upward motion increases from weight of lift due to its upward acceleration.



when lift moves upward with same acceleration then

$T - mg = ma$

or $T = m(g + a)$

Given m = 1000 kg, a = 1 m/s^2, g = 9.8 m/s^2

Thus T = 1000 (9.8 + 1)

= 1000 × 10.8

= 10800 N

19. (A)

Sol. $F = ma = m \times \frac{\Delta v}{\Delta t}$

$= 0.1 \times \frac{10}{0.1} = 10\text{ N}$

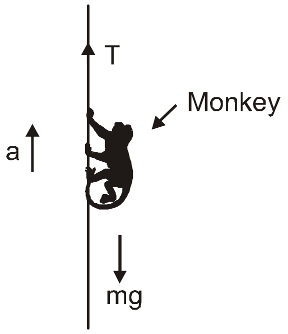
20. (B)

Sol. Maximum bearable tension in the rope

$T = 25 \times 10 = 250$ N

From the figure,

$T - mg = ma$



or $\quad a = \dfrac{T - mg}{m}$

Given

$m = 20$ kg, $\quad g = 10$ m/s^2,

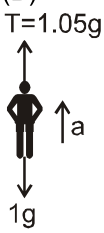
$T = 250$ N

Hence $a = \dfrac{250 - 20 \times 10}{20}$

$= \dfrac{50}{20} = 2.5$ m/s^2

21. (B)

Sol.



$1.05\,g - 1 \times g = 1 \times a \quad \Rightarrow \quad a = 0.5$ m/s^2

22. (D)

Sol. 1 ms^{-2}

20 ⟵ M ⟶ T

$F - T = m.a$

$20 - T = 6\ (1)$

$T = 14$ N

23. (B)

Sol Since downward force along the inclined plane $= mg\sin\theta = 5 \times 10 \times \sin 30° = 25$ N

24. (B)

Sol. $a = \dfrac{m_2 g - m_1 g \sin 30°}{m_1 + m_2}$

$a = \dfrac{2}{5} g = 4$ m/s^2

25. (D)

Sol. **Key Idea :** According to Newton's second law of motion force = mass × acceleration.

Here $\quad \vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$

$|F| = \sqrt{36 + 64 + 100}$

$= 10\sqrt{2}$ N $\quad a = 1$ ms^{-2}

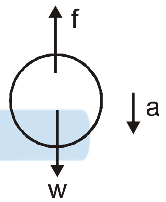
$\therefore m = \dfrac{10\sqrt{2}}{1} = 10\sqrt{2}$ kg

26. (C)

Sol. $T - mg = ma \quad \Rightarrow T = m\,(g + a) = 500\,(9.8 + 2) = 5900$ N

27. (C)

Sol.



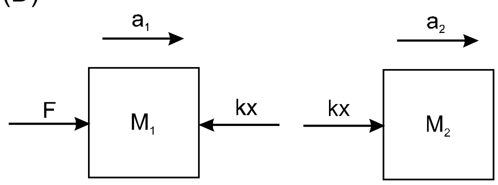
$w - f = ma \qquad\qquad w - ma = f$

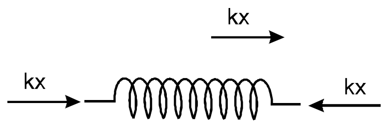
$w\left\{1 - \dfrac{m}{w}a\right\} = f \qquad w\left\{1 - \dfrac{m}{mg}a\right\} = f$

$w\left\{1 - \dfrac{a}{g}\right\} = f$

28. (D)

Sol.





$F - kx = M_1 a_1$ [Newton's II law for M_1]

$kx = M_2 a_2$ [Newton's II law for M_2]

By adding both equations.

$F = M_1 a_1 + M_2 a_2$

$\Rightarrow a_2 = \dfrac{F - M_1 a_1}{M_2}$

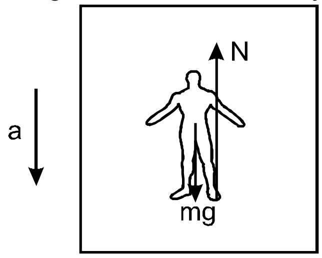
29. (C)

Sol. $(a)_{system} = \dfrac{10}{2 + 3 + 5} = 1$

so $T_1 = (3 + 5)\,(1)_{system} = 8 \times 1 = 8$ N

30. (D)

Sol. Weight of man in stationary lift is mg.



mg – N = ma [Newton's II law for man]

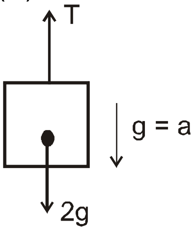
$\Rightarrow$ N = m (g – a)

Weight of man in moving lift is equal to N.

$\Rightarrow \dfrac{m\ \ g}{m\ \ (g-a)} = \dfrac{3}{2}$ $\Rightarrow a = \dfrac{g}{3}$

31. (D)

Sol.



Reading of spring balance is tension

2g – T = 2 a

2g – 2a = T (a = g)

0 = T

32. (B)

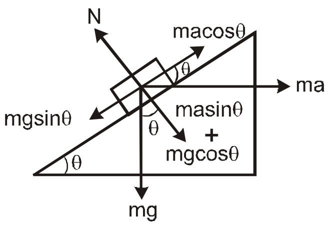
Sol. ma cosθ = mg sinθ

a = g tanθ

N = mg cosθ + ma sinθ

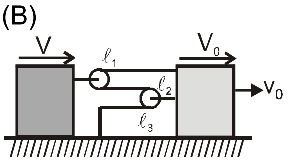
$= mg\cos\theta + \dfrac{mg\sin^2\theta}{\cos\theta}$

$= \dfrac{mg}{\cos\theta}$



33. (B)

Sol.



$\ell'_1 + \ell'_2 + \ell'_3 = 0$

$(-v + v_0) + (-v + v_0) + (0 + v_0) = 0$

$3\ v_0 = 2\ v \Rightarrow v = \dfrac{3v_0}{2}$

$\Rightarrow V_{AB} = V_A - V_B = V - V_0$

$= \dfrac{3V_0}{2} - V_0 = \dfrac{V_0}{2}$

34. (B)

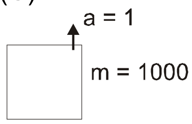
Sol. When stone hits the ground momentum $P = m\sqrt{2gh}$

when some stone dropped from 2h (100% of initial) then momentum $P' = m\sqrt{2g(2h)} = \sqrt{2}P$

Which is is changed by 41% of initial.

35. (C)

Sol.



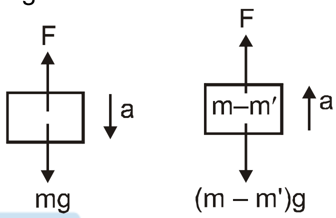
T – 1000g = 1000 × 1

T = 1000 × 11

SECTION-B

36. (A)

Sol. mg – F = ma .....(1)



F – (m – m')g = (m – m')a

from (1)

F – mg + m′g = ma – m′a

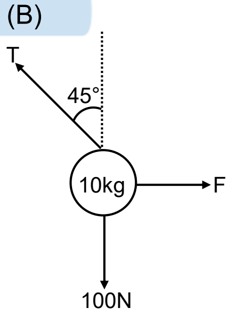
mg – ma – mg + m′g = ma – m′a

m′(g + a) = 2ma

$m' = \dfrac{2ma}{g+a}$

37. (B)

Sol.



$\dfrac{T}{\sqrt{2}} = 100$

$\dfrac{T}{\sqrt{2}} = F$

F = 100 N

38. (C)

Sol. $F = \dfrac{dp}{dt} \Rightarrow Kt = \dfrac{dp}{dt}$

$\int_P^{3P} dP = \int_0^t Ktdt \Rightarrow 3P - P = \dfrac{Kt^2}{2}$

$\Rightarrow t = 2\sqrt{\dfrac{P}{K}}$

39. (A)

Sol. The correct option is A Both Assertion and Reason are correct and Reasion is the correct explanation for Assertion The value of coefficient of friction is lowered due to wetting of the surface. Hence the frictional force becomes less and vehicle takes longer to stop after sliding for some distance.

40. (B)

Sol. In uniform circular motion of a body the speed remains constant but velocity changes as direction of motion changes.
As linear momentum = mass × velocity, therefore linear momentum of a body changes in a circle.
On the other hand, if the body is moving uniformly along a straight line then its velocity remains constant and hence acceleration is equal to zero. So force is equal to zero.

41. (C)

Sol. For given condition we can apply direct formula $l_1 = \left(\frac{\mu}{\mu+1}\right) l$

42. (A)

Sol. $l' = \left(\frac{\mu}{\mu+1}\right) l = \left(\frac{0.25}{0.25+1}\right) l = \frac{l}{5} = 20\%$ of *l*.

43. (B)

44. (D)

Sol. In the given condition the required centripetal force is provided by frictional force between the road and tyre.

$$\frac{mv^2}{R} = \mu mg \quad \therefore \quad v = \sqrt{\mu Rg}$$

45. (B)

Sol. $s = \frac{u^2}{2\mu g} = \frac{(20)^2}{2 \times 0.5 \times 10} = 40\ m$

46. (A)

Sol. $F_l = \mu mg = 0.6 \times 1 \times 9.8 = 5.88\ N$

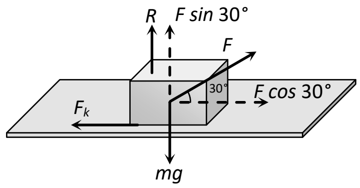
Pseudo force on the block = $ma = 1 \times 5 = 5\ N$

Pseudo is less then limiting friction hence static force of friction = 5 *N.*

47. (B)

48. (A)

Sol.



Kinetic friction = $\mu_k R = 0.2(mg - F\sin 30°)$

$$= 0.2\left(5 \times 10 - 40 \times \frac{1}{2}\right) = 0.2(50 - 20) = 6\ N$$

Acceleration of the block

$$= \frac{F\cos 30° - \text{Kinetic friction}}{\text{Mass}}$$

$$= \frac{40 \times \frac{\sqrt{3}}{2} - 6}{5} = 5.73\ m/s^2$$

49. (C)

50. (C)

Sol. Newton's first law defines force. Newton's second law given us a measure of force. Impulse given us the effect of force. Recoiling of gun is accounted for by Newton's 3rd law.