SAFE HANDS & IIT-ian's PACE

LEAP TEST-03 (NEET) ANS KEY Dt. 05-12-2023

PHYSICS	
Q. NO.	[ANS]
1	B
2	D
3	D
4	B
5	D
6	D
7	C
8	B
9	B
10	A
11	B
12	B
13	C
14	C
15	A
16	A
17	C
18	D
19	A
20	A
21	A
22	A
23	A
24	D
25	C
26	B
27	D
28	C
29	D
30	C
31	A
32	D
33	D
34	A
35	D
36	A
37	C
38	D
39	B
40	C
41	A
42	B
43	D
44	D
45	B

CHEMISTRY	
Q. NO.	[ANS]
46	A
47	B
48	A
49	D
50	D
51	C
52	D
53	C
54	B
55	B
56	B
57	C
58	C
59	A
60	D
61	A
62	A
63	B
64	B
65	A
66	B
67	A
68	D
69	A
70	A
71	D
72	C
73	B
74	B
75	C
76	A
77	C
78	B
79	B
80	D
81	A
82	A
83	A
84	A
85	C
86	A
87	B
88	A
89	A
90	A

BIOLOGY	
Q. NO.	[ANS]
91	B
92	B
93	C
94	A
95	B
96	C
97	C
98	D
99	C
100	D
101	D
102	D
103	B
104	B
105	C
106	C
107	B
108	A
109	A
110	B
111	C
112	C
113	A
114	C
115	C
116	C
117	D
118	A
119	C
120	C
121	B
122	B
123	B
124	B
125	C
126	A
127	A
128	A
129	B
130	C
131	A
132	C
133	A
134	D
135	C

BIOLOGY	
Q. NO.	[ANS]
136	C
137	B
138	A
139	D
140	B
141	B
142	C
143	C
144	A
145	D
146	B
147	A
148	C
149	C
150	D
151	C
152	B
153	C
154	D
155	D
156	A
157	C
158	B
159	C
160	A
161	C
162	D
163	A
164	A
165	C
166	A
167	A
168	C
169	B
170	C
171	A
172	D
173	C
174	C
175	B
176	A
177	B
178	C
179	D
180	D

SEE PHYSICS SOLUTIONS ON NEXT PAGE....

SAFE HANDS & PACE

LT 3 (NEET) Physics Solutions

: ANSWER KEY :

1)	b	2)	d	3)	d	4)	b	29)	d	30)	c	31)	a	32)	d
5)	d	6)	d	7)	c	8)	b	33)	d	34)	a	35)	d	36)	a
9)	b	10)	a	11)	b	12)	b	37)	c	38)	d	39)	b	40)	c
13)	C	14)	c	15)	a	16)	a	41)	a	42)	b	43)	d	44)	d
17)	c	18)	d	19)	a	20)	a	45)	b						
21)	a	22)	a	23)	a	24)	d								
25)	c	26)	b	27)	d	28)	c								

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 **(b)**

2 **(d)**

3 **(d)**

4 **(b)**

As the spring balance are massless therefore both the scales read $M\ kg$ each

5 **(d)**

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

Force $F = 25 \times 10^5 N$

Displacement $s = 25\ m$

According to the Newton's second law of motion

$F = ma$

$\Rightarrow a = \frac{F}{m} = \frac{25 \times 10^5}{2 \times 10^7} = 12.5 \times 10^{-2}\ m/s^2$

The relation for final velocity is

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

$\Rightarrow v = \sqrt{6.25} = 2.5\ m/s$

6 **(d)**

Given that, $u = 10\ \text{ms}^{-1}, \frac{dm}{dt} = 2\ \text{kgs}^{-1}$

Total mass of the truck, $M = (100 + 100)\ \text{kg} = 200\ \text{kg}$

We know that,

$F = \frac{u\ dm}{dt}$

or $F = 10 \times 2 = 20\ \text{N}$

or $Ma = 20\ \text{N}$

or $200a = 20\ \text{N}$

or $a = \frac{20}{200} ms^{-2} = \frac{1}{10} ms^{-2}$

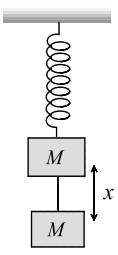
now, we know that,

$a = \frac{v - u}{t} \quad (u = 10 ms^{-2}, t = 50 s)$

$\Longrightarrow \frac{1}{10} = \frac{v - 10}{50} \Longrightarrow v = 15\ \text{ms}^{-1}$

8 **(b)**

Work done in max extension = stored $P.E.$



$\Rightarrow Mg \times x = \frac{1}{2} kx^2$

$\Rightarrow x = \frac{2Mg}{k}$

9 **(b)**

Thrust force by rocket

$F_t = v_r\left(-\frac{dm}{dt}\right)$ (upwards)

Weight of the rocket

$w = mg$ (downwards)

Net force on the rocket

$F_{\text{net}} = f_t - w$

$\Rightarrow \quad ma = v_r\left(\frac{-dm}{dt}\right) - mg$

$\Rightarrow \quad ma = v_r\left(\frac{-dm}{dt}\right) = \frac{m(g+a)}{v_r}$

$\therefore$ Rate of the ejected per second

$= \frac{5000(10+20)}{800} = \frac{5000 \times 30}{800}$

$= 187.5 \text{ kgs}^{-1}$

10 **(a)**

When

$P = mg\ (\sin\theta - \mu\cos\theta)$

$f = \mu mg\cos\theta$ (upwards)

when $P = mg\sin\theta$

$f = 0$

and when $P = mg(\sin\theta + \mu\cos\theta)$

$f = \mu\, mg\cos\theta$ (downwards)

Hence, friction is first positive, then zero and then negative.

11 **(b)**

Initially, the weight of load L is the force on the system of mass 8 kg

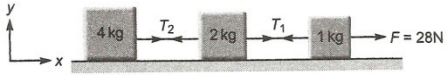
Acceleration $= \frac{2\times10}{8} = \frac{20}{8}$ units

Towards the end, force $= (2+1) \times 10$N = 30N

So, acceleration now is $\frac{30}{8}$ units

12 **(b)**

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



Using , $\sum F_x = ma_x$

or $28 = (4+2+1)a$

or $a = \frac{28}{7} = 4 \text{ ms}^{-2}$

13 **(a)**

Slope of surface should change from one constant value (non zero) to another constant value (non zero) in terms of sign because force is constant piecewise

14 **(c)**

15 **(a)**

Retardation in upward motion $= g(\sin\theta + \mu\cos\theta)$

$\therefore$ Force required just to move up $F_{up} = mg(\sin\theta + \mu\cos\theta)$

Similarly for down ward motion $a = g(\sin\theta - \mu\cos\theta)$

$\therefore$ Force required just to prevent the body sliding down

$F_{dn} = mg(\sin\theta - \mu\cos\theta)$

According to problem $F_{up} = 2F_{dn}$

$\Rightarrow mg(\sin\theta + \mu\cos\theta) = 2mg(\sin\theta - \mu\cos\theta)$

$\Rightarrow \sin\theta + \mu\cos\theta = 2\sin\theta - 2\mu\cos\theta$

$\Rightarrow 3\mu\cos\theta = \sin\theta \Rightarrow \tan\theta\, 3\mu$

$\Rightarrow\ \theta = \tan^{-1}(3\mu) = \tan^{-1}(3 \times 0.25) = \tan^{-1}(0.75) = 36.8°$

16 **(a)**

Work done against gravity $= mgh = 2 \times 10 \times 10 = 200\,J$

Work done against friction $=$ (Total work done $-$ work done against gravity) $= 300 - 200 = 100\,J$

17 **(c)**

Apparent weight of the man, $R = m(g + a)$

$= m(g + 4g) = 5mg$

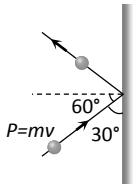
18 **(d)**

$F = mnv = 150 \times 10^{-3} \times 20 \times 800 = 2400\,N$

19 **(a)**

During collision of ball with the wall horizontal momentum changes (vertical momentum remains constant)

$$\therefore F = \frac{\text{Change in horizontal momentum}}{\text{Time of contact}}$$

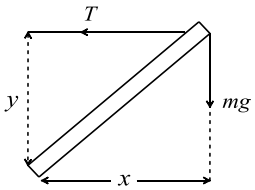


$$= \frac{2P\cos\theta}{0.1} = \frac{2mv\cos\theta}{0.1}$$

$$= \frac{2 \times 0.1 \times 10 \times \cos 60°}{0.1} = 10\,N$$

20 **(a)**

For equilibrium, $mg.x = T \times y \Rightarrow T = \frac{mg.x}{y}$



For T to be minimum y should be maximum

21 **(a)**

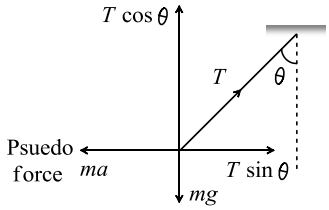
$Mg' = Mg + M(4g)$ or $Mg' = 5\,Mg$

22 **(a)**

$T\cos\theta = mg$

$T\sin\theta = ma$

$$\tan\theta = \frac{a}{g}$$



$\therefore \theta = \tan^{-1}(a/g)$

23 (a)

Since acceleration of lift is zero

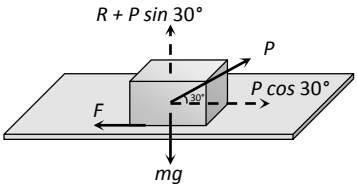
24 (d)

$v = u - at \Rightarrow t = \frac{u}{a}$ [As $v = 0$]

$t = \frac{u \times m}{F} = \frac{30 \times 1000}{5000} = 6\ sec$

25 (c)

Normal reaction $R = mg - P\sin 30° = mg - \frac{P}{2}$



$\therefore$ Limiting friction between body and surface is given by, $F = \mu R = \mu\left(mg - \frac{P}{2}\right)$

26 (b)

From the formula

$F = ma$

$100 = 5a$

$\Rightarrow \quad a = 20\ \text{cms}^{-2}$

from equation of motion

$v = u + at = 0 + 20 \times 10$

$v = 200\ \text{cms}^{-1}$

27 (d)

$\mu_s = \frac{\text{Length of the chain hanging from the table}}{\text{Length of the chain lying on the table}}$

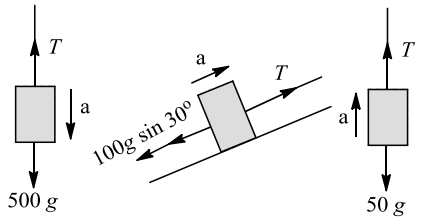
$= \frac{l/3}{l - l/3} = \frac{l/3}{2l/3} = \frac{1}{2}$

28 (c)

$500g - T = 500a$

$T - 100\text{g}\sin 30° - T' = 100a$

or $\quad T - T' - 50\text{g} = 100a$



Again, $T' - 50\text{g} = 50a$

From Eqs. (ii) and (iii)

$T - 100\text{g} = 150a$

Adding Eqs. (i) and (iv), 400g = 650 a or $a = \frac{400g}{650} = \frac{8g}{13}$

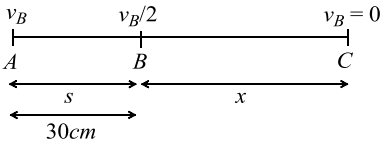
This acceleration is downwards

29 **(d)**

In terms of three significant figure

Momentum $P = mv = 3.513 \times 5.00 = 17.6$

30 **(c)**



Let bullet is fired with velocity v_B at point A and its velocity becomes half when it travels a distance s and reaches at point B. When it reaches at point C, it comes to rest and travels a distance x

From A to B, using, $v^2 - u^2 = 2as$

$\Rightarrow \left(\frac{v_B}{2}\right)^2 - v_B^2 = 2as \Rightarrow \frac{v_B^2}{4} - v_B^2 = 2as$

$\Rightarrow \frac{-3v_B^2}{4} = 2as \Rightarrow a = \frac{-3v_B^2}{8s}$

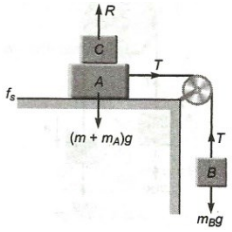
$\therefore$ From B to C, using $v^2 - u^2 = 2as$

$0^2 - \left(\frac{v_B}{2}\right)^2 = 2as \Rightarrow \frac{-v_B^2}{4} = 2\left(\frac{-3v_B^2}{8s}\right)x$

$\Rightarrow x = \frac{8s}{4 \times 6} = \frac{8 \times 30}{24} = 10\ cm$

31 **(a)**

The following free body diagram shows the various forces acting on the system. Let m be the minimum mass of block C and f_s be the maximum value of static friction.



For block *A*

$R = (m + m_A)g, f_s = T$

$\therefore\ \mu(m + m_A)g = T$ ...(i)

For block *B*

$T = m_B g$ ...(ii)

From Eqs. (i) and (ii), we get

$m = \frac{m_B - \mu\, m_A}{\mu}$

$m = \frac{10 - 0.4 \times 15}{0.4} = 10\ \text{kg}$

32 **(d)**

$T = \frac{2 \times m_B m_C}{m_A + m_B + m_C} \times g = \frac{2 \times 1 \times 5}{3 + 1 + 5} \times g = \frac{10}{9} g$

33 **(d)**

$m = 5kg, a = 5\ m/s^2$

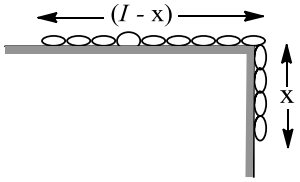
$\because F \leq fr_{\max} \leq \mu N$

$F = ma = 5 \times 5 = 25N$

$\therefore fr = F \Rightarrow fr = 25N$

34 **(a)**

Let length of chain be l and mass m. Let a part x of chain can hang over one edge of table having coefficient of friction



$\therefore$ Pulling force, $F = \frac{mx}{l}\mathrm{g}$

and friction force, $f = \mu N = \mu\frac{m}{l}(l-x)\mathrm{g}$

For equilibrium, $F = f$, hence

$\frac{mx}{l}.\mathrm{g} = \mu\frac{m}{l}(l-x)\mathrm{g} = 0.25\frac{m}{l}(l-x)\mathrm{g}$

$\Rightarrow\ x = \frac{l}{5}$ or $\frac{x}{l} = \frac{1}{5} = 20\%$

35 **(d)**

Special theory of relativity is based on two postulates

(i) All laws of physics are the same in all inertial reference frames

(ii) The speed of light in vacuum has the same value in all inertial frames, regardless of the velocity of the observer or the velocity of source emitting the light

36 **(a)**

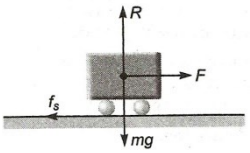
Work done = Force $\times$ displacement $= \mu\, mg \times (v \times t)$

$W = (0.2) \times 2 \times 9.8 \times 2 \times 5\ joule$

Heat generated $Q = \frac{W}{J} = \frac{0.2\times2\times9.8\times2\times5}{4.2} = 9.33\ cal$

37 **(c)**

There is a static friction between tyres and road, so frictional force cause the retardation in velocity of a automobile.



Free body diagram of automobile is shown. From Newton's third law

$F = f_s = \mu\, R = \mu\, mg$

Where m is the mass of automobile.

Also, $F = ma$

$ma = \mu\, mg$

$\Longrightarrow\ a = \text{retardation} = \mu\, g = 0.5\, g$

Let automobile stops at a distance x, then from equation of motion

$v^2 = v^2 - 2\, ax$

$\text{Given,, } v = 0, u = 72\ \mathrm{kmh^{-1}} = 72 \times \frac{5}{18}\mathrm{ms^{-1}} = 20\ \mathrm{ms^{-1}},$

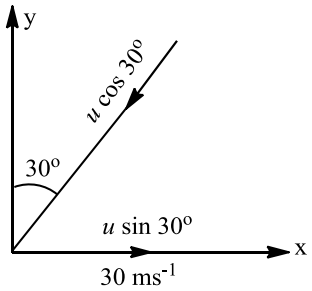
$g = 9.8\ \mathrm{ms^{-2}}$

$\therefore\ 0^2 = (20)^2 - 2 \times 0.5 \times 9.8x$

$\Longrightarrow\ x = \frac{20 \times 20}{2 \times 0.5 \times 9.8} = 40.8\ \mathrm{m}$

38 **(d)**

If a constant force **F** is applied on a body for a short interval of time Δt, then the impulse of this force is $F \times \Delta t$



Since, impulse = change in momentum (Δp)

$\therefore \quad F \times \Delta t = \Delta p$

$\Longrightarrow \quad F = \dfrac{\Delta p}{\Delta t}$

Change in x-direction

$$F = \frac{m[30 - (-15 \sin 30°)]}{0.01}$$

$$F = \frac{0.1 \times 37.5}{0.01} = 375 \text{ N}$$

39 **(b)**

$$a = \left(\frac{m_1 - m_2}{m_1 + m_2}\right) g \Rightarrow \frac{g}{8} = \left(\frac{m_1 - m_2}{m_1 + m_2}\right) g \Rightarrow \frac{m_1}{m_2} = \frac{9}{7}$$

40 **(c)**

Force applied by engine $= 6m$

When two cars are pulled,

$(m + m)a = 6m$

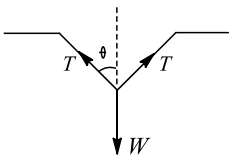
$2ma = 6m$

$a = 3 \text{ ms}^{-2}$

Assertion - Reasoning Type

41 **(a)**

As is clear from figure



$2T \cos \theta = W$

$$T = \frac{W}{2 \cos \theta}$$

For the string to become horizontal,

$\theta = 90°, \cos \theta = \cos 90° = 0$

$$\therefore T = \frac{W}{2 \cos 90°} = \infty$$

Both the assertion and reason are true and latter is correct explanation of the former

43 **(d)**

Acceleration down a rough inclined plane

$a = g(\sin\theta - \mu\cos\theta)$ and this is less than g

44 **(d)**

Static friction alone is a self adjusting force and not all types of friction. Assertion is false, reason is true

45 **(b)**

Statement 1 is practical experience based; so it is true. Statement 2 is also true but is not the correct explanation of Statement 1. Correct explanation is " there is increase in normal reaction when the object is pushed and there is decreases in normal reaction when object is pulled"