SAFE HANDS & IIT-ian's PACE

MAJOR TEST-09 (NB-15 NEET) ANS KEY Dt. 07-09-2023

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

CHEMISTRY	
Q. NO.	[ANS]
51	A
52	A
53	A
54	C
55	C
56	B
57	C
58	B
59	D
60	C
61	D
62	B
63	A
64	A
65	B
66	A
67	B
68	C
69	D
70	B
71	A
72	D
73	C
74	D
75	A
76	A
77	B
78	A
79	B
80	A
81	B
82	B
83	A
84	C
85	A
86	A
87	C
88	C
89	C
90	B
91	C
92	D
93	C
94	A
95	D
96	C
97	B
98	C
99	A
100	D

BOTANY	
Q. NO.	[ANS]
101	C
102	A
103	A
104	D
105	A
106	B
107	A
108	C
109	B
110	B
111	A
112	C
113	A
114	B
115	D
116	B
117	A
118	B
119	D
120	C
121	B
122	D
123	A
124	C
125	A
126	D
127	D
128	C
129	C
130	B
131	D
132	D
133	C
134	A
135	D
136	B
137	B
138	A
139	C
140	C
141	B
142	A
143	A
144	A
145	A
146	C
147	D
148	A
149	A
150	A

ZOOLOGY	
Q. NO.	[ANS]
151	A
152	C
153	B
154	C
155	A
156	B
157	D
158	C
159	B
160	D
161	A
162	A
163	C
164	C
165	C
166	A
167	D
168	B
169	D
170	C
171	D
172	D
173	A
174	C
175	C
176	D
177	C
178	B
179	C
180	B
181	B
182	C
183	A
184	B
185	B
186	B
187	D
188	D
189	D
190	A
191	D
192	C
193	A
194	C
195	D
196	D
197	A
198	C
199	B
200	A

MAJOR TEST 9
PHYSICS SOLUTIONS (NEET)

: ANSWER KEY :

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

: HINTS AND SOLUTIONS :

1 **(d)**

$1\ newton = 10^{-5}\ dyne$

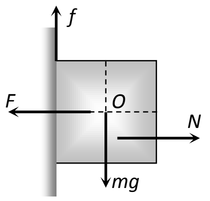
2 **(d)**

As the block remains stationary therefore

For translatory equilibrium

$\sum F_x = 0 \therefore F = N$

and $\sum F_y = 0 \therefore f = mg$



For rotational equilibrium $\sum \tau = 0$

By taking the torque of different forces about point 0

$\overrightarrow{\tau_F} + \overrightarrow{\tau_f} + \overrightarrow{\tau_N} + \overrightarrow{\tau_{mg}} = 0$

As F and mg passing through point O

$\therefore \overrightarrow{\tau_1} + \overrightarrow{\tau_N} = 0$

As $\overrightarrow{\tau_f} \neq 0 \ \therefore \overrightarrow{\tau_N} \neq 0$ and torque by friction and normal reaction will be in opposite direction

3 **(c)**

For charge q placed at the centre of circle, the circular path is an equipotential surface and hence works done along all paths AB or AC or AD or AE is zero.

4 **(a)**

By using $W = Q(\mathbf{E}.\Delta\mathbf{r})$

$\Rightarrow \mathrm{W} = Q[e_1\hat{\boldsymbol{i}} + e_2\hat{\boldsymbol{j}} + e_3\hat{\boldsymbol{k}}).(a\hat{\boldsymbol{i}} + b\hat{\boldsymbol{j}})]$

$= Q(e_1a + e_2b)$

5 **(b)**

The effective capacitance of three capacitor connected in parallel=$3C$

When $3C$ is connected in series to C

$$C_{\mathrm{resul}} = \frac{3C \times C}{3C + C} = 3.75$$

$$\Rightarrow \qquad C = 5\mu\mathrm{F}$$

6 **(b)**

$$\frac{1}{C_s} = \frac{1}{4} + \frac{1}{6} + \frac{1}{12} = \frac{3+2+1}{12} = \frac{6}{12} = \frac{1}{2}$$

$C_s = 2\ \mu\mathrm{F}$

$C_p = 4 + 6 + 12 = 22\ \mu\mathrm{F}$

$$\frac{C_s}{C_p} = \frac{2}{22} = \frac{1}{11}$$

7 **(c)**

Power $= \frac{W}{t}$ If W is constant then $P \propto \frac{1}{t}$

$i.e. \frac{P_1}{P_2} = \frac{t_2}{t_1} = \frac{20}{10} = \frac{2}{1}$

8 **(b)**

$$10^6 = \frac{LAdg}{A}$$

$$\therefore \ L = \frac{10^6}{3 \times 10^3 \times 9.8}\mathrm{m} = \frac{1000}{3 \times 9.8} = 34.01\mathrm{m}$$

9 **(a)**

Limiting friction between block and slab $= \mu_s m_A g$

$= 0.6 \times 10 \times 9.8 = 58.8\ N$

But applied force on block A is 100 N. So the block will slip over a slab

Now kinetic friction works between block and slab

$F_k = \mu_k m_A g = 0.4 \times 10 \times 9.8 = 39.2\ N$

This kinetic friction helps to move the slab

$\therefore$ Acceleration of slab $= \frac{39.2}{m_B} = \frac{39.2}{40}$

$= 0.98\ m/s^2$

10 **(b)**

$R \propto l^2 \Rightarrow$ If l doubled then R becomes 4 times

11 **(a)**

Because with rise in temperature resistance of conductor increases, so graph between V and i becomes non linear

12 **(c)**

$R_2, R_3 and\ R_4$ are in parallel order, so their equivalent resistance

$$\frac{1}{R'} = \frac{1}{R^2} + \frac{1}{R^3} + \frac{1}{R^4}$$

$$= \frac{1}{50} + \frac{1}{50} + \frac{1}{75}$$

$$= \frac{30 + 30 + 20}{1500}$$

$$= \frac{80}{1500} = \frac{4}{75}$$

$$\therefore \ R' = \frac{75}{4}\Omega$$

$$\mathrm{R} = \mathrm{R}_1 + \mathrm{R}' = 100 + \frac{75}{4}$$

$$= \frac{475}{4}\Omega = 118.75\Omega$$

13 **(b)**

$\frac{T^2}{R^3} = \frac{T^2}{d^3} = \frac{1}{n^2d^3} =$ constant

$\therefore n_1^2 d_1^3 = n_2^2 d_2^3$ [where $n =$ frequency]

14 **(a)**

The rms velocity of an ideal gas is

$$v_{rms} = \sqrt{\frac{3RT}{M}}$$

Where T is the absolute temperature and M is the molar mass of an ideal gas

Since M remains the same

$\therefore v_{rms} \propto \sqrt{T}$

$$\frac{v'_{rms}}{v_{rms}} = \sqrt{\frac{T'}{T}} = \sqrt{\frac{3T}{T}}$$

$\Rightarrow v'rms = \sqrt{3}v_{rms}$

15 **(d)**

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

For planoconvex lens

$R_1 = \infty, R_2 = -R = -1.5\ cm, \mu = 1.4$

$$\therefore \frac{1}{f} = (1.4 - 1)\left(0 + \frac{1}{15}\right)$$

$$or \frac{1}{f} = 0.4 \times \frac{1}{15}$$

Therefore, power of the lens in diopter

$$P = \frac{100}{f} = \frac{40}{15} = 2.66\ D$$

16 **(b)**

The far and near point for normal eye are usually taken to be infinite and 25 cm respectively, ie, a normal eye can see very distant objects clearly but near objects only if they are at a distance greater than 25 cm from the eye. The ability of eye to see objects from infinite distance to 25 cm from it is called power of accommodation.

18 **(b)**

$$E = \frac{V}{d} = \frac{10}{2 \times 10^{-2}} = 500\ N/C$$

19 **(d)**

$\phi = \frac{\sum q}{\varepsilon_0} = 0$ *i.e.* net charge on dipole is zero

20 **(c)**

Inside a conducting body, potential is same everywhere and equals to the potential of it's surface

22 **(b)**

Average velocity is that uniform velocity with which the object will cover the same displacement in same interval of time as it does with its actual variable velocity during that time interval.

Here, total distance covered

$$= (3\ \text{ms}^{-1} \times 20\ \text{s}) + (4\ \text{ms}^{-1} \times 20\ \text{s}) + (5\ ms^{-1} \times 20\ \text{s})$$

$$= (60 + 80 + 100) = 240\ \text{m}$$

Total time taken $= 20 + 20 + 20 = 60$ s

$$\therefore \text{Average velocity} = \frac{240}{60} = 4\ \text{ms}^{-1}$$

23 **(a)**

$$v_1 = \frac{V}{A_1} = \frac{12 \times 10^{-6}}{6 \times 10^{-6}} = 2\ \text{ms}^{-1} = 200\ \text{cms}^{-1}$$

$$v_2 = \frac{V}{A_2} = \frac{12 \times 10^{-6}}{3 \times 10^{-6}} = 4\ \text{ms}^{-1} = 400\ \text{cms}^{-1}$$

$$p_A - p_B = \rho g(h_2 - h_1) + \frac{\rho}{2}(v_2^2 - v_1^2)$$

$$= 1 \times 1000(100) + \frac{1}{2}(16 \times 10^4 - 4 \times 10^4)$$

$$= 10^5 + 6 \times 10^4 = 1.6 \times 10^5\ \text{dyne cm}^{-2}$$

24 **(c)**

In C.G.S. $B_{axial} = 9 = \frac{2M}{x^3}$ ...(i)

$$B_{\text{equatorial}} = \frac{M}{\left(\frac{x}{2}\right)^3} = \frac{8M}{x^3} \quad \text{... (ii)}$$

From equation (i) and (ii), $B_{\text{equatorial}} = 36\ gauss$

25 **(a)**

In SI unit of pole strength is Amp-meter. Here, the pole strength is given in Weber, which is the unit of $(\mu_0 m)$.

$\therefore \mu_0 m = 10^{-3}$Wb

$$m = \frac{10^{-3}}{\mu_0}$$

Magnetic moment of magnet

$$M = m \times 2l = \frac{10^{-3}}{\mu_0}(0.1) = \frac{10^{-4}}{\mu_0}.$$

Torque, $\tau = MB\sin\theta$

$$= \frac{10^{-4}}{4\pi \times 10^{-7}}(4\pi \times 10^{-3}) \times \frac{1}{2} = 0.5\ \text{Nm}$$

26 **(a)**

Water is dia-magnetic.

27 **(b)**

Both the particles will meet at C, if their time of flight is the same. The time of flight of A is

$$T = \frac{2u \sin\theta}{g} = \frac{2 \times 10 \times \sin 60°}{10} = \sqrt{3}\text{s}$$

For vertical downward motion of particle B from B to C

We have

$$h = \frac{1}{2}gT^2 = \frac{1}{2} \times 10 \times (\sqrt{3})^2 = 15\ \text{m}$$

28 **(c)**

Given, a=0.2m

$v = 360\ ms^{-1}, \lambda = 60m$

Equations of transverse wave travelling along positive x-axis

$$y = a \sin 2\pi \left[\frac{t}{T} - \frac{x}{\lambda}\right]$$

Or

$$y = a \sin 2\pi \left[\frac{v}{\lambda} t - \frac{x}{\lambda}\right]$$

$$y = 0.2 \sin 2\pi \left[6t - \frac{x}{60}\right]$$

29 **(a)**

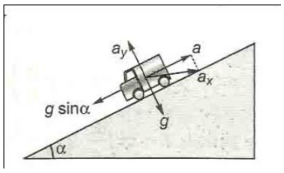
The acceleration of the vehicle down the plane= $g \sin \alpha$.

The reaction force acting on the bob of pendulum gives it an acceleration $a(= g \sin \alpha)$ up the plane. This acceleration has two rectangular components,

$a_x = a \cos \alpha = g \sin \alpha \cos \alpha$

And $a_y = a \sin \alpha = g\ \sin^2 \alpha$ as shown in figure.

The effective acceleration due to gravity acting on the bob is given by



$$g_{eff}^2 = a_x^2 + (g - a_y)^2 = a_x^2 g^2 + a_y^2 - 2g a_y$$

$$= g^2 \sin^2 \alpha \cos^2 \alpha + g^2 \sin^4 \alpha - 2g \times g \sin^2 \alpha$$

$$= g^2 \sin^2 \alpha (\cos^2 \alpha + \sin^2 \alpha) + g^2 - 2g^2 \sin^2 \alpha$$

$$= g^2 \sin^2 \alpha + g^2 - 2g^2 \sin^2 \alpha = g^2 (1 - \sin^2 \alpha)$$

$$= g^2 \cos^2 \alpha$$

$$\therefore \quad g_{eff} = g \cos \alpha$$

Now, $T' = 2\pi \sqrt{\frac{L}{e_{eff}}}$

$$= 2\pi \sqrt{\frac{L}{g \cos \alpha}}$$

30 **(c)**

$$\frac{d\theta}{dt} = \frac{\varepsilon A \sigma}{mc} 4\theta_0^3 \Delta\theta$$

For given sphere and cube $\frac{\varepsilon A \sigma}{mc} 4\theta_0^3 \Delta\theta$ is constant so for both rate of fall of temperature $\frac{d\theta}{dt} =$ constant

31 **(c)**

Resistance of 40 W lamp is given by

$$R = \frac{V^2}{P} = \frac{(220)^2}{40} = 1210\Omega$$

Resistance of 100 W lamp is given by

$$R = \frac{V^2}{P} = \frac{(220)^2}{100} 484\ \Omega$$

Current through series combination is given by

$$i = \frac{440}{(1210+484)} = 0.26\ \text{A}$$

Hence, potential drop across 40 W lamp

$$= 1210 \times 0.26 = 314.6\ \text{V}$$

Hence, 40 W bulb will fuse because lamp can tolerate 220 V.

32 **(a)**

The possibility of an electric bulb fusing is higher at the time of switching ON and switching OFF because inductive effect produces a surge at the time of switching ON and OFF

33 **(d)**

As the shell is initially at rest and after explosion, according to law of conservation of linear momentum, the centre of mass remains at rest. While parts of shell move in all direction, such that total momentum of all parts is equal to zero

35 **(a)**

Second law of thermodynamics can be explained with the help of example of refrigerator, as we know that in refrigerator, the working substance extracts heat from colder body and rejects a large amount of heat to a hotter body with the help of an external agency, i. *e*., the electric supply of the refrigerator. No refrigerator can ever work without external supply of electric energy to it

38 **(b)**

Both the statements are true but reason is not a correct explanation of assertion. Here, friction causes motion

39 **(c)**

Equivalent capacitance of parallel combination is $C_p = C_1 + C_2 + C_3$

40 **(b)**

Electric field and field lines are perpendicular to an equipotential surface because there is not potential gradient along the equipotential surface *ie*, along the surface $\frac{dV}{dr} = 0$.

41 **(a)**

When metal sphere is placed inside a charged parallel plate capacitor, the electric lines of force will not enter the metallic conductor as $E = 0$inside a charged conductor. Moreover, the surface of a charged conductor is an equipotential surface and hence, electric lines of force are always perpendicular to equipotential surface.

42 **(d)**

$$v_{rms} = \sqrt{\frac{3kT}{m}} = v_{rms} \propto \frac{1}{\sqrt{m}}$$

43 **(a)**

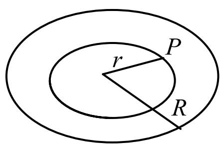
$$PV = \mu RT = \frac{m}{M}RT \Rightarrow V = \frac{mRT}{MP}$$

$$= \frac{2 \times 10^{-3} \times 8.3 \times 300}{32 \times 10^{-3} \times 10^5} = 1.53 \times 10^{-3} m^3 = 1.53\ litre$$

44 **(c)**

$$E \times 4\pi r_1^2 = \frac{\int_0^{r_1} \frac{Q}{\pi R^4} r 4\pi r^2 dr}{\varepsilon_0}$$

$$\Rightarrow E = \frac{Q r_1^2}{4\pi\varepsilon_0 R^4}$$



45 **(d)**

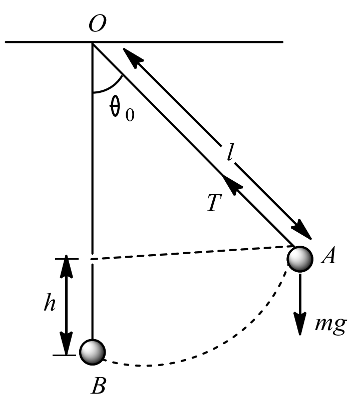
The simple pendulum at angular amplitude θ_0 is shown in the figure.

Maximum tension in the string is

$$T_{\max} = mg + \frac{mv^2}{l}$$

...(i)

When bob of the pendulum comes from A to B, it covers a vertical distance h



$\therefore \quad \cos\theta_0 = \frac{l-h}{l}$

$\Rightarrow \quad h = l(1 - \cos\theta_0)$

...(ii)

Also during A to B, potential energy of bob converts into kinetic energy *ie*, $mgh = \frac{1}{2}mv^2$

$\therefore \quad v = \sqrt{2gh}$

...(iii)

Thus, using Eqs. (i),(ii) and (iii), we obtain

$$T_{\max} = mg + \frac{2mg}{l} l(1 - \cos\theta)$$

$$= mg + 2mg\left[1 - 1 + \frac{\theta_0^2}{2}\right]$$

$$= mg(1 + \theta_0^2)$$

46 **(a)**

$$I = \frac{dq}{dt} = 3t^2 + 2t + 5$$

$$\therefore dq = (3t^2 + 2t + 5)dt$$

$$\therefore q = \int_{t=0}^{t=2} (3t^2 + 2t + 5)dt$$

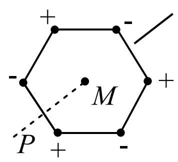
$$= \frac{3t^3}{3} + \frac{2t^2}{2} + 5t \Big|_0^2 = t^3 + t^2 + 5t\Big|_0^2 = 22\ C$$

47 **(b)**

$$i \propto \frac{1}{R}$$

49 **(a)**

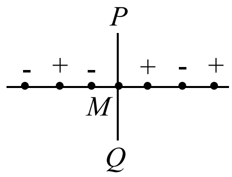
(p)



By symmetry an $E = 0, V = 0, B = 0$

$\mu =$ NIA but $I_{\text{effective}} = 0$, So, $\mu = 0$

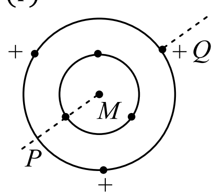
(q)



$E \neq 0, V = 0$ Since $I_{\text{effective}} = 0$

$\Rightarrow B = 0$ and $\mu = 0$

(r)



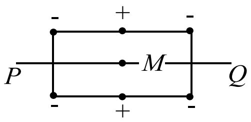
$E = 0$ (By Symmetry)

$V \neq 0$ (Since distances are different)

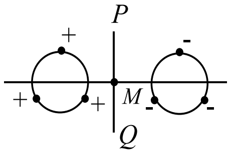
$B \neq 0$ (Since Radius is different)

$\mu \neq 0$

(s)



$E = 0$ (By Symmetry)
$V \neq 0$ (Since distances are different)
$B \neq 0$
$\mu \neq 0$
(t)



$E \neq 0, V = 0, \mu = 0, B = 0$ and given each rotating charge to be equivalent to a steady current so $B = 0$ so $(t \rightarrow C)$ and it was not given that each rotating charge to be equivalent to steady current then $B \neq 0$