SAFE HANDS & IIT-ian's PACE

LEAP TEST-09 (NEET) ANS KEY Dt. 23-12-2023

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

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

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

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

SAFE HANDS & PACE

LT-09 (NEET) PHYSICS SOLUTIONS

: ANSWER KEY :

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

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 **(c)**

Energy supplied $= 0.93 \times 3600\, joules = 3348\, joules$

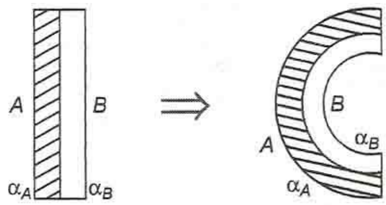
Heat required to melt 10 gms of ice

$= 10 \times 80 \times 4.18 = 3344\, joules$

Hence block of ice just melts

2 **(c)**

A bimetallic strip on being heated bends in from of an arc with more expandable metal (A) outside (as shown)



3 **(b)**

We know that heat lost $= mc\theta$

For a given quantity of heat, we must need a minimum mass of water for cooling the radiators due to a high value of specific heat

4 **(a)**

If mass of the bullet is $m\, gm$,

Then total heat required for bullet to just melt down

$Q_1 = m\, c\, \Delta\theta + m\, L$

$= m \times 0.03(327 - 27) + m \times 6$

$= 15\, m\, cal = (15m \times 4.2)J$

Now when bullet is stopped by the obstacle, the loss in its mechanical energy $= \frac{1}{2}(m \times 10^{-3})v^2 J$

(As $m\, g = m \times 10^{-3} kg$)

As 25% of this energy is absorbed by the obstacle, The energy absorbed by the bullet

$$Q_2 = \frac{75}{100} \times \frac{1}{2} mv^2 \times 10^{-3} = \frac{3}{8} \times 10^{-3} J$$

Now the bullet will melt if $Q_2 \geq Q_1$

$$i.e., \frac{3}{8} mv^2 \times 10^{-3} \geq 15m \times 4.2 \Rightarrow v_{\min}$$

$$= 410 m/s$$

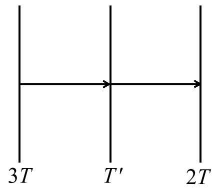
5 **(d)**

$$\frac{C}{5} = \frac{F - 32}{9} \Rightarrow \frac{C}{5} = \frac{140 - 32}{9} \Rightarrow C = 60°\text{C}$$

6 **(a)**

$$\frac{K_1}{K_2} = \frac{l_1^2}{l_2^2} \therefore K_2 = \frac{K_1 l_2^2}{l_1^2} \approx \frac{0.92 \times (4.2)^2}{(8.4)^2} = 0.23$$

7 **(c)**



In steady state energy absorbed by middle plate is equal to energy released by middle plate

$\sigma A(3T)^4 - \sigma A(T'')^4 = \sigma A(T'')^4 - \sigma A(2T)^4$

$(3T)^4 - (T'')^4 = (T'')^4 - (2T)^4$

$2(T'')^4 = (16 + 81)T^4$

$$T'' = \left(\frac{97}{2}\right)^{1/4} T$$

8 **(b)**

In vapor to liquid phase transition, heat liberates

9 **(b)**

$Q = m.c.\Delta\theta$; if $\Delta\theta = 1\, K$ then $Q = mc =$ Thermal capacity

10 **(b)**

From Wien's law

$$\lambda_m T = \text{constant}$$

Where λ_m is maximum wavelength and T the absolute temperature.

Given, $\lambda_1 = 140$, $\lambda_2 = 4200$Å

$\therefore \quad \frac{\lambda_2}{\lambda_1} = \frac{T_1}{T_2} = \frac{4200}{140}$

11 **(a)**

Since, $t = \frac{\rho L}{2k\theta}(x_2^2 - x_1^2)$

$$\therefore t = \frac{\rho L}{2k\theta}(x^2 - y^2) = \frac{\rho L(x + y)(x - y)}{2K\theta}$$

12 **(b)**

Pressure inside the mines is greater than that of normal pressure. Also we know that boiling point increases with increase in pressure

13 **(d)**

Area under given curve represents emissive power and emissive power $\propto T^4 \Rightarrow A \propto T^4$

$$\Rightarrow \frac{A_2}{A_1} = \frac{T_2^4}{T_1^4} = \frac{(273 + 327)^4}{(273 + 27)^4} = \left(\frac{600}{300}\right)^4 = \frac{16}{1}$$

14 **(c)**

When the temperature of black body becomes equal to the temperature of the furnace, the black body will radiate maximum energy and it will be brightest of all. Initially it will absorb all the radiant energy incident on it. So, it is the darkest one.

15 **(b)**

As we know $\gamma_{\text{real}} = \gamma_{\text{app.}} + \gamma_{\text{vessel}}$

$\Rightarrow \gamma_{\text{app.}} = \gamma_{\text{glycerine}} - \gamma_{\text{glass}}$

$= 0.000597 - 0.000027 = 0.00057/^oC$

16 **(b)**

Heat released by 5 kg of water when its temperature falls from 20°C to 0°C is,

$Q_1 = m_1 c_1\, \Delta\theta_1 = (5)(10^3)(20 - 0) = 10^5$ cal

When 2 kg ice at −20°C comes to a temperature of 0°C, it takes an energy

$Q_2 = m_2 c_2\, \Delta\theta_2 = (2)(500)(20) = 0.2 \times 10^5$ cal

The remaining heat

$Q = Q_1 - Q_2 = 0.8 \times 10^5$ cal will melt a mass m of the ice, thus

$$m = \frac{Q}{L} = \frac{0.8\times10^5}{80\times10^3} = 1 \text{ kg}$$

So, the temperature of the mixture will be 0°C, mass of water in it is 5+1=6 kg and mass of ice is 2−1=1 kg

17 **(a)**

Since coefficient of expansion of steel is greater than that of bronze, hence with small increase in it's temperature the hole expands sufficiently

18 **(b)**

Heat current, $\frac{Q}{t} = \frac{KA(\theta_1-\theta_1)}{l}$

$= \frac{100\times100\times10^{-4}(100-0)}{1}$

$\Rightarrow \quad \frac{Q}{t} = 100\text{J/s} = 6 \times 10^3$ J/min

19 **(d)**

According to Wien's law

$$\lambda_m \propto \frac{1}{T}$$

And from the figure

$$(\lambda_m)_1 < (\lambda_m)_3 < (\lambda_m)_2$$

Therefore, $\quad T_1 > T_3 > T_2$

21 **(d)**

Thermal capacity $= mc = 40 \times 0.2 = 8\ cal/$°C

22 **(c)**

With rise of altitude pressure decreases and boiling point decreases

23 **(b)**

$$\Delta t = \frac{\Delta Q(\Delta x)}{KA(\Delta T)}$$

When two rods of same length are joined in parallel,

$A \rightarrow 2$ and $(\Delta x) \rightarrow \frac{1}{2}$ times

$\therefore\ \Delta t$ becomes $\frac{1}{4}$ times *ie*, $\frac{1}{4} \times 12\text{s} = 3\text{s}$

25 **(b)**

In series, $R_{eq} = R_1 + R_2 \Rightarrow \frac{2l}{K_{eq}A} = \frac{l}{K_1 A} + \frac{l}{K_2 A}$

$\Rightarrow \frac{2}{K_{eq}} = \frac{1}{K_1} + \frac{1}{K_2} \Rightarrow K_{eq} = \frac{2K_1K_2}{K_1 + K_2}$

26 **(b)**

Change in length of brass rod

$\Delta l_B = \alpha_B l_B (T_2 - T_1)$

$= 2.5 \times 10^{-5} \times 500 \times (200 - 50)$

$= 1.875$ mm

Similarly change in length of the steel rod

$\Delta i l_s = \alpha_B l_S (T_2 - T_1)$

$= 1.25 \times 10^{-5} \times 500 \times (200 - 50)$

$= 0.9375$ mm

Therefore, change in length of the combined rod

$= \Delta l_B + \Delta l_S = 1.875 + 0.9375$

$= 2.8175$ mm $=2.8$ mm

27 **(b)**

Calorimeters are made by conducting materials

28 **(c)**

According to Stefan's law $E = \sigma T^4$

$\Rightarrow \ln E = \ln \sigma + 4 \ln T \Rightarrow \ln E = 4 \ln T + \ln \sigma$

On comparing this equation with $y = mx + C$

We find that graph between $\ln E$ and $\ln T$ will be a straight line, having positive slope $(m = 4)$ and intercept on $\ln E$ axis equal to $\ln \sigma = -16.68$

29 **(b)**

When water falls from a height, it has potential energy (mgh),

this is used in heating up the water ($mc\Delta\theta$).

Hence, we have

$$mgh = mc\Delta\theta$$

$$\Rightarrow \quad \Delta\theta = \frac{gh}{c}$$

$$= \frac{9.8 \times 500}{4.2 \times 10^3} = 1.16\text{°C}$$

30 **(c)**

All wavelength are emitted

31 **(a)**

According to Stefan's law

$$E \propto T^4$$

$\frac{E'}{E} = \left(\frac{3T}{T}\right)^4$ or $E' = 81E$

32 **(a)** do it your self, no lunches are free lunches.

33 **(c)**

$$\frac{T_2}{T_1} = \frac{\lambda_{m_1}}{\lambda_{m_2}} = \frac{1.75}{14.35} \Rightarrow T_2 = \frac{1.75}{14.35} \times 1640 = 200\ K$$

34 **(a)**

$$\lambda_m \propto \frac{1}{T}$$

$$\therefore \quad \frac{\lambda_A}{\lambda_B} = \frac{T_B}{T_A} = \frac{500}{1500} = \frac{1}{3}$$

$E \propto T^4$ (where A = surface area = $4\pi R^2$)

$$\therefore \quad E \propto T^4 R^2$$

$$\frac{E_A}{E_B} = \left(\frac{T_A}{T_B}\right)^4 \left(\frac{R_A}{R_B}\right)^2$$

$$= (3)^4 \left(\frac{16}{18}\right)^2 = 9$$

35 **(d)**

$T_1 = 277°\text{C} = 277 + 273 = 550\ \text{K}$

$T_2 = 67°\text{C} = 67 + 273 = 340\ \text{K}$

Temperature of surrounding

$$T = 27°\text{C} = 27 + 273 = 300\ \text{K}$$

Ratio of loss of heat$=\frac{T_1^4 - T^4}{T_2^4 - T^4}$

$$\frac{(550)^4 - (300)^4}{(340)^4 - (300)^4} = \frac{15.8}{1} \cong \frac{16}{1}$$

36 **(a)**

$$\frac{h_1}{h_2} = \frac{\rho_2}{\rho_1} = \frac{(1 + \gamma\theta_1)}{(1 + \gamma\theta_2)} \qquad \left[\because \rho = \frac{\rho_0}{(1 + \gamma\theta)}\right]$$

$$\Rightarrow \frac{50}{60} = \frac{1 + \gamma \times 50}{1 + \gamma \times 100} \Rightarrow \gamma = 0.005/°\text{C}$$

37 **(c)**

From given curve,

Melting point for $A = 60°\text{C}$

And melting point for $B = 20°\text{C}$

Time taken by A for fusion $= (6 - 2) = 4$ minute

Time taken by B for fusion $= (6.5 - 4) = 2.5$ minute

Then $\frac{H_A}{H_B} = \frac{6 \times 4 \times 60}{6 \times 2.5 \times 60} = \frac{8}{5}$

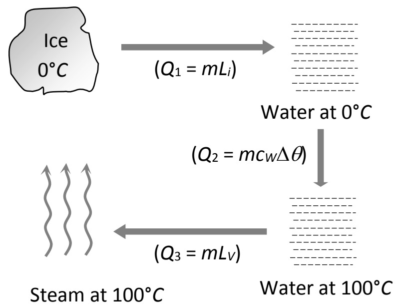
38 **(c)**

Ice (0°C) converts into steam (100°C) in following three steps.

Total heat required $Q = Q_1 + Q_2 + Q_3$

$= 5 \times 80 + 5 \times 1 \times (100 - 0) + 5 \times 540$

$= 3600\ cal$



39 **(c)**

When we increase the temperature of a liquid, the liquid will expand. So, the volume of the liquid will increase and hence, the density of the liquid will decrease.

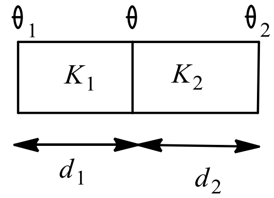
40 **(c)**

Pyrometer can measure temperature from 800°C to 6000°C. Hence temperature of sun is measured with pyrometer

42 **(c)**

For first slab,

Heat current, $H_1 = \frac{K_1(\theta_1 - \theta)A}{d_1}$



For second slab,

Heat current, $H_2 = \frac{K_2(\theta - \theta_2)A}{d_2}$

As slabs are in series

$$H_1 = H_2$$

$$\therefore \quad \frac{K_1(\theta_1 - \theta)A}{d_1} = \frac{K_2(\theta - \theta_2)A}{d_2}$$

$$\Rightarrow \quad \theta = \frac{K_1\theta_1 d_2 + K_2\theta_2 d_1}{K_2 d_1 + K_1 d_2}$$

43 **(d)**

$W = JQ \Rightarrow (2m)gh = J \times m'c\Delta\theta$

$\Rightarrow 2 \times 5 \times 10 \times 10 = 4.2(2 \times 1000 \times \Delta\theta)$

$\Rightarrow \Delta\theta = 0.1190°\text{C} = 0.12°\text{C}$

44 **(a)**

Rapidly changing temperature is measured by thermocouple thermometers

45 **(b)**

$$\lambda_{m_2} = \frac{T_1}{T_2} \times \lambda_{m_1} = \frac{1500}{2500} \times 5000 = 3000\text{Å}$$