New Light Institute

SINCE 1984

PHYSICS TOPIC TEST : 2021-22

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S O L U T I O N

PHYSICS

Part-1 [SECTION-A]

1. (2) **[NCERT-298]**

The amount of heat rejected by the

Water = $ms\Delta t$

= 1000 × 1 × 24 = 24000 *cal*

we know that $Q = mL$

so heat required to melt completly

$Q = 1200 \times 80$

= 96000 *cal*.

24000 = *m* x 80

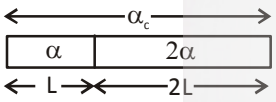
m = 300 *gm*

So fraction of ice which melts

$= \frac{300}{1200} = \frac{1}{4}$

→ fraction left = 1–1/4 = 3/4

2. (3) **[NCERT-289]**



$(3L)(\alpha_c)\Delta\theta = (L)\alpha\Delta\theta + (2L)(2\alpha)(\Delta\theta)$

$3\alpha_c = 5\alpha$

$\alpha_c = \frac{5\alpha}{3} = \frac{10}{6}\alpha$

3. (3) **[NCERT-289]**

4. (4) **[NCERT-288]**

Since level of water decreases. Hence expansion of vessel is more than expansion of liquid.

5. (1) **[NCERT-298]**

Heat given out by water = $ms\Delta t$

= 20 x 1 x 30

= 600 *cal*.

Heat required by ice to melt completly

= *mL*

= 40 x 80

= 3200 *cal*

The amount of ice which melts by 600 *cal*.

600 = *m* x 80

m = 7.5 *gm*.

Part-1 [SECTION-A]

1. (2) **[NCERT-298]**

जल के द्वारा मुक्त ऊष्मा = $ms\Delta t$

= 1000 × 1 × 24 = 24000 *cal*

हम जानते है $Q = mL$

पूरी तरह से पिघलने के लिए आवश्यक ऊष्मा

$Q = 1200 \times 80$

= 96000 *cal*.

24000 = *m* x 80

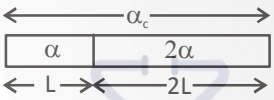
m = 300 *gm*

अत: बर्फ का वह भाग जो गल जाता है।

$= \frac{300}{1200} = \frac{1}{4}$

→ बचा हुआ भाग = 1–1/4 = 3/4

2. (3) **[NCERT-289]**



$(3L)(\alpha_c)\Delta\theta = (L)\alpha\Delta\theta + (2L)(2\alpha)(\Delta\theta)$

$3\alpha_c = 5\alpha$

$\alpha_c = \frac{5\alpha}{3} = \frac{10}{6}\alpha$

3. (3) **[NCERT-289]**

4. (4) **[NCERT-288]**

चूंकि जल का स्तर गिरता है अत: बर्तन का प्रसार द्रव के प्रसार से अधिक होगा।

5. (1) **[NCERT-298]**

जल के द्वारा दी गयी ऊष्मा = $ms\Delta t$

= 20 x 1 x 30

= 600 *cal*.

बर्फ के पूरी तरह गलने के लिए आवश्यक ऊष्मा

= *mL*

= 40 x 80

= 3200 *cal*

600 कैलोरी से गलने वाली बर्फ की मात्रा

600 = *m* x 80

m = 7.5 *gm*

6. (2) **[NCERT-289]**

$V = V_0 (1 + \gamma \Delta\theta)$

$L^3 = L_0 (1 + \alpha_1 \Delta\theta) L_0^2 (1 + \alpha_2 \Delta\theta) (1 + \alpha_3 \Delta\theta)$

$L_0^3 = V_0$ and $L^3 = V$

$1 + \gamma \Delta\theta$

$= (1 + \alpha_1 \Delta\theta) (1 + \alpha_2 \Delta\theta) (1 + \alpha_3 \Delta\theta)$

$= [1 + \alpha_1 \Delta\theta + \alpha_2 \Delta\theta + \alpha_1\alpha_2 (\Delta\theta)^2] (1 + \alpha_3 \Delta\theta)$

$\gamma = \alpha_1 + \alpha_2 + \alpha_3$

7. (4) **[NCERT-289]**

$W = mgh$

$W = 5 \times 10 \times 30$

$W = 1500 \text{ J} = 357.14 \text{ cal.}$

8. (2) **[NCERT-289]**

According to question

$\Delta l_1 = \Delta l_2$

$l_1\alpha_1\Delta T = l_2\alpha_2\Delta T$

$\frac{l_1}{l_2} = \frac{\alpha_2}{\alpha_1}$

9. (2) **[NCERT-289]**

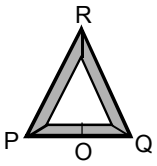
$l = 2\pi R$

$\Delta l = l\alpha\theta$

$= (2\pi R)\alpha\ \theta$

$= (2\pi R\alpha\theta)$

10. (2) **[NCERT-289]**



$OR^2 = PR^2 - PO^2$

$= (PR')^2 - (PO')^2$

$$\Rightarrow L^2 - \frac{L^2}{4} = \{L(1+\alpha_1\Delta\theta)\}^2 - \left\{\frac{L}{2}(1+\alpha_2\Delta\theta)\right\}^2$$

$$\Rightarrow L^2 - 2L^2\alpha_1\Delta\theta - \frac{L^2}{4} - \frac{L^2}{4}2\alpha_2\Delta\theta$$

$$2\alpha_1\Delta\theta = \frac{2\alpha_2\Delta\theta}{4} \Rightarrow \alpha_2 = 4\alpha_1$$

6. (2) **[NCERT-289]**

$V = V_0 (1 + \gamma \Delta\theta)$

$L^3 = L_0 (1 + \alpha_1 \Delta\theta) L_0^2 (1 + \alpha_2 \Delta\theta) (1 + \alpha_3 \Delta\theta)$

$L_0^3 = V_0$ और $L^3 = V$

$1 + \gamma \Delta\theta$

$= (1 + \alpha_1 \Delta\theta) (1 + \alpha_2 \Delta\theta) (1 + \alpha_3 \Delta\theta)$

$= [1 + \alpha_1 \Delta\theta + \alpha_2 \Delta\theta + \alpha_1\alpha_2 (\Delta\theta)^2] (1 + \alpha_3 \Delta\theta)$

$\gamma = \alpha_1 + \alpha_2 + \alpha_3$

7. (1) **[NCERT-289]**

$W = mgh$

$W = 5 \times 10 \times 30$

$W = 1500 \text{ J} = 357.14 \text{ cal.}$

8. (2) **[NCERT-289]**

प्रश्न के अनुसार

$\Delta l_1 = \Delta l_2$

$l_1\alpha_1\Delta T = l_2\alpha_2\Delta T$

$\frac{l_1}{l_2} = \frac{\alpha_2}{\alpha_1}$

9. (2) **[NCERT-289]**

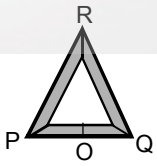
$l = 2\pi R$

$\Delta l = l\alpha\theta$

$= (2\pi R)\alpha\ \theta$

$= (2\pi R\alpha\theta)$

10. (2) **[NCERT-289]**



$OR^2 = PR^2 - PO^2$

$= (PR')^2 - (PO')^2$

$$\Rightarrow L^2 - \frac{L^2}{4} = \{L(1+\alpha_1\Delta\theta)\}^2 - \left\{\frac{L}{2}(1+\alpha_2\Delta\theta)\right\}^2$$

$$\Rightarrow L^2 - 2L^2\alpha_1\Delta\theta - \frac{L^2}{4} - \frac{L^2}{4}2\alpha_2\Delta\theta$$

$$2\alpha_1\Delta\theta = \frac{2\alpha_2\Delta\theta}{4} \Rightarrow \alpha_2 = 4\alpha_1$$

11. (3) **[NCERT-298]**

$$\theta_{mix} = \frac{mcT + \frac{m}{2}2cT}{mc + \frac{m}{2}2c} = T$$

12. (2) **[NCERT-303]**

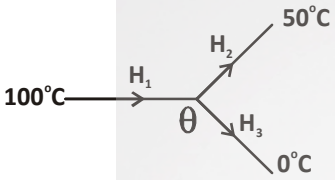
$$\boxed{Slope \propto \frac{1}{specific\ heat}}$$

13. (2) **[NCERT-289]**

Fractional change in its density = $\gamma \times \Delta t$

$= 49 \times 10^{-5} \times 30 = .0147$

14. (2) **[NCERT-320]**



$H_1 = H_2 + H_3$

$$\frac{(100-\theta)}{\left(\frac{l}{3KA}\right)} = \frac{(\theta-50)}{\left(\frac{l}{2KA}\right)} + \frac{(\theta-0)}{\left(\frac{l}{KA}\right)}$$

or $3(100-\theta) = 2(\theta-50) + \theta$

or $\boxed{\theta = \frac{200}{3}\,^0C}$

15. (4) **[NCERT-320]**

$$Q = \frac{KA(\theta_1 - \theta_2)t}{L}$$

$$\frac{QL}{KAt} = (\theta_1 - \theta_2)$$

from above eq. If $K = \infty$ then $\theta_1 - \theta_2 = 0$

and $\boxed{\theta_1 = \theta_2}$

16. (1) **[NCERT-320]**

$$R_{thermal} = \frac{\Delta\theta}{H}$$

$$H = \frac{Q}{t} = \frac{\left[ML^2T^{-2}\right]}{[T]} \Rightarrow H = \left[ML^2T^{-3}\right]$$

$$R_{thermal} = \frac{[\theta]}{\left[ML^2T^{-3}\right]} = \left[M^{-1}L^{-2}T^3\theta\right]$$

11. (3) **[NCERT-298]**

$$\theta_{mix} = \frac{mcT + \frac{m}{2}2cT}{mc + \frac{m}{2}2c} = T$$

12. (2) **[NCERT-303]**

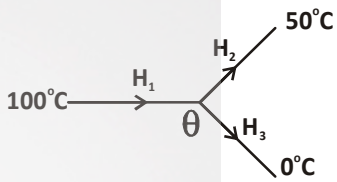
प्रवणता $\propto \frac{1}{\text{विशिष्ट ऊष्मा}}$

13. (2) **[NCERT-289]**

घनत्व में भिन्नात्मक परिवर्तन = $\gamma \times \Delta t$

$= 49 \times 10^{-5} \times 30 = .0147$

14. (2) **[NCERT-320]**



$H_1 = H_2 + H_3$

$$\frac{(100-\theta)}{\left(\frac{l}{3KA}\right)} = \frac{(\theta-50)}{\left(\frac{l}{2KA}\right)} + \frac{(\theta-0)}{\left(\frac{l}{KA}\right)}$$

या $3(100-\theta) = 2(\theta-50) + \theta$

या $\boxed{\theta = \frac{200}{3}\,^0C}$

15. (4) **[NCERT-320]**

$$Q = \frac{KA(\theta_1 - \theta_2)t}{L}$$

$$\frac{QL}{KAt} = (\theta_1 - \theta_2)$$

उपरोक्त समीकरण से यदि $K = \infty$ तब $\theta_1 - \theta_2 = 0$

और $\boxed{\theta_1 = \theta_2}$

16. (1) **[NCERT-320]**

$$R_{thermal} = \frac{\Delta\theta}{H}$$

$$H = \frac{Q}{t} = \frac{\left[ML^2T^{-2}\right]}{[T]} \Rightarrow H = \left[ML^2T^{-3}\right]$$

$$R_{thermal} = \frac{[\theta]}{\left[ML^2T^{-3}\right]} = \left[M^{-1}L^{-2}T^3\theta\right]$$

17. (2) **[NCERT-320]**

Kirchoff's law states that "good absorbs for a particular wavelength are also good emitters of the same wavelength".

18. (1) **[NCERT-321]**

$$P = e\sigma AT^4$$

$$\frac{P_1}{P_2} = \frac{A_1 T_1^4}{A_1 T_2^4} \Rightarrow \frac{P_1}{P_2} = \left(\frac{4\pi r^2}{4\pi (4r)^2}\right)\frac{16T_0^4}{T_0^4}$$

$$\frac{P_1}{P_2} = \frac{r^2}{16r^2} \times \frac{16T_0^4}{T_0^4}$$

$$\boxed{\frac{P_1}{P_2} = 1:1}$$

19. (2) **[NCERT-320]**

$$\frac{(\theta_1 - \theta_2)}{t} = \left(\frac{\theta_1 + \theta_2}{2} - \theta_0\right)$$

$$\frac{\frac{(50-40)}{5} = \left(\frac{50+40}{2} - 15\right)}{\frac{(40-30)}{t} = \left(\frac{40+30}{2} - 15\right)}$$

$$\frac{t}{5} = \frac{45-15}{35-15}$$

$$\frac{t}{5} = \frac{30}{20} \qquad \boxed{t = \frac{15}{2}\text{min}}$$

20. (1) **[NCERT-321]**

Heat will be more in the rod which have greater value of K.

21. (2) **[NCERT-321]**

We know that at the top of the flame heat is transferred by mainly convection.

17. (2) **[NCERT-320]**

किरचॉफ नियम से अनुसार अच्छे उत्सर्जक अच्छे अवशोषक होते है।

18. (1) **[NCERT-321]**

$$P = e\sigma AT^4$$

$$\frac{P_1}{P_2} = \frac{A_1 T_1^4}{A_1 T_2^4} \Rightarrow \frac{P_1}{P_2} = \left(\frac{4\pi r^2}{4\pi (4r)^2}\right)\frac{16T_0^4}{T_0^4}$$

$$\frac{P_1}{P_2} = \frac{r^2}{16r^2} \times \frac{16T_0^4}{T_0^4}$$

$$\boxed{\frac{P_1}{P_2} = 1:1}$$

19. (2) **[NCERT-320]**

$$\frac{(\theta_1 - \theta_2)}{t} = \left(\frac{\theta_1 + \theta_2}{2} - \theta_0\right)$$

$$\frac{\frac{(50-40)}{5} = \left(\frac{50+40}{2} - 15\right)}{\frac{(40-30)}{t} = \left(\frac{40+30}{2} - 15\right)}$$

$$\frac{t}{5} = \frac{45-15}{35-15}$$

$$\frac{t}{5} = \frac{30}{20} \qquad \boxed{t = \frac{15}{2}\text{min}}$$

20. (1) **[NCERT-321]**

ऊष्मा उस छड़ से ज्यादा प्रवाहित होगी जिसका K बड़ा होगा।

21. (2) **[NCERT-321]**

हम जानते है कि ज्वाला के ऊपर की ओर मुख्यत: सवंहन से ऊष्मा प्रवाहित होती है।

22. (4) **[NCERT-321]**

23. (4) **[NCERT-321]**

$$P = \sigma e A T^4$$

$$\frac{P_1 \propto T_1^4}{P_2 \propto T_2^4}$$

$$\frac{P_1}{P_2} = \left(\frac{T_1^4}{T_2^4}\right)^4 = \frac{P_1}{P_2} = \left(\frac{400}{1200}\right)^4$$

$$= \frac{P_1}{P_2} = \left(\frac{1}{3}\right)^4 \Rightarrow \boxed{\frac{P_1}{P_2} = \frac{1}{81}}$$

24. (1) **[NCERT-321]**

Area $\propto$ Total energy radiated $\propto T^4$

25. (3) **[NCERT-277]**

$R_t = R_0 (1 + \alpha t)$

$$\frac{2.71}{3.70} = \frac{1+\alpha\times10}{1+\alpha\times10} \Rightarrow \alpha = \frac{0.99}{234}$$

$$\frac{3.26}{2.71} = \frac{1+\alpha t}{1+\alpha\times10}$$

$3.26 + 32.6\ \alpha = 2.71 + 2.71\ \alpha t.$

$$\frac{5\times234}{9} + 32.6 = 2.71t \Rightarrow t = 60^oC.$$

26. (2) **[NCERT-275]**

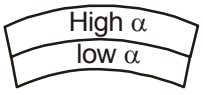
$$\frac{C-0}{100-0} = \frac{F-32}{212-32}$$

$$\frac{C}{100} = \frac{3C-32}{180} \Rightarrow C = \frac{80}{3}\ ^oC$$

27. (2) **[NCERT-277]**

$$\frac{dE}{dt} = 4t - 9t^2 \Rightarrow 0 = t(4-9t) \Rightarrow t = \frac{4}{9}\ ^oC$$

28. (2) **[NCERT-279]**



29. (4) **[NCERT-279]**

$25\ [1 + 12 \times 10^{-6}\ (t - 20)]$

$= 24.9\ [1 + 20 \times 10^{-6}\ (t - 20)]$

or $t = 525^oC$

22. (4) **[NCERT-321]**

23. (4) **[NCERT-321]**

$$P = \sigma e A T^4$$

$$\frac{P_1 \propto T_1^4}{P_2 \propto T_2^4}$$

$$\frac{P_1}{P_2} = \left(\frac{T_1^4}{T_2^4}\right)^4 = \frac{P_1}{P_2} = \left(\frac{400}{1200}\right)^4$$

$$= \frac{P_1}{P_2} = \left(\frac{1}{3}\right)^4 \Rightarrow \boxed{\frac{P_1}{P_2} = \frac{1}{81}}$$

24. (1) **[NCERT-321]**

क्षेत्रफल $\propto$ सम्पूर्ण उत्सर्जित ऊष्मा $\propto T^4$

25. (3) **[NCERT-277]**

$R_t = R_0 (1 + \alpha t)$

$$\frac{2.71}{3.70} = \frac{1+\alpha\times10}{1+\alpha\times10} \Rightarrow \alpha = \frac{0.99}{234}$$

$$\frac{3.26}{2.71} = \frac{1+\alpha t}{1+\alpha\times10}$$

$3.26 + 32.6\ \alpha = 2.71 + 2.71\ \alpha t.$

$$\frac{5\times234}{9} + 32.6 = 2.71t \Rightarrow t = 60^oC.$$

26. (2) **[NCERT-275]**

$$\frac{C-0}{100-0} = \frac{F-32}{212-32}$$

$$\frac{C}{100} = \frac{3C-32}{180} \Rightarrow C = \frac{80}{3}\ ^oC$$

27. (2) **[NCERT-277]**

$$\frac{dE}{dt} = 4t - 9t^2 \Rightarrow 0 = t(4-9t) \Rightarrow t = \frac{4}{9}\ ^oC$$

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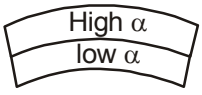


29. (4) **[NCERT-279]**

$25\ [1 + 12 \times 10^{-6}\ (t - 20)]$

$= 24.9\ [1 + 20 \times 10^{-6}\ (t - 20)]$

या $t = 525^oC$

30. (1) **[NCERT-277]**

$p_1 = p_0 (1 + \gamma t)$

$\therefore \quad p_1 = p_0 (1 + \gamma t)$ .....(i)

and $p_{100} - p_0 = p_0 \gamma \times 100$ .....(ii)

Dividing equation (i) by equation (ii), we get

$$\frac{p_t - p_0}{p_{100} - p_0} = \frac{t}{100} \quad \text{or} \quad \frac{p_1 - p_0}{P_{100} - p_0} \times 100$$

$$= \frac{60-50}{90-50} \times 100 = 25^\circ C$$

31. (4) **[NCERT-279]**

Density of water in maximum at 4°C hence volume of water first decreases up to 4°C then increases.

32. (4) **[NCERT-275]**

33. (2) **[NCERT-275]**

$$\frac{F-32}{9} = \frac{C}{5}$$

$$\Rightarrow F = \frac{9C}{5} + 32$$

we y-intersept is positive.

34. (4) **[NCERT-279]**

35. (3) **[NCERT-282]**

Due to high pressure at the base melting point decreases.

Part-1 [SECTION-B]

36. (2) **[NCERT-279]**

Change in volume of liquid relative to container,

$\Delta V = V(\gamma_L - \gamma_g)\Delta\theta$

Given, V = 1 litre = 1000 cc

$\gamma_s = 3\alpha_g = 0.3 \times 10^{-4}/C$

$\therefore \Delta V = 1000 (1.82 - 0.3) \times 10^{-4} \times 100 = 15.2$ cc.

37. (2) **[NCERT-282]**

$Q_1 = (ms\Delta T)_{water}$

$= (10 \times 10^3) \times 1 \times (80 - 20)$

$= 600 \times 10^3$ cal.

$Q_2 = (ms\,\Delta T)_{steam} + mL_{steam} + (ms\,\Delta T)_{water}$.

30. (1) **[NCERT-277]**

$p_1 = p_0 (1 + \gamma t)$

$\therefore \quad p_1 = p_0 (1 + \gamma t)$ .....(i)

और $p_{100} - p_0 = p_0 \gamma \times 100$ .....(ii)

समीकरण (i) को समीकरण (ii) से विभाजित करने पर हम पाते है

$$\frac{p_t - p_0}{p_{100} - p_0} = \frac{t}{100} \quad \text{या} \quad \frac{p_1 - p_0}{P_{100} - p_0} \times 100$$

$$= \frac{60-50}{90-50} \times 100 = 25^\circ C$$

31. (4) **[NCERT-279]**

जल का घनत्व 4°C पर अधिक होता है। अत: 4°C तक जल का आयतन घटेगा फिर बढ़ेगा।

32. (4) **[NCERT-275]**

33. (2) **[NCERT-275]**

$$\frac{F-32}{9} = \frac{C}{5}$$

$$\Rightarrow F = \frac{9C}{5} + 32$$

अत: y-अक्ष पर अन्त: खण्ड धनात्मक होगा।

34. (4) **[NCERT-279]**

35. (3) **[NCERT-282]**

उच्च दाब के कारण आधार का गलनांक घट जाता है।

Part-1 [SECTION-B]

36. (2) **[NCERT-279]**

द्रव के बर्तन के सापेक्ष आयतन में परिवर्तन

$\Delta V = V(\gamma_L - \gamma_g)\Delta\theta$

दिया, V = 1 लीटर = 1000 cc

$\gamma_s = 3\alpha_g = 0.3 \times 10^{-4}/C$

$\therefore \Delta V = 1000 (1.82 - 0.3) \times 10^{-4} \times 100 = 15.2$ cc.

37. (2) **[NCERT-282]**

$Q_1 = (ms\Delta T)_{water}$

$= (10 \times 10^3) \times 1 \times (80 - 20)$

$= 600 \times 10^3$ cal.

$Q_2 = (ms\,\Delta T)_{steam} + mL_{steam} + (ms\,\Delta T)_{water}$.

38. (2) **[NCERT-279]**

Let angle subtended by the arc formed be θ, then

$$\theta = \frac{l}{r}$$

or $$\theta = \frac{dl}{dr} = \frac{l_2 - l_1}{r_1 - r_2}$$

$$\therefore \quad \theta = \frac{l(\alpha_2 - \alpha_1)\Delta T}{t}$$

or $$\frac{l}{r} = \frac{l(\alpha_2 - \alpha_2)\Delta T}{t}$$

or $$r = \frac{t}{(\alpha_2 - \alpha_1)\Delta T}$$

39. (2) **[NCERT-283]**

$Q_1 = 5 \times 1 \times 10 = 50$ cal

$Q_2 = 1 \times 80 = 80$ cal

Hence, $Q_1 < Q_2$ and final temperature = 0^oC.

40. (4) **(NCERT-288)**

Because heat conducted is directly proportional to area and inversealy proportional to the length, hence length should be small and radius large .

41. (2) **(NCERT-288)**

42. (4) **(NCERT-286)**

$$\frac{K_F A(100-\theta)}{d} = \frac{K_{Ag} A(\theta - 0)}{d}$$

or $$\frac{1}{11} = \frac{\theta}{100-\theta}$$

$$\therefore \quad \theta = \frac{100}{12} = 8.3^oC$$

43. (1) **(NCERT-286)**

The upper part is kept hot and lower cooled so that convectional flow is stopped.

44. (3) **(NCERT-287)**

45. (4) **(NCERT-290)**

38. (2) **[NCERT-279]**

माना चाप के द्वारा अन्तरित कोण θ, तब

$$\theta = \frac{l}{r}$$

या $$\theta = \frac{dl}{dr} = \frac{l_2 - l_1}{r_1 - r_2}$$

$$\therefore \quad \theta = \frac{l(\alpha_2 - \alpha_1)\Delta T}{t}$$

या $$\frac{l}{r} = \frac{l(\alpha_2 - \alpha_2)\Delta T}{t}$$

या $$r = \frac{t}{(\alpha_2 - \alpha_1)\Delta T}$$

39. (2) **[NCERT-283]**

$Q_1 = 5 \times 1 \times 10 = 50$ cal

$Q_2 = 1 \times 80 = 80$ cal

अतः $Q_1 < Q_2$ और परिणामी ताप = 0^oC.

40. (4) **(NCERT-288)**

चूंकि प्रवाहित ऊष्मा क्षेत्रफल के अनुक्रमानुपाती और लम्बाई के व्युत्क्रमानुपाती होती है। अतः लम्बाई छोटी और त्रिज्या बड़ी होनी चाहिए।

41. (2) **(NCERT-288)**

42. (4) **(NCERT-286)**

$$\frac{K_F A(100-\theta)}{d} = \frac{K_{Ag} A(\theta - 0)}{d}$$

या $$\frac{1}{11} = \frac{\theta}{100-\theta}$$

$$\therefore \quad \theta = \frac{100}{12} = 8.3^oC$$

43. (1) **(NCERT-286)**

सवंहन को रूकने के लिए ऊपरी भाग का ताप ज्यादा रखा जाता है।

44. (3) **(NCERT-287)**

45. (4) **(NCERT-290)**

46. (2) **(NCERT-287)**

For parallel combination of two rods of equal length and equal area of cross section

$$K = \frac{K_1 + K_2}{2}$$

$$= \frac{K_1 + 4K_1/3}{2} = \frac{7K_1}{6} = \frac{K}{K_1} = \frac{7}{6}$$

47. (4) **(NCERT-290)**

$$\frac{E_1}{E_2} = \left(\frac{T_1}{T_2}\right)^4$$

$$\frac{E_1}{E_2} = \left(\frac{T}{2T}\right)^4 = \frac{1}{16}$$

48. (2) **(NCERT-287)**

$$\frac{2kA(100-T)}{\ell} = \frac{3kA(T-0)}{\ell} \Rightarrow T = 40^\circ C$$

49. (3) **(NCERT-289)**

By Wien's law

$$\lambda_1 T_1 = \lambda_2 T_2$$

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

or $$T_2 = \frac{1.56}{1.80} \times 2000 = 1670K$$

50. (2) **(NCERT-287)**

$$t \propto x_2^2 - x_1^2$$

Here $t_2 \propto (2^2 - 1^2)$

and $t_1 = (1^2 - 0^2)$

$$\therefore \quad \frac{t_2}{t_1} = \frac{2^2 - 1^2}{1^2 - 0^2} = \frac{3}{1}$$

Part-2 [SECTION-A]

51. (2) **[NCERT 67]**

$$\sqrt{(0.5)^2 + (.8)^2 + C^2} = 1$$

$$C = \sqrt{0.11}$$

46. (2) **(NCERT-287)**

समान लम्बाई और समान परिछेद की छड़ों के समान्तर संयोजन के लिए

$$K = \frac{K_1 + K_2}{2}$$

$$= \frac{K_1 + 4K_1/3}{2} = \frac{7K_1}{6} = \frac{K}{K_1} = \frac{7}{6}$$

47. (4) **(NCERT-290)**

$$\frac{E_1}{E_2} = \left(\frac{T_1}{T_2}\right)^4$$

$$\frac{E_1}{E_2} = \left(\frac{T}{2T}\right)^4 = \frac{1}{16}$$

48. (2) **(NCERT-287)**

$$\frac{2kA(100-T)}{\ell} = \frac{3kA(T-0)}{\ell} \Rightarrow T = 40^\circ C$$

49. (3) **(NCERT-289)**

वीस नियम से

$$\lambda_1 T_1 = \lambda_2 T_2$$

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

या $$T_2 = \frac{1.56}{1.80} \times 2000 = 1670K$$

50. (2) **(NCERT-287)**

$$t \propto x_2^2 - x_1^2$$

यहाँ $t_2 \propto (2^2 - 1^2)$

और $t_1 = (1^2 - 0^2)$

$$\therefore \quad \frac{t_2}{t_1} = \frac{2^2 - 1^2}{1^2 - 0^2} = \frac{3}{1}$$

Part-2 [SECTION-A]

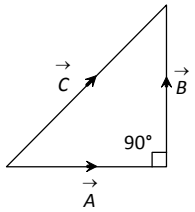
51. (2) **[NCERT 67]**

$$\sqrt{(0.5)^2 + (.8)^2 + C^2} = 1$$

$$C = \sqrt{0.11}$$

52. (3) **[NCERT 67]**

$C = \sqrt{A^2 + B^2}$



The angle between *A* and *B* is $\pi / 2$

53. (4) **[NCERT 32]**

[*n*] = Number of particles crossing a unit area in unit time = $[L^{-2}T^{-1}]$

$[n_2]=[n_1]$ = number of particles per unit volume = $[L^{-3}]$

$[x_2]=[x_1]$ = positions

$\therefore \quad D = \frac{[n][x_2 - x_1]}{[n_2 - n_1]} = \frac{[L^{-2}T^{-1}]\times[L]}{[L^{-3}]} = [L^2T^{-1}]$

54. (1) **[NCERT 32]**

In given equation, $\frac{\alpha z}{k\theta}$ should be dimensionless

$\therefore \quad \alpha = \frac{k\theta}{z} \Rightarrow [\alpha] = \frac{[ML^2T^{-2}K^{-1}\times K]}{[L]} = [MLT^{-2}]$

and $P = \frac{\alpha}{\beta} \Rightarrow [\beta] = \left[\frac{\alpha}{p}\right] = \frac{[MLT^{-2}]}{[ML^{-1}T^{-2}]} = [M^0L^2T^0]$.

55. (1) **[NCERT 76]**

Effective speed of the bullet

= speed of bullet + speed of police jeep

= 180 m/s + 45 km/h = (180+12.5) m/s

= 192.5 m/s

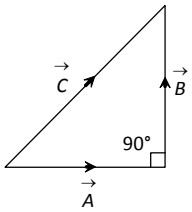
Speed of thief 's jeep = 153 km/h = 42.5 m/s

Velocity of bullet *w.r.t* thief 's car = 192.5 – 42.5

= 150*m/s*

52. (3) **[NCERT 67]**

$C = \sqrt{A^2 + B^2}$



A और *B* के बीच का कोण $\pi / 2$

53. (4) **[NCERT 32]**

[*n*] = एकांक समय में एकांक क्षेत्रफल से गुजरने वाले कणों की संख्या = $[L^{-2}T^{-1}]$

$[n_2]=[n_1]$ = एकांक आयतन में कणों की संख्या = $[L^{-3}]$

$[x_2]=[x_1]$ = स्थिति

$\therefore \quad D = \frac{[n][x_2 - x_1]}{[n_2 - n_1]} = \frac{[L^{-2}T^{-1}]\times[L]}{[L^{-3}]} = [L^2T^{-1}]$

54. (1) **[NCERT 32]**

दिया गया समीकरण $\frac{\alpha z}{k\theta}$ विमाहीन होना चाहिए

$\therefore \quad \alpha = \frac{k\theta}{z} \Rightarrow [\alpha] = \frac{[ML^2T^{-2}K^{-1}\times K]}{[L]} = [MLT^{-2}]$

तथा $P = \frac{\alpha}{\beta} \Rightarrow [\beta] = \left[\frac{\alpha}{p}\right] = \frac{[MLT^{-2}]}{[ML^{-1}T^{-2}]} = [M^0L^2T^0]$.

55. (1) **[NCERT 76]**

गोली की प्रभावी वेग

= गोली का वेग + पुलिस जीप का वेग

= 180 m/s + 45 km/h = (180+12.5) m/s

= 192.5 m/s

चोर जीप का वेग = 153 km/h = 42.5 m/s

चोर के कार के सापेक्ष गोली का वेग = 192.5 – 42.5

= 150*m/s*

56. (3) **[NCERT 47]**

Acceleration of body along *AB* is gcosθ

Distance travelled in time *t sec* = $AB = \frac{1}{2}(g\cos\theta)t^2$

From $\Delta ABC,\ AB = 2R\cos\theta;\ 2R\cos\theta = \frac{1}{2}g\cos\theta t^2$

$\Rightarrow t^2 = \frac{4R}{g}$ or $t = 2\sqrt{\frac{R}{g}}$

57. (1) **[NCERT 47]**

When the stone is released from the balloon. Its height $h = \frac{1}{2}at^2 = \frac{1}{2}\times 1.25\times(8)^2 = 40\ m$ and velocity

$v = at = 1.25\times 8 = 10\ m/s$

Time taken by the stone to reach the ground

$$t = \frac{v}{g}\left[1+\sqrt{1+\frac{2gh}{v^2}}\right] = \frac{10}{10}\left[1+\sqrt{1+\frac{2\times 10\times 40}{(10)^2}}\right]$$

=4 *sec*

58. (4) **[NCERT 72]**

Let the car accelerate at rate α for time t_1 then maximum velocity attained, $v = 0 + \alpha t_1 = \alpha t_1$

Now, the car decelerates at a rate β for time ($t - t_1$) and finally comes to rest. Then,

$0 = v - \beta(t - t_1) \Rightarrow 0 = \alpha t_1 - \beta t + \beta t_1$

$\Rightarrow t_1 = \frac{\beta}{\alpha+\beta}t$

$\therefore\ v = \frac{\alpha\beta}{\alpha+\beta}t$

59. (3) **[NCERT 42]**

Area of trapezium

$= \frac{1}{2}\times 3.6\times(12+8) = 36.0\ m$

56. (3) **[NCERT 47]**

AB के अनुदिश वस्तु का त्वरण gcosθ

t सेकेण्ड में चली गयी दूरी = $AB = \frac{1}{2}(g\cos\theta)t^2$

$\Delta ABC,\ AB = 2R\cos\theta;\ 2R\cos\theta = \frac{1}{2}g\cos\theta t^2$

$\Rightarrow t^2 = \frac{4R}{g}$ or $t = 2\sqrt{\frac{R}{g}}$

57. (1) **[NCERT 47]**

जब पत्थर गुब्बारे से छोड़ा जाता है तब, इसकी ऊँचाई $h = \frac{1}{2}at^2 = \frac{1}{2}\times 1.25\times(8)^2 = 40\ m$ और वेग

$v = at = 1.25\times 8 = 10\ m/s$

जमीन पर पहुंचने का समय

$$t = \frac{v}{g}\left[1+\sqrt{1+\frac{2gh}{v^2}}\right] = \frac{10}{10}\left[1+\sqrt{1+\frac{2\times 10\times 40}{(10)^2}}\right]$$

=4 *sec*

58. (4) **[NCERT 72]**

माना कार t समय α दर से त्वरित हो रही है महत्तम वेग

$v = 0 + \alpha t_1 = \alpha t_1$

अब कार ($t - t_1$) समय में β दर से मन्दित हो रही है और अन्त में रूक जा रही है।

$0 = v - \beta(t - t_1) \Rightarrow 0 = \alpha t_1 - \beta t + \beta t_1$

$\Rightarrow t_1 = \frac{\beta}{\alpha+\beta}t$

$\therefore\ v = \frac{\alpha\beta}{\alpha+\beta}t$

59. (3) **[NCERT 42]**

ट्रापेजियम का क्षेत्रफल

$= \frac{1}{2}\times 3.6\times(12+8) = 36.0\ m$

60. (4) **[NCERT 77]**

Standard equation of projectile motion

$$y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$$

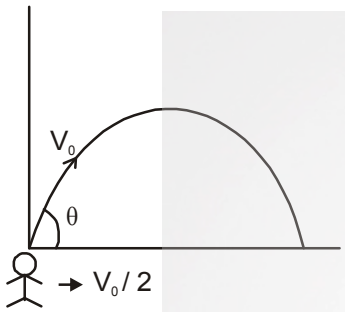
Comparing with given equation

$A = \tan\theta$ and $B = \frac{g}{2u^2\cos^2\theta}$

So $\frac{A}{B} = \frac{\tan\theta \times 2u^2\cos^2\theta}{g} = 40$

(As $\theta = 45°, u = 20\ m/s, g = 10\ m/s^2$)

61. (1) **[NCERT 77]**



$V_0\cos\theta = \frac{V_0}{2}$

$\theta = 60^0$

62. (2) **[NCERT 77]**

$75 = 50\sin 53^0\, t - 1/2\, gt^2$

$t^2 - 8t + 15 = 0$

t = 5 sec and 3 sec

$AB = 50\cos 53^0 \times \Delta t$

$AB = 50 \times 3/5 \times 2 = 60$ m

63. (3) **[NCERT 77]**

$h = u\sin\theta t - 1/2\, gt^2$

from above the graph is downward parabola.

64. (2) **[NCERT 116]**

$\Delta\vec{r} = \vec{r}_2 - \vec{r}_1$

$= (14\hat{i} + 13\hat{j} + 9\hat{k}) - (3\hat{i} + 2\hat{j} - 6\hat{k})$

$= (11\hat{i} + 11\hat{j} + 15\hat{k})$

$W = \vec{F}.\Delta\vec{r}$

$(4\hat{i} + \hat{j} + 3\hat{k}).(11\hat{i} + 11\hat{j} + 15\hat{k}) = 100J$

60. (4) **[NCERT 77]**

प्रक्षेप्य गति का समीकरण

$$y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$$

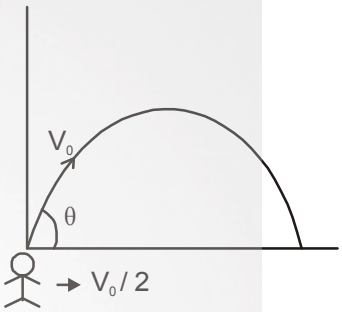
दिये गये समीकरण से तुलना करने पर

$A = \tan\theta$ और $B = \frac{g}{2u^2\cos^2\theta}$

अत: $\frac{A}{B} = \frac{\tan\theta \times 2u^2\cos^2\theta}{g} = 40$

($\theta = 45°, u = 20\ m/s, g = 10\ m/s^2$)

61. (1) **[NCERT 77]**



$V_0\cos\theta = \frac{V_0}{2}$

$\theta = 60^0$

62. (2) **[NCERT 77]**

$75 = 50\sin 53^0\, t - 1/2\, gt^2$

$t^2 - 8t + 15 = 0$

t = 5 sec and 3 sec

$AB = 50\cos 53^0 \times \Delta t$

$AB = 50 \times 3/5 \times 2 = 60$ m

63. (3) **[NCERT 77]**

$h = u\sin\theta t - 1/2\, gt^2$

उपरोक्त समीकरण से ग्राफ नीचे की ओर परवलय होगा।

64. (2) **[NCERT 116]**

$\Delta\vec{r} = \vec{r}_2 - \vec{r}_1$

$= (14\hat{i} + 13\hat{j} + 9\hat{k}) - (3\hat{i} + 2\hat{j} - 6\hat{k})$

$= (11\hat{i} + 11\hat{j} + 15\hat{k})$

$W = \vec{F}.\Delta\vec{r}$

$(4\hat{i} + \hat{j} + 3\hat{k}).(11\hat{i} + 11\hat{j} + 15\hat{k}) = 100J$

65. (1) **[NCERT 119]**

$$W = 2\int_1^3 x\,dx + 2\int_2^6 dy + 3\int_3^1 z^2\,dz$$

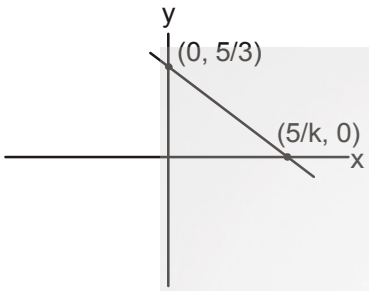
$W = -10$ J.

66. (4) **[NCERT 114]**

$$W = \frac{1}{2}k(x+y)^2 - \frac{1}{2}kx^2$$

$$W = \frac{1}{2}ky[2x+y]\,.$$

67. (1) **[NCERT 124]**



$$W = \vec{F}.\Delta\vec{r}$$

$$0 = (2\hat{i}+3\hat{j})\cdot\left(\frac{5}{3}\hat{j}+\frac{5}{k}\hat{i}\right)$$

$k = 2$.

68. (2) **[NCERT 118]**

Applying conservation of mechanical energy

$$Mg(1.5x) + \frac{1}{2}K(0.5x)^2 = \frac{1}{2}mv^2$$

$$1.5\,Mgx + \frac{1}{2}\times\frac{4Mg}{x}\times(0.5x)^2 = \frac{1}{2}mv^2$$

$1.5\,g\,x + 0.5\,gx = 1/2\,v^2$

$v^2 = 4gx$

$v = 2\sqrt{gx}$

69. (3) **[NCERT 122]**

$W_T = \Delta K$

$mgh + W_f = K_f + K_i$

$$1\times10\times1+W_f=\frac{1}{2}\times1\,[16-4]$$

$10+W_f = 6$

$W_f = 6 - 10$

$= -4$ J

65. (1) **[NCERT 119]**

$$W = 2\int_1^3 x\,dx + 2\int_2^6 dy + 3\int_3^1 z^2\,dz$$

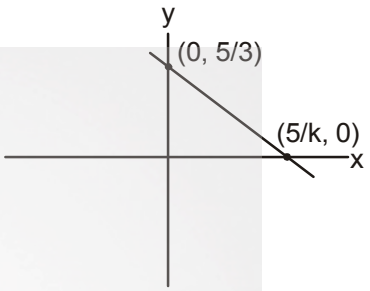
$W = -10$ J.

66. (4) **[NCERT 114]**

$$W = \frac{1}{2}k(x+y)^2 - \frac{1}{2}kx^2$$

$$W = \frac{1}{2}ky[2x+y]\,.$$

67. (1) **[NCERT 124]**



$$W = \vec{F}.\Delta\vec{r}$$

$$0 = (2\hat{i}+3\hat{j})\cdot\left(\frac{5}{3}\hat{j}+\frac{5}{k}\hat{i}\right)$$

$k = 2$.

68. (2) **[NCERT 118]**

यात्रिंक ऊर्जा संरक्षण से

$$Mg(1.5x) + \frac{1}{2}K(0.5x)^2 = \frac{1}{2}mv^2$$

$$1.5\,Mgx + \frac{1}{2}\times\frac{4Mg}{x}\times(0.5x)^2 = \frac{1}{2}mv^2$$

$1.5\,g\,x + 0.5\,gx = 1/2\,v^2$

$v^2 = 4gx$

$v = 2\sqrt{gx}$

69. (3) **[NCERT 122]**

$W_T = \Delta K$

$mgh + W_f = K_f + K_i$

$$1\times10\times1+W_f=\frac{1}{2}\times1\,[16-4]$$

$10+W_f = 6$

$W_f = 6 - 10$

$= -4$ J

70. (1) **[NCERT-102]**

Limiting friction between block and slab

$= \mu_s m_A g$

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

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

$F_k = \mu_k m_A g$

$= 0.4 \times 10 \times 9.8 = 39.2 \ N$

Now kinetic friction works between block and slab

This kinetic friction helps to move the slab

$\therefore$ Acceleration of slab

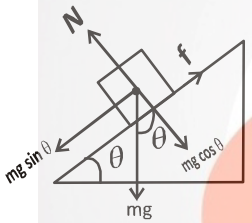
$= \frac{39.2}{m_B} = \frac{39.2}{40} = 0.98 \ m/s^2$

71. (2) **[NCERT-105]**

$2 t \sin\theta = ma$

$\theta = a = g/\sqrt{3}$

72. (3) **[NCERT- 102]**



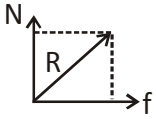
Since block is at rest

so $f = mg \sin\theta$

and Normal reaction

$N = mg \sin\theta$

So, Net of N and f gives us reaction force



$R = \sqrt{N^2 + f^2}$

$R = \sqrt{(mg\cos\theta)^2 + (mg\sin\theta)^2}$

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

$R = mg$

70. (1) **[NCERT-102]**

ब्लाक और स्लेब के बीच सीमित घर्षण $= \mu_s m_A g$

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

लेकिन ब्लॉक A पर 100 N है जिसके कारण ब्लॉक स्लेब पर फिसलेगा।

$F_k = \mu_k m_A g$

$= 0.4 \times 10 \times 9.8 = 39.2 \ N$

अब ब्लॉक और स्लेब के बीच गतिज घर्षण कार्य करेगा।

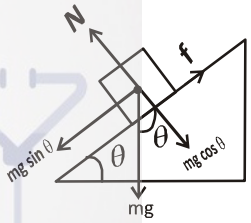
$= \frac{39.2}{m_B} = \frac{39.2}{40} = 0.98 \ m/s^2$

71. (2) **[NCERT-105]**

$2 t \sin\theta = ma$

$\theta = a = g/\sqrt{3}$

72. (3) **[NCERT- 102]**



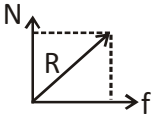
चूकि ब्लॉक रूका हुआ है

अत: $f = mg \sin\theta$

और सामान्य प्रतिक्रिया बल

$N = mg \sin\theta$

इसलिए N और f का परिणाम प्रतिक्रिया बल देगा।



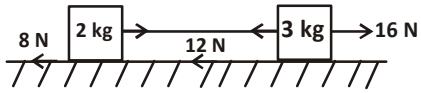
$R = \sqrt{N^2 + f^2}$

$R = \sqrt{(mg\cos\theta)^2 + (mg\sin\theta)^2}$

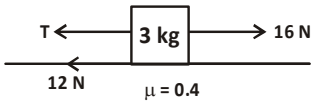
$R = mg\sqrt{\cos^2\theta + \sin^2\theta}$

$R = mg$

73. (1) **[NCERT-111]**



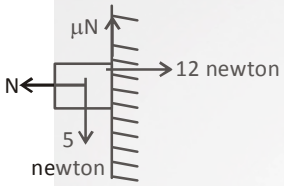
F.B.D. of block 3 kg (block is at rest)



T + 12 = 16 T = 4 N

74. (4) **[NCERT-101]**

Since block is in equilibrium position



N = 12 newton —— (i)

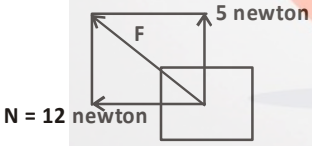
$f = \mu N \Rightarrow$ $f = 0.6 \times 10$

$f = 7.2$ N

friction force is greater than weight 5N of block

so friction force will equal to 5 N

so f = 5 N



So Net contact force

$F = \sqrt{(5)^2 + (12)^2}$

$= \sqrt{25+144} \Rightarrow F = \sqrt{169}$

F = 13 N

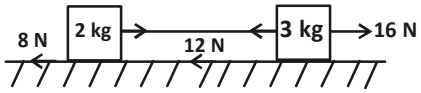
75. (4) **[NCERT-109]**

Maximum friction on B is f = 0.1 x 10 x 5

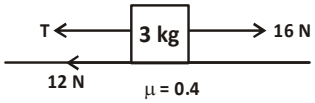
$\Rightarrow$ f = 5N

So maximum acceleration of B without slipping will be

73. (1) **[NCERT-111]**



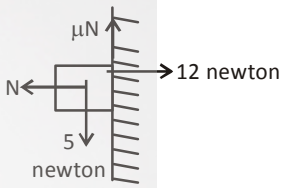
3 kg ब्लॉक का F.B.D



T + 12 = 16 T = 4 N

74. (4) **[NCERT-101]**

चूंकि ब्लॉक साम्यावस्था पर है



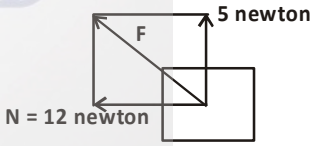
N = 12 न्यूटन —— (i)

$f = \mu N \Rightarrow$ $f = 0.6 \times 10$

$f = 7.2$ N

घर्षण बल का मान ब्लॉक के भार से ज्यादा है। इसलिए घर्षण बल 5 N के बराबर होगा।

अतः f = 5 N



इसलिए तुल्य सम्पर्क बल

$F = \sqrt{(5)^2 + (12)^2}$

$= \sqrt{25+144} \Rightarrow F = \sqrt{169}$

F = 13 N

75. (4) **[NCERT-109]**

B पर महत्तम घर्षण f = 0.1 x 10 x 5

$\Rightarrow$ f = 5N

इसलिए बिना फिसले हुए B का महत्तम त्वरण

$$a_{max} = \frac{f}{m_A} \Rightarrow a_{max} = \frac{5}{5} \quad = a_{max} = 1 m/s^2 .$$

76. (2) **[NCERT 275]**

77. (4) **[NCERT 275]**

Difference of 100°C = difference of 180°F

$\therefore$ Difference of $30° = \frac{180}{100} \times 30 = 54°$

78. (1) **[NCERT 277]**

$$\gamma = \frac{\Delta V}{V.\Delta T} = \frac{0.24}{100 \times 40} = 6 \times 10^{-5} /°C$$

$$\Rightarrow \alpha = \frac{\gamma}{3} = 2 \times 10^{-5} /°C$$

79. (3) **[NCERT 281]**

When state is not changing $\Delta Q = mc\Delta\theta$.

80. (1) **[NCERT 282]**

If *m gm* ice melts then

Heat lost = Heat gain

$$80 \times 1 \times (30 - 0) = m \times 80 \Rightarrow m = 30\ gm$$

81. (2) **[NCERT 288]**

$$K_1 : K_2 = l_1^2 : l_2^2 \Rightarrow \frac{l_1}{l_2} = \sqrt{\frac{K_1}{K_2}} = \sqrt{\frac{10}{9}} = \frac{\sqrt{10}}{3}$$

82. (1) **[NCERT 289]**

$\frac{K_1}{K_2} = \frac{1}{3}$(given)

Let Interface temperature is θ

$$\frac{K_1 A(100 - \theta)}{x} = \frac{K_2 A(\theta - 0)}{x}$$

$$\theta = \frac{100}{4} = 25^0 C$$

83. (4) **[NCERT 288]**

$$\frac{Q}{t} = \frac{KA\Delta\theta}{l} \Rightarrow \frac{K_A}{K_B} = \frac{A_B}{A_A} = \left(\frac{r_B}{r_B}\right)^2 = \frac{1}{4} \Rightarrow K_A = \frac{K_B}{4}$$

$$a_{max} = \frac{f}{m_A} \Rightarrow a_{max} = \frac{5}{5} \quad = a_{max} = 1 m/s^2 .$$

76. (2) **[NCERT 275]**

77. (4) **[NCERT 275]**

100°C का अन्तर = 180°F का अन्तर

$\therefore$ 30° का अन्तर $= \frac{180}{100} \times 30 = 54°$

78. (1) **[NCERT 277]**

$$\gamma = \frac{\Delta V}{V.\Delta T} = \frac{0.24}{100 \times 40} = 6 \times 10^{-5} /°C$$

$$\Rightarrow \alpha = \frac{\gamma}{3} = 2 \times 10^{-5} /°C$$

79. (3) **[NCERT 281]**

जब अवस्था नहीं बदल रही है $\Delta Q = mc\Delta\theta$.

80. (1) **[NCERT 282]**

यदि *m gm* बर्फ पिघलती है तब

ऊष्मा हानि = ऊष्मा लाभ

$$80 \times 1 \times (30 - 0) = m \times 80 \Rightarrow m = 30\ gm$$

81. (2) **[NCERT 288]**

$$K_1 : K_2 = l_1^2 : l_2^2 \Rightarrow \frac{l_1}{l_2} = \sqrt{\frac{K_1}{K_2}} = \sqrt{\frac{10}{9}} = \frac{\sqrt{10}}{3}$$

82. (1) **[NCERT 289]**

$\frac{K_1}{K_2} = \frac{1}{3}$ (दिया है)

यदि अन्तरापृष्ठ का ताप θ हो

$$\frac{K_1 A(100 - \theta)}{x} = \frac{K_2 A(\theta - 0)}{x}$$

$$\theta = \frac{100}{4} = 25^0 C$$

83. (4) **[NCERT 288]**

$$\frac{Q}{t} = \frac{KA\Delta\theta}{l} \Rightarrow \frac{K_A}{K_B} = \frac{A_B}{A_A} = \left(\frac{r_B}{r_B}\right)^2 = \frac{1}{4} \Rightarrow K_A = \frac{K_B}{4}$$

84. (3) **[NCERT 290]**

Warming of glass of bulb due to filament.

85. (3) **[NCERT 290]**

$$\lambda_{m_1} T_1 = \lambda_{m_2} T_2 \Rightarrow \lambda_{m_2} = \frac{\lambda_{m_1} T_1}{T_2} = \frac{14 \times 200}{1000} = 2.8\ \mu m$$

Part-2 [SECTION-B]

86. (2) **[NCERT 308]**

87. (2)

$\Delta L = L$

$A = (2 \times 10^{-3})^2 = 4 \times 10^{-6}$

$L = \frac{T}{10^7} \times \frac{L}{4 \times 10^{-6}}$

$T = 40\ N$

88. (1)

89. (3)

90. (3)

Liquids do not have a definite shape and not capable to attain linear or shear strain

91. (2)

Since material and cross section is same hence breaking force will reamain same

92. (2)

As excess pressure inside soap bubble

$P = \frac{4T}{R}$

& $V = \frac{4}{3}\pi R^3$

So $PV = \frac{4T}{R} \times \frac{4}{3}\pi R^3$

$PV\ \alpha\ R^2$

84. (3) **[NCERT 290]**

फिलामेंट के कारण कांच के वल्ब का गर्म होना

85. (3) **[NCERT 290]**

$$\lambda_{m_1} T_1 = \lambda_{m_2} T_2 \Rightarrow \lambda_{m_2} = \frac{\lambda_{m_1} T_1}{T_2} = \frac{14 \times 200}{1000} = 2.8\ \mu m$$

Part-2 [SECTION-B]

86. (2) **[NCERT 308]**

87. (2)

$\Delta L = L$

$A = (2 \times 10^{-3})^2 = 4 \times 10^{-6}$

$L = \frac{T}{10^7} \times \frac{L}{4 \times 10^{-6}}$

$T = 40\ N$

88. (1)

89. (3)

90. (3)

द्रव का कोई निश्चित आकार नहीं होता है।

91. (2)

पदार्थ का क्षेत्रफल समान है इसलिए तोड़ने वाला बल समान रहेगा।

92. (2)

साबुन के अन्दर अधिक्य दाब

$P = \frac{4T}{R}$

तथा $V = \frac{4}{3}\pi R^3$

अतः $PV = \frac{4T}{R} \times \frac{4}{3}\pi R^3$

$PV\ \alpha\ R^2$

93. (2)

Volume of big drop = Volume of 8 small droplets.

$$\frac{4}{3}\pi R^3 = 8\times\frac{4}{3}\pi r^3$$

$$r = \frac{R}{2}$$

For small drop $\Delta P_s = \frac{2T}{r}$

$$= \frac{2T}{R/2} = \frac{4T}{R}$$

For bigger drop

$$\Delta P_b = \frac{2T}{R}$$

$$\Delta P_b = \frac{\Delta Ps}{2}$$

94. (3)

95. (1)

In this law of Conservation of energy will be hold. The K.E. per unit volume will be equal to P.E. per unit volume.

So $\frac{1}{2}\rho v^2 = \rho gh$

$$r^2\omega^2 = 2gh$$

$$h = \frac{r^2\omega^2}{2g}$$

$$= \frac{(.05)^2(4)^2}{2\times10}$$

$$= \frac{.05\times.05\times4\times4}{2\times10}$$

= 200 x 10^{-5}

$\Rightarrow$ h =0.002 m

93. (2)

बड़ी बूंद का आयतन = 8 छोटी बूंद का आयतन

$$\frac{4}{3}\pi R^3 = 8\times\frac{4}{3}\pi r^3$$

$$r = \frac{R}{2}$$

छोटी बूंद के लिए $\Delta P_s = \frac{2T}{r}$

$$= \frac{2T}{R/2} = \frac{4T}{R}$$

बड़ी बूंद के लिए

$$\Delta P_b = \frac{2T}{R}$$

$$\Delta P_b = \frac{\Delta Ps}{2}$$

94. (3)

95. (1)

एकांक आयतन की गतिज ऊर्जा = एकांक आयतन की स्थितिज ऊर्जा

अतः $\frac{1}{2}\rho v^2 = \rho gh$

$$r^2\omega^2 = 2gh$$

$$h = \frac{r^2\omega^2}{2g}$$

$$= \frac{(.05)^2(4)^2}{2\times10}$$

$$= \frac{.05\times.05\times4\times4}{2\times10}$$

= 200 x 10^{-5}

$\Rightarrow$ h =0.002 m

96. (1)

As Q = $\frac{M}{d}=\frac{P\pi r^4}{8\eta\ell}$

so, M = $\frac{P\pi r^4}{8(\eta/d)\ell}$

As, M is same

so, $\frac{\eta}{d}=\frac{P\pi r^4}{8M\ell}$

so, = $\frac{\eta_1}{d_1}=\frac{\eta_2}{d_2}$

then $\frac{\eta_1}{\eta_2}=\frac{d_1}{d_2}$

97. (1)

$$\rho_0+\rho_{t_2}gl_2=\rho_0+\rho_{t_1}gl_1$$
$$\rho_{t_2}l_2=\rho_{t_1}l_1$$
$$\frac{\rho_0}{1+\gamma t_2}l_2=\frac{\rho_0}{1+\gamma t_1}l_1$$
$$(1+\gamma t_1)l_2=l_2-l_2$$
$$\gamma(l_2t_1-l_1t_2)=l_1-l_2$$
$$\gamma=\frac{l_1-l_2}{l_2t_1-l_1t_2}$$

98. (3)

99. (3)

100. (3)

volume entering per second = volume leaving per second

$$v_1A_1=v_2A_2+v_3A_3$$
$$8\times\frac{4}{10}=4\times\frac{4}{10}+v_3\times\frac{8}{10}$$
$$\therefore\quad v_3=2ms^{-1}$$

96. (1)

Q = $\frac{M}{d}=\frac{P\pi r^4}{8\eta\ell}$

अत: M = $\frac{P\pi r^4}{8(\eta/d)\ell}$

M समान है

अत: $\frac{\eta}{d}=\frac{P\pi r^4}{8M\ell}$

इसलिए = $\frac{\eta_1}{d_1}=\frac{\eta_2}{d_2}$

तब $\frac{\eta_1}{\eta_2}=\frac{d_1}{d_2}$

97. (1)

$$\rho_0+\rho_{t_2}gl_2=\rho_0+\rho_{t_1}gl_1$$
$$\rho_{t_2}l_2=\rho_{t_1}l_1$$
$$\frac{\rho_0}{1+\gamma t_2}l_2=\frac{\rho_0}{1+\gamma t_1}l_1$$
$$(1+\gamma t_1)l_2=l_2-l_2$$
$$\gamma(l_2t_1-l_1t_2)=l_1-l_2$$
$$\gamma=\frac{l_1-l_2}{l_2t_1-l_1t_2}$$

98. (3)

99. (3)

100. (3)

प्रवेश के समय एकांक आयतन = निर्गत का एकांकआयतन

$$v_1A_1=v_2A_2+v_3A_3$$
$$8\times\frac{4}{10}=4\times\frac{4}{10}+v_3\times\frac{8}{10}$$
$$\therefore\quad v_3=2ms^{-1}$$

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