# NEET ANSWER KEY & SOLUTIONS

**SUBJECT :- PHYSICS**

**CLASS :- 11th** **PAPER CODE :- CWT-13**

**CHAPTER :- THERMAL PROPERTIES OF MATTER**

## ANSWER KEY

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

## SOLUTIONS

### SECTION-A

**1.** (C)

**Sol.** At absolute zero (i.e. 0 K) $v_{rms}$ becomes zero.

**2.** (B)

**Sol.** $\frac{C}{5}=\frac{F-32}{9} \Rightarrow \frac{25}{5}=\frac{F-32}{9} \Rightarrow F=77°F$.

**3.** (C)

**Sol.** Due to evaporation cooling is caused which lowers the temperature of bulb wrapped in wet hanky

**4.** (C)

**Sol.** $\frac{C}{5}=\frac{F-32}{9} \Rightarrow \frac{C}{5}=\frac{(140-32)}{9} \Rightarrow C=60°$

**5.** (A)

**Sol.** $t=\frac{(P_t-P_0)}{(P_{100}-P_0)}\times 100°C=\frac{(60-50)}{(90-50)}\times 100=25°C$

**6.** (D)

**Sol.** $\frac{Q}{t}=\frac{KA\,\Delta\theta}{l} \Rightarrow \frac{Q}{t}\propto\frac{A}{l}\propto\frac{d^2}{l}$

($d$ = Diameter of rod)

$\Rightarrow \frac{(Q/t)_1}{(Q/t)_2}=\left(\frac{d_1}{d_2}\right)^2\times\frac{l_2}{l_1}=\left(\frac{1}{2}\right)^2\times\left(\frac{1}{2}\right)=\frac{1}{8}$

**7.** (D)

**Sol.** We know that $F=\frac{9}{5}C+32$

$\Rightarrow 140=\frac{9}{5}C+32$

$\Rightarrow C=\frac{108\times 5}{9}$

$\Rightarrow 12\times 5=60°$

**8.** (A)

**Sol.** Initially liquid oxygen will gain the temp. up to its boiling temprature then it change its state to gas. After this again its temprature will increase, so corresponding graph will be option (A)

**9.** (A)

**Sol.** $\Delta d=d_o\alpha\Delta t$

Where, Δd = Change in diameter of the hole $d_o$= Initial diameter of the hole

α= Coefficient of linear expansion of steel

Δt= Rise in temperature

Putting the values as given in the question:

$0.003 = 0.9997 \times 12 \times 10^{-6} \times \Delta t$

Rearranging the equation, we obtain:

$\Delta t = 0.0030.9997 \times 12 \times 10^{-6}C$

Hence, we obtain:

Δt = 25°C

**10.** (B)

**Sol.** In vapor to liquid phase transition, heat liberates. so When vapour condenses into liquid It liberates heat

**11.** (A)

**Sol.** The latent heat of vaporization is always greater than the latent heat of fusion because, in phase change from liquid to vapour, there is a large increase in volume. Hence, more heat is required as compared to phase change from solid to liquid.

The latent heat of sublimation at a particular temperature is the amount of heat required to convert a unit mass of solid into a gas.

**12.** (B)

**Sol.** When water is cooled at 0°C to form ice then 80 calorie/gm (latent heat) energy is released. Because potential energy of the molecules decreases. Mass will remain constant in the process of freezing of water.

**13.** (A)

**Sol.** $\rho = \rho_0 (1 - \gamma\Delta t)$

$\frac{\Delta\rho}{\rho_0} = \gamma\Delta T = (5 \times 10^{-4})(40) = 0.02$

**14.** (D)

**Sol.** $V_i = 0.1\ cm^2$, $V_f = 167.1\ cm^3$

$\Delta V = 167\ cm^3 = 167 \times (10^{-2})^3 = 167 \times 10^{-6}\ m^3$

$W = P\Delta V = (167 \times 10^{-6}) \times (10^5) = 16.7\ J$

$Q = 54 \times 4.2 = 226.8$

$Q = W + U\uparrow$

$226.8 = 16.7 + U\uparrow$

$U\uparrow = 226.8 - 16.7 = 210\ J$

**15.** (B)

**Sol.** The heat generated due to friction between our palms increase the temperature of our palms.
But if keep rubbing, the excess heat gets lost to surrounding air.

**16.** (B)

**Sol.** Firstly the temperature of bullet rises up to melting point, then it melts. Hence according to
W = JQ

$\Rightarrow \frac{1}{2}mv^2 = J.[mc\Delta\theta + mL] = J[mS(475 - 25 + mL]$

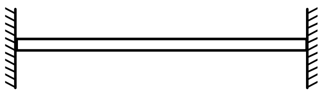
$\Rightarrow mS(475 - 25) + mL = \frac{mv^2}{2J}$

**17.** (B)

**Sol.** $\frac{\Delta\ell}{\ell} = \alpha.\Delta T$

and $Y = \frac{F/A}{\Delta\ell/\ell}$

So, $F = AY\alpha t$



Thermal stress $\left(\frac{F}{A}\right) = Y\alpha t.$

**18.** (A)

**Sol.** The height from which the Hailstone falls is 1 km.
The energy lost by the hailstone is the potential energy and as it falls, this energy converts into heat energy. This heat energy is utilized in melting the hailstone.
So, the part of the hailstone melted is given by equating the potential energy to the latent heat of fusion

mgh = KmL

$\because$ Latent heat of ice = $3.36 \times 10^5$ J/kg

$\Rightarrow K = \frac{gh}{L}$

$= \frac{10 \times 1000}{3.36 \times 10^5}$

$= = \frac{1}{33}$

**19.** (D)

**Sol.** A liquid starts to boil at a temperature when its vapor pressure becomes equal to the external atmospheric pressure, that temperature is known as boiling point of that liquid.

**20.** (C)

**Sol.** The boiling point are the conditions of temperature and pressure, when the vapour pressure of the boiling liquid is EQUAL to the ambient pressure, and bubbles of vapour form directly in the liquid.
On increasing the pressure water has to be elevated much higher temperature for its pressure to be equal to net applied pressure on it and therefore the water will boil at higher temprature

**21.** (A)

**Sol.** A liquid gets converted into vapor phase when its vapor pressure becomes equal to the atmospheric pressure.
That's why, a liquid boils faster at high altitude than sea level.

**22.** (A)

**Sol.** Freezing point of water decreases when pressure increases,because water expands on solidification while ,except water'for other liquid freezing point increases with increase in pressure.
Since the liquid in question is water. Hence, it expands on freezing.

**23.** (A)

**Sol.** It is known that

W = JQ

Putting Values according to question:

W = JQ $\Rightarrow \frac{1}{2}\left(\frac{1}{2}Mv^2\right) = J(mc\Delta\theta)$

$\Rightarrow \frac{1}{4}\times 1\times(50)^2 = 4.2[200\times 0.105\times\Delta\theta] \Rightarrow \Delta\theta = 7.1°C$

**24.** (A)

**Sol.** The specific heat capacity of a substance is the amount of heat energy required to raise the temperature of unit mass of the substance by one degree centigrade.

S = $\frac{Q}{m\Delta T}$

**25.** (D)

**Sol.** On heating the KE of the atoms increses and hence they are able to vibrate over a larger distance and hence their size increases.

**26.** (C)

**Sol.** Since, it is given that the coefficient of cubical expansion of alcohol is more than that of the metal.

This statement means that when we raise the temperature, the volume of alcohol increase at a faster rate than as compared to the increase in volume of metal ball.

OR in other words, the density of alcohol decreases at a faster rate as compared to metal ball. As a result, the metal ball experiences a lesser bouyant force as the temperature is raised. Hence, the weight at increased temperatures would be more.

Hence, answer should be

$W_1 < W_2$

**27.** (D)

**Sol.** The volume expansion at 100°C is given as,

$\Delta V = V_0\gamma \times \Delta T$

$=10^{-6} \times 18 \times 10^{-5} \times 100$

$=18 \times 10^{-9} m^3$

The length of the mercury column is given as,

$1 = \frac{\Delta V}{A}$

$= \frac{18\times 10^{-9}}{4\times 10^{-7}}$

$= 4.5 \times 10^{-2}$m

Thus, the length of the mercury column is 4.5cm.

**28.** (B)

**Sol.** It will start solidifying from the bottom upward

Substances are classified into two categories

(i) water like substances which expand on solidification.

(ii) $CO_2$ like (Wax, Ghee etc.) which contract on solidification.

Their behaviour regarding solidification is opposite.

Melting point of ice decreases with rise of temp but that of wax etc increases with increase in temperature. Similarly ice starts forming from top downwards whereas wax starts its formation from bottom.

**29.** (A)

**Sol.** The temperature of land rises rapidly as compared to sea because of specific heat of land is five times less than that of sea water. Thus, the air above the land become hot and light so rises up so because of pressure drops over land. To compensate the drop of pressure, the cooler air starts from sea starts blowing towards lands, so, setting up sea breeze. During night land as well sea radiate heat energy. The temperature of landfalls more rapidly as compared to sea water, as sea water consists of higher specific heat capacity. The air above seawater being warm and light rises up and to take its place the cold air from land starts blowing towards sea and so et up breeze.

**30.** (D)

**Sol.** For cooking utensils, low specific heat is preferred for it's material as it should need less heat to raise its temperature and it should have high conductivity, because, it should transfer heat quickly.Hence, it must have low specific heat and high conductivity .

**31.** (D)

**Sol.** It is the property of material.

**32.** (D)

**Sol.** Because steady state has been reached.

**33.** (B)

**Sol.** $\left(\frac{Q}{t}\right)_1 = \frac{K_1A_1(\theta_1-\theta_2)}{l}$

and $\left(\frac{Q}{t}\right)_2 = \frac{K_2A_2(\theta_1-\theta_2)}{l}$

given $\left(\frac{Q}{t}\right)_1 = \left(\frac{Q}{t}\right)_2 \Rightarrow K_1A_1 = K_2A_2$

34. (B)

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

35. (C)

Sol. $\frac{dQ}{dt} = KA\frac{\Delta T}{\ell} \quad \Rightarrow 4000$

$= \frac{400 \times 100 \times 10^{-4} \times \Delta T}{0.1} \quad \Rightarrow \Delta T = 100°C$

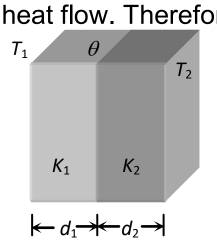
## SECTION-B

36. (A)

Sol. When a piece of glass is heated, due to low thermal conductivity it does not conduct heat fast. Hence unequal expansion of it's layers crack the glass.

37. (A)

Sol. In series both walls have same rate of heat flow. Therefore




$\frac{dQ}{dt} = \frac{K_1 A(T_1 - \theta)}{d_1} = \frac{K_2 A(\theta - T_2)}{d_2}$

$\Rightarrow K_1 d_2 (T_1 - \theta) = K_2 d_1 (\theta - T_2)$

$\Rightarrow \theta = \frac{K_1 d_2 T_1 + K_2 d_1 T_2}{K_1 d_2 + K_2 d_1}$

38. (B)

Sol. In series $R_{eq} = R_1 + R_2$

$\Rightarrow \frac{2l}{K_{eq}A} = \frac{l}{K_1 A} + \frac{l}{K_2 A}$

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

39. (B)

Sol. $\frac{dQ}{dt} = KA\frac{d\theta}{dl} \Rightarrow \frac{dQ}{dt} \propto \frac{d\theta}{dl}$

(Temperature gradient)

40. (D)

Sol. Temperature is related to kinetic energy
Heat is related to total internal energy
During the process of melting there is no changes in temperature
The property expansion of substances is used to measure the temperature.

41. (C)

Sol. Heat energy always flow from higher temperature to lower temperature. Hence, temperature difference w.r.t. length (temperature gradient) is required to flow heat from one part of a solid to other part.

42. (B)

Sol. Temperature of water just below the lower surface of ice layer is 0°C.

43. (A)

Sol. Temperature of interface $\theta = \frac{K_1\theta_1 l_2 + K_2\theta_2 l_1}{K_1 l_2 + K_2 l_1}$

It is given that $K_{Cu} = 9K_S$. So if $K_S = K_1 = K$ then $K_{Cu} = K_2 = 9K$

$\Rightarrow \theta = \frac{9K \times 100 \times 6 + K \times 0 \times 18}{9K \times 6 + K \times 18}$

$= \frac{5400\,K}{72\,K} = 75°C$

44. (C)

Sol. $K = \frac{2K_1K_2}{K_1 + K_2} = \frac{2.K.2K}{K + 2K} = \frac{4}{3}K$

45. (C)

Sol. In winter, the temperature of surrounding is low compared to the body temperature $(37.4^o C)$. Since woolen clothes are bad conductors of heat, so they keep the body warm.

46. (B)

Sol. Rate of heat flow $\left(\frac{Q}{t}\right) = \frac{k\pi r^2(\theta_1 - \theta_2)}{L} \propto \frac{r^2}{L}$

$\therefore \frac{Q_1}{Q_2} = \left(\frac{r_1}{r_2}\right)^2\left(\frac{l_2}{l_1}\right) = \left(\frac{1}{2}\right)^2 \times \left(\frac{2}{1}\right) = \frac{1}{2}$

$\Rightarrow Q_2 = 2Q_1$

47. (B)

Sol. $\frac{Q}{t} = \frac{KA\Delta\theta}{l} \Rightarrow 6000 = \frac{200 \times 0.75 \times \Delta\theta}{1}$

$\therefore \Delta\theta = \frac{6000 \times 1}{200 \times 0.75} = 40°C$

48. (B)

Sol. Because of uneven surfaces of mountains, most of it's parts remain under shadow. So, most of the mountains. Land is not heated up by sun rays. Besides this, sun rays fall slanting on the mountains and are spread over a larger area. So, the heat received by the mountains top per unit area is less and they are less heated compared to planes (Foot).

49. (C)

50. (A)

Sol. Woolen fibres encloses a large amount of air in them. Both wool and air are the bad conductors of heat and the coefficient of thermal conductivity is small. So, they prevent any loss of heat from our body.