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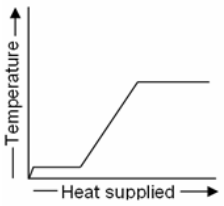
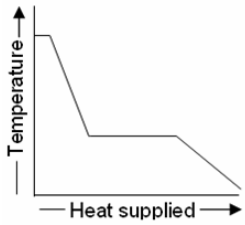
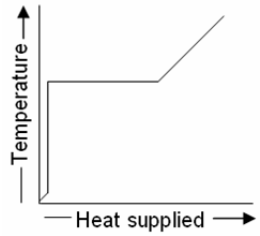
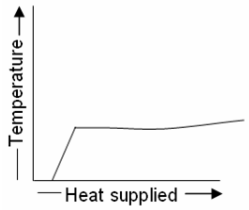
Class: XI
Subject: Physics
Topic: Thermal properties of matter
No. of Questions: 27

Q1. A block of ice at – 10° is slowly heated and converted to steam at 100°C. Which of the following curves represent this phenomenon qualitatively?

a. 

b. 

c. 

d. 

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Q2. A copper bar of length 1 m and cross-sectional area 10×10^2 m^2 has its one end maintained at 100°C by mean of 0.4 kW electric heater. What is temperature of the other end in steady state, given that the thermal conductivity of copper is 400 W/mK?

a. 100^oC

b. 90^oC

c. 80^oC

d. 70^oC

Q3. The thermal conductivity of a rod is 2. What is its thermal resistivity?

a. 0.5

b. 1

c. 0.25

d. 2

Q4. If the door of a refrigerator is opened while connected to supply, then the room

a. gets cooled

b. gets heated

c. has no effect

d. temperature is not affected

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Q5. The temperatures of equal masses of three different liquids A, B and C are 12°C, 19°C and 28°C, respectively, The temperature when A and B are mixed is 16°C and when B and C are mixed is 23°C. The temperature when A and C are mixed is

a. 18.2°C

b. 22°C

c. 20.2°C

d. 24.2°C

Q6. If the difference in temperature on the sides of a wall increases from 100°C to 200°C, its thermal conductivity

a. remains unchanged

b. is doubled

c. becomes half

d. becomes four times

Q7. Three objects, coloured black, gray and white, can withstand hostile conditions upto 2800^0C. These objects are thrown into a furnace where each of them attains a temperature of 2000^0C. Which object will glow the brightest?

a. The white object

b. The black object

c. The gray object

d. All will glow with equal brightness

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Q8. If a piece of blue glass is heated to a high temperature and a piece of red glass at room temperature, are taken inside a dimly lit room, then

a. the blue piece will look blue and red will look as usual

b. red looks brighter red and blue looks ordinary blue

c. blue shines like brighter red compared to the red piece

d. both the pieces will look equally red

Q9. The temperature of a furnace is 2324 ^{o}C and the intensity is maximum in its radiation spectrum nearly at 12000 $\mathring{A}$. If the intensity in the spectrum of a star is maximum nearly at 4800 $\mathring{A}$, then calculate the surface temperature of the star in ^{o}C?

a. 6219.5

b. 5231.45

c. 5623.12

d. 8652.32

Q10. A beaker is completely filled with water at 4^{o}C. It will overflow if

a. heated above 4^{o}C

b. cooled below 4^{o}C

c. both heated and cooled above and below 4^{o}C respectively

d. none of these

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Q11. In which mode of transmission, the heat waves travel along straight line with the speed of light?

a. Thermal radiation

b. Forced convection

c. Natural convection

d. Thermal convection

Q12. The thermal conductivity of a rod is 2. What is its thermal resistivity?

a. 0.5

b. 1

c. 0.25

d. 2

Q13. **Directions:** In the following question, a statement of Assertion is given, followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as:

a. If both assertion and reason are true, and the reason is the correct explanation of assertion.
b. If both assertion and reason are true, but the reason is not the correct explanation of the assertion.
c. If assertion is true statement, but reason is false.
d. If both assertion and reason are false.

Assertion: It is hotter over the top of fire than at the same distance on the sides.
Reason: Air surrounding the fire conducts more heat upwards.

a. (a)

b. (b)

c. (c)

d. (d)

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Q14. **Directions:** The following question has four choices out of which ONLY ONE is correct.

The work done in which of the following processes is zero?

a. Isothermal process

b. Adiabatic process

c. Isochoric process

d. None of these

Q15. A copper bar of length 1 m and cross-sectional area 10×10^{-2} m^2 has its one end maintained at 100^oC by means of 0.4 kW electric heater. What is the temperature of the other end in steady state, given that the thermal conductivity of copper is 400 W/mK?

a. 100^oC

b. 90^oC

c. 80^oC

d. 70^oC

Q16. **Directions:** The following question has four choices out of which ONLY ONE is correct. In isochoric process

a. $\Delta W = 0$

b. $\Delta U = 0$

c. $\Delta Q = 0$

d. $\Delta T = 0$

Q17. The temperatures of equal masses of three different liquids A, B and C are 12°C, 19°C and 28°C, respectively. The temperature when A and B are mixed is 16°C and when B and C are mixed is 23°C. The temperature when A and C are mixed is

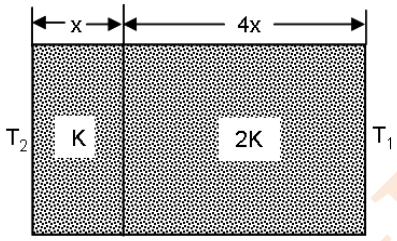
a. 18.2°C

b. 22°C

c. 20.3°C

d. 24.2°C

Q18. The temperature of the two outer surfaces of a composite slab, consisting of two materials having coefficients of thermal conductivity K, and 2K and thickness x and 4x, respectively are T_2 and T_1 ($T_2 > T_1$). The rate of heat transfer through the slab, in a steady state is $\left(\frac{A(T_2 - T_1)K}{x}\right)f$, with f equal to



a. 1

b. 1/2

c. 2/3

d. 1/3

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Q19. Three objects, colored black, gray and white, can withstand hostile conditions upto 2800^0C. These objects are thrown into a furnace where each of them attains a temperature of 2000^0C. Which object will glow the brightest?

a. The white object

b. The black object

c. The gray object

d. All will glow with equal brightness

Q20. An electric fan is switched on in a closed room. The air in the room is:

a. cooled

b. heated

c. maintains its temperature

d. heated or cooled depending on the atmospheric pressure

Q21. The triple points of neon and carbon dioxide are 24. 57 K and 216.55 K respectively. Express these temperatures on the Celsius and Fahrenheit scales

Q22. Two absolute scales A and B have triple points of water defined to be 200 A and 350 B. What is the relation between T_A and T_B?

Q23. The electrical resistance in ohms of a certain thermometer varies with temperature according to the approximate law:

$R = R_o [1 + \alpha (T - T_o)]$

The resistance is 101.6 Ω at the triple-point of water 273.16 k, and 165.5 Ω at the normal melting point of lead (600.5 k). What is the temperature when the resistance is 123.4 Ω?

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Q24. Answer the following:

a. The tripe-point of water is a standard fixed point in modern thermometry. Why? What is wrong in taking the melting point of ice and the boiling point of water as standard fixed points (as was originally done in the Celsius scale)?
b. There were two fixed points in the original Celsius scale as mentioned above which were assigned the number 0°C and 100°C respectively. On the absolute scale, one of the fixed points is the triple-point of water, which on the Kelvin absolute scale is assigned the number 273.16 K. What is the other fixed point on this (Kelvin) scale?
c. The absolute temperature (Kelvin scale) T is related to the temperature t_c on the Celsius scale by
$t_c = T - 273.15$
Why do we have 273.15 in this relation, and not 273.16?
d. What is the temperature of the triple-point of water on an absolute scale whose unit interval size is equal to that of the Fahrenheit scale?

Q25. Answer the following questions based on the P-T phase diagram of carbon dioxide:

a. At what temperature and pressure can the solid, liquid and vapour phases of CO_2 co-exist in equilibrium?
b. What is effect of decrease of pressure on the fusion and boiling point of CO_2?
c. What are the critical temperature and pressure for CO_2? What is their significance?
d. Is CO_2 solid, liquid or gas at (a) -70 °C under 1 atm, (b) 60 °C under 10 atm, (c) 15 °C under 56 atm?

Q26. A copper block of mass 2.5 kg is heated in a furnace to a temperature of 500 °C and then placed on a large ice block. What is the maximum amount of ice that can melt? (Specific heat of copper = 0.39 J g^{-1} K^{-1}; heat of fusion of water = 335 J g^{-1}).

Q27. Answer the following question bases on the P-T phase diagram of CO_2:

a. CO_2 at 1 atm pressure and temperature – 60 °C is compressed isothermally. Does it to through a liquid phase?
b. What happens when CO_2 at 4 atm pressure is cooled from room temperature at constant pressure?
c. Describe qualitatively the changes in a given mass of solid CO_2 at 10 atm pressure and temperature – 65 °C as it is heated up to room temperature at constant pressure.
d. CO_2 is heated to a temperature 70 °C and compressed isothermally. What changes in its properties do you expect to observe?