

Properties of Matter

Date Planned : __ / __ / __	Daily Tutorial Sheet - 1	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 1	Exact Duration : _____
Topics covered : <i>Calorimetry</i>		

- Which of the following pairs represent units of the same physical quantity?
 (A) Kelvin and joule (B) Kelvin and calorie
 (C) Newton and calorie (D) Joule and calorie
- Which of the following pairs of physical quantities may be represented in the same unit?
 (A) Heat and temperature (B) Temperature and mole
 (C) Heat and work (D) Specific heat and heat
- Two bodies at different temperatures are mixed in a calorimeter. Which of the following quantities remains conserved?
 (A) Sum of the temperatures of the two bodies
 (B) Temperature of the calorimeter
 (C) Total internal energy of the two bodies
 (D) Internal energy of each body
- 50 g of copper is heated to increase its temperature by 10°C. If the same quantity of heat is given to 10 g of water, the rise in its temperature is : (Specific heat of copper = 420 J/kg/°C)
 (A) 5°C (B) 6°C (C) 7°C (D) 8°C
- Two tanks A and B contain water at 30°C and 80°C, respectively; calculate the amount of water that must be taken from each tank respectively to prepare 40 kg of water of 50°C. ▶
 (A) 24 kg, 16 kg (B) 16 kg, 24 kg (C) 20 kg, 20 kg (D) 30 kg, 10 kg
- Three liquids with masses m_1, m_2, m_3 are thoroughly mixed. If their specific heats are c_1, c_2, c_3 and their temperature T_1, T_2, T_3 respectively, then the temperature of the mixture is : ▶
 (A) $\frac{c_1T_1 + c_2T_2 + c_3T_3}{m_1c_1 + m_2c_2 + m_3c_3}$ (B) $\frac{m_1c_1T_1 + m_2c_2T_2 + m_3c_3T_3}{m_1c_1 + m_2c_2 + m_3c_3}$
 (C) $\frac{m_1c_1T_1 + m_2c_2T_2 + m_3c_3T_3}{m_1T_1 + m_2T_2 + m_3T_3}$ (D) $\frac{m_1T_1 + m_2T_2 + m_3T_3}{c_1T_1 + c_2T_2 + c_3T_3}$
- A calorimeter contains 0.2 kg of water at 30°C, 0.1 kg of water at 60°C is added to it. The mixture is well stirred and the resulting temperature is found to be 35°C. The thermal capacity of the calorimeter is : ▶
 (A) 6300 J/K (B) 1260 J/K (C) 4200 J/K (D) None of these
- Equal masses of three liquids A, B and C have temperatures 10°C, 25°C and 40°C respectively. If A and B are mixed, the mixture has a temperature of 15°C. If B and C are mixed, the mixture has a temperature of 30°C. If A and C are mixed, the mixture will have a temperature of :
 (A) 16°C (B) 20°C (C) 25°C (D) 29°C

9. A 2g bullet moving with a velocity of 200 m/s is brought to a sudden stoppage by an obstacle. The total heat produced goes to the bullet. If the specific heat of the bullet is $0.03 \text{ cal/g}^\circ\text{C}$, the rise in its temperature will be :
(A) 158.0°C **(B)** 15.80°C **(C)** 1.58°C **(D)** 0.1580°C
10. The specific heat of many solids at low temperatures varies with absolute temperature T according to the relation $S = AT^3$, where A is a constant. The heat energy required to raise the temperature of a mass m of such a solid from $T = 0$ to $T = 20 \text{ K}$ is : 
(A) $4 \times 10^4 \text{ mA}$ **(B)** $2 \times 10^3 \text{ mA}$ **(C)** $8 \times 10^6 \text{ mA}$ **(D)** $2 \times 10^6 \text{ mA}$
11. Boiling water is changing into steam. Under this condition, the specific heat of water is :
(A) one **(B)** zero **(C)** ∞ **(D)** < 1
12. Heat is required to change 1 kg of ice at -20°C into steam. Q_1 is the heat needed to warm the ice from -20°C to 0°C , Q_2 is the heat needed to melt the ice, Q_3 is the heat needed to warm the water from 0°C to 100°C and Q_4 is the heat needed to vaporize the water. Then : ($S_{\text{ice}} = 0.5 \text{ cal/gm}^\circ\text{C}$, $S_{\text{water}} = 1 \text{ cal/gm}^\circ\text{C}$, $L_f = 80 \text{ cal/gm}$, $L_v = 540 \text{ cal/gm}$)
(A) $Q_4 > Q_3 > Q_2 > Q_1$ **(B)** $Q_4 > Q_3 > Q_1 > Q_2$
(C) $Q_4 > Q_2 > Q_3 > Q_1$ **(D)** $Q_4 > Q_2 > Q_1 > Q_3$
13. 5 g of water at 30°C and 5 g of ice at -20°C are mixed together in a calorimeter. Find the final temperature of the mixture. Assume water equivalent of calorimeter to be negligible, specific heat of ice and water are 0.5 and 1 cal/g $^\circ\text{C}$, and latent heat of ice is 80 cal/g. 
(A) 0°C **(B)** 10°C **(C)** -30°C **(D)** $> 10^\circ\text{C}$
14. A stationary object weighing 3.5 kg falls from a height of 2000 metres on a snow mountain at 0°C . If the temperature of the object just before hitting the snow is 0°C and the object comes to rest immediately, then the object will melt : ($g = 10 \text{ m/sec}^2$ and latent heat of ice = $3.5 \times 10^5 \text{ joule per kg}$) 
(A) 2 gm of ice **(B)** 20 gm of ice **(C)** 200 gm of ice **(D)** 2 kg of ice
15. 500 gm of ice at -5°C is mixed with 100 gm of water at 20°C , when equilibrium is reached, amount of ice in the mixture is:
(A) 93.75 gm **(B)** 421.75 gm **(C)** 406.25 gm **(D)** zero