

REVIEW QUESTIONS

Chapter 2

1. Convert the following temperatures:

a) 10 °C to °F

$$^{\circ}\text{F} = [(10 + 40) \times 1.8] - 40 = 50^{\circ}\text{F}$$

b) 200 K to °C

$$^{\circ}\text{C} = \text{K} - 273 = 200 - 273 = -73^{\circ}\text{C}$$

c) 425 °F to °C

$$^{\circ}\text{C} = [(425 + 40) \div 1.8] - 40 = 218^{\circ}\text{C}$$

2. Classify the following properties of sodium metal as *physical* or *chemical*:

a) silver metallic color

physical

b) turns grey in air

chemical

c) melts at 98°C

physical

d) reacts explosively with chlorine

chemical

e) dissolves in water to produce a gas

chemical

f) malleable (can be shaped)

physical

3. Classify the following changes as *physical* or *chemical* :

a) steam condenses to a liquid on a cool surface

physical

b) baking soda dissolves in vinegar, producing bubbles

chemical

c) moth balls gradually disappear at room temperature

physical

d) when a can of soda is opened bubbles form

physical

4. How many calories of heat are required to heat 45 g of water from 12°C to 76°C?
(Specific heat of water = 1.0 cal/g°C)

$$Q = m \times s \times \Delta T$$

$$Q = (45 \text{ g}) \times (1.0 \text{ cal/g}^\circ\text{C}) \times (76^\circ\text{C} - 12^\circ\text{C})$$

$$Q = 2880 \text{ cal} \xrightarrow{\text{round to 2 sig figs}} 2900 \text{ cal}$$

5. a) Calculate the calories required to melt 65 g of ice at 0°C.

$$Q = m \times H_f = (65 \text{ g}) (80 \text{ cal/g}) = 5200 \text{ cal}$$

- b) Calculate the kilocalories required to vaporize 125 g of water at 100°C.

$$Q = m \times H_v = (125 \text{ g}) (540 \text{ cal/g}) = 67500 \text{ cal}$$

$$67500 \text{ cal} \times \frac{1 \text{ kcal}}{1000 \text{ cal}} = 67.5 \text{ kcal}$$

6. A sample of gold weighing 15 g requires 84 calories of heat to increase its temperature from 35°C to 215°C. Calculate the specific heat of gold.

$$s = \frac{Q}{m \times \Delta T} = \frac{84 \text{ cal}}{(15 \text{ g}) \times (215^\circ\text{C} - 35^\circ\text{C})} = 0.031 \text{ cal/g}^\circ\text{C}$$

7. Calculate the Calories in 1 cup of milk: 12 g of carbohydrates, 9 g of fat and 9 g of protein.

Carbohydrate	12 g x 4 Cal/g = 48 Cal
Fat	9 g x 9 Cal/g = 81 Cal
Protein	9 g x 4 Cal/g = 36 Cal
Total Calories	48 + 81 + 36 = 165 Cal

8. How many kcal of heat are released when 45 g of steam at 100°C is converted to liquid water at 15°C?

$$Q_{\text{Total}} = Q_{\text{Condensation}} + Q_{\text{Cooling water}}$$

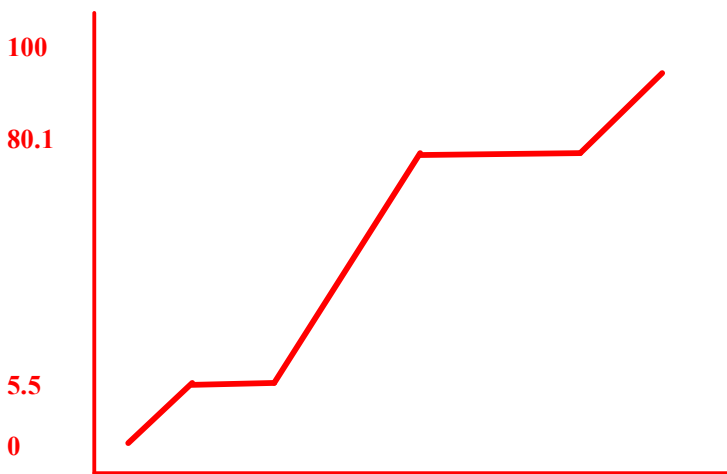
$$Q_{\text{Condensation}} = m \times H_v = (45 \text{ g}) (540 \text{ cal/g}) = 24300 \text{ cal}$$

$$Q_{\text{Cooling water}} = m \times s \times \Delta T = (45 \text{ g}) (1.0 \text{ cal/g}^\circ\text{C}) (100^\circ\text{C} - 15^\circ\text{C}) = 3825 \text{ cal}$$

$$Q_{\text{Total}} = 24300 \text{ cal} + 3825 \text{ cal} = 28000 \text{ cal} \quad (\text{round to 2 sig figs})$$

$$Q_{\text{Total}} = 28000 \text{ cal} \times \frac{1 \text{ kcal}}{1000 \text{ cal}} = 28 \text{ kcal}$$

9. The melting point of benzene is 5.5°C and its boiling point is 80.1°C. Sketch a heating curve for benzene from 0°C to 100°C, and answer the following questions:



- a) What is the state of benzene at 15°C? liquid
- b) What is the state of benzene at 98°C? gas
- c) At what temperature are both liquid and gas present? 80.1°C