

1-10 Matching A) 1000; B) 4.184; C) temperature; D) heat; E) calorie;
 F) Joule; G) Newton; H) specific heat; I) thermometer; J) manometer;
 K) calorimeter; L) endothermic; M) exothermic

1. ____ The total kinetic energy of the particles in a sample of matter.
2. ____ Instrument used to measure temperature.
3. ____ A reaction that absorbs energy.
4. ____ The SI unit for energy.
5. ____ The average kinetic energy of the particles in a sample of matter.
6. ____ The amount of heat needed to raise the temperature of one gram of a substance 1 °C.
7. ____ Instrument used to measure the gain or loss of heat.
8. ____ The number of joules in a calorie.
9. ____ The amount of heat needed to raise the temperature of one gram of water 1 °C.
10. ____ The number of calories in a Calorie.

11. Calculate the specific heat of a 75.0 g object that loses 341 J of heat as its temperature goes from 75.0 °C to 63.0 °C.

$$c = \frac{-341 \text{ J}}{(75 \text{ g})(63 - 75^\circ \text{C})} = 379 \frac{\text{J}}{\text{g}^\circ \text{C}}$$

12. The specific heat of Al is 0.902 J/g°C. How much heat is lost by a 25.0 g piece of Al when its temperature goes from 75.0 °C to 25.0 °C?

$$\text{heat} = (25 \text{ g})(0.902 \text{ J/g}^\circ \text{C})(25 - 75^\circ \text{C}) = -1128 \text{ J}$$

13. Lead has a specific heat of 0.128 J/g°C. How much heat is needed to raise the temperature of a 150.0 g piece of lead 25.0 °C to 100.0 °C?

$$\text{heat} = (150 \text{ g})(0.128 \text{ J/g}^\circ \text{C})(100 - 25^\circ \text{C}) = 1440 \text{ J}$$

14. A chemical reaction takes place inside a calorimeter which contains 75.0 grams of water. The temperature of the water rises from 21.0 °C to 23.0 °C. Calculate the heat given off by the reaction.

$$\text{heat rxn} = -(75 \text{ g})(4.184)(23 - 21^\circ \text{C}) = -628 \text{ J}$$

15. A chemical reaction takes place inside a calorimeter which contains 100.0 grams of water. The temperature of the water goes from 25.0 °C to 23.0 °C. Calculate the heat absorbed by the reaction.

$$\text{heat rxn} = -(100 \text{ g})(4.184)(23 - 25^\circ \text{C}) = 837 \text{ J}$$

16. 5.00 g of a substance at a temperature of 100. °C is placed in a calorimeter holding 75.0 g of water at 20.0 °C. The temperature of the water rises to 22.0 °C. What is the specific heat of the substance?

$$(5 \text{ g})c(22 - 100^\circ \text{C}) = -(75 \text{ g})(4.184)(22 - 20^\circ \text{C})$$

$$c = 1.61 \text{ J/g}^\circ \text{C}$$

17. A 10.0 gram piece of metal is heated to 100.°C. It is placed in a calorimeter containing 75.0 grams of water at 25.0 °C. The final temperature of the metal and water is 27.0 °C. What is the specific heat of the metal?

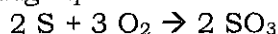
$$(10 \text{ g})c(27 - 100^\circ \text{C}) = -(75 \text{ g})(4.184)(27 - 25^\circ \text{C})$$

$$c = 860 \text{ J/g}^\circ \text{C}$$

$$m_{\text{substance}} \Delta T = -m_{\text{water}} \Delta T$$

Enthalpy Stoichiometry Worksheet

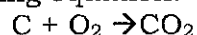
1. How much heat will be released when 6.44 g of sulfur reacts with excess O_2 according to the following equation?



$$\Delta H = -791.4 \text{ kJ}$$

$$\frac{6.44 \text{ g S}}{32 \text{ g}} \times \frac{1 \text{ mol S}}{2 \text{ mol S}} \times \frac{-791.4 \text{ kJ}}{2 \text{ mol S}} = -159 \text{ kJ}$$

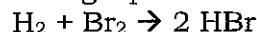
2. How much heat will be released when 4.72 g of carbon reacts with excess O_2 according to the following equation?



$$\Delta H = -393.5 \text{ kJ}$$

$$\frac{4.72 \text{ g C}}{12.01 \text{ g}} \times \frac{1 \text{ mol C}}{1 \text{ mol C}} \times \frac{-393.5 \text{ kJ}}{1 \text{ mol C}} = -155 \text{ kJ}$$

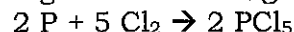
3. How much heat will be absorbed when 38.2 g of bromine reacts with excess H_2 according to the following equation?



$$\Delta H = 72.80 \text{ kJ}$$

$$\frac{38.2 \text{ g Br}_2}{160 \text{ g Br}_2} \times \frac{1 \text{ mol Br}_2}{1 \text{ mol Br}_2} \times \frac{72.8 \text{ kJ}}{1 \text{ mol Br}_2} = 17.4 \text{ kJ}$$

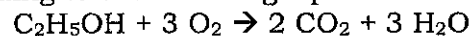
4. How much heat will be released when 1.48 g of chlorine reacts with excess phosphorus according to the following equation?



$$\Delta H = -886 \text{ kJ}$$

$$\frac{1.48 \text{ g Cl}_2}{70.9 \text{ g Cl}_2} \times \frac{1 \text{ mol Cl}_2}{5 \text{ mol Cl}_2} \times \frac{-886 \text{ kJ}}{5 \text{ mol Cl}_2} = -3.70 \text{ kJ}$$

5. How much heat will be released when 4.77 g of ethanol (C_2H_5OH) reacts with excess O_2 according to the following equation?



$$\Delta H = -1366.7 \text{ kJ}$$

$$\frac{4.77 \text{ g C}_2\text{H}_5\text{OH}}{46.07 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol C}_2\text{H}_5\text{OH}} \times \frac{-1366.7 \text{ kJ}}{1 \text{ mol C}_2\text{H}_5\text{OH}} = -142 \text{ kJ}$$