

Name: _____

KEY

* with explanations!

Chapter 17 Mixed Review

Match each item with the correct statement below.

- | | |
|------------------------|-------------------------|
| a. heat of reaction | f. heat of vaporization |
| b. heat of formation | g. heat of condensation |
| c. exothermic reaction | h. heat capacity |
| d. heat of fusion | i. specific heat |
| e. heat of solution | j. endothermic reaction |

- A the enthalpy change for a chemical reaction exactly as it is written
- E the enthalpy change caused by dissolving a substance
- D the energy required to melt a solid at its melting point
- B the change in enthalpy that accompanies the formation of a compound from its elements
- C a chemical reaction that gives off heat
- J a chemical reaction that absorbs heat
- F the energy required to turn a liquid into a gas
- G the energy given off when a gas turns into a liquid
- H The amount of heat needed to increase the temperature of an object exactly 1°C
- I The amount of heat needed to increase the temperature of 1 g of a substance 1°C

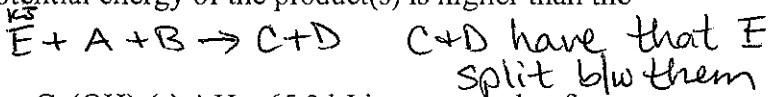
Classify each of these statements as true or false.

- T 11. $\Delta H_{\text{fus}} = -\Delta H_{\text{solid}}$
- F 12. Melting and vaporization are exothermic processes. *They are endo b/c you need to add heat to melt/vaporize.*
- T 13. In order to convert 1 mole of $\text{H}_2\text{O}(l)$ to 1 mol of $\text{H}_2\text{O}(g)$, 40.7 kJ must be supplied. *↳ ΔH_{vap} of water (in book)*
- F 14. As ice melts, the temperature of the ice increases until the entire sample becomes liquid. *It stays constant when changing phases*
- F 15. When ammonium nitrate dissolves in water, the solution gets cold. This is an example of an exothermic reaction. *False → an exothermic reaction giving off heat will feel hot*
- T 16. The sign of ΔH is negative for an exothermic reaction.
- T 17. If 129 kJ of heat is required to decompose 2 moles of NaHCO_3 , then 258 kJ is required to decompose 4 moles of NaHCO_3 . *↳ $\text{exo} = q$*

*if 2 mol makes 129 kJ,
4 mol will make double: 258 kJ*

F 18. The physical state of the reactants and products in a thermochemical reaction are not important when calculating ΔH of the reaction. *Yes they are!*

T 19. In endothermic reactions, the potential energy of the product(s) is higher than the potential energy of the reactants.



T 20. The equation $\text{CaO}(s) + \text{H}_2\text{O}(l) \rightarrow \text{Ca}(\text{OH})_2(s)$ $\Delta H = 65.2 \text{ kJ}$ is an example of a thermochemical equation.

need states of matter + ΔH for a thermochemical eq.

→ giving off heat

21. In an exothermic reaction, the energy stored in the chemical bonds of the reactants is B.

- a. equal to the energy stored in the bonds of the products
- b. greater than the energy stored in the bonds of the products
- c. less than the energy stored in the bonds of the products
- d. less than the heat released



E is lost from system so original reactants had higher E in bonds before they reacted & lost it

22. A process that releases heat is a(n) B.

- a. polythermic process
- b. exothermic process
- c. ectothermic process
- d. endothermic process

23. What is the amount of heat required to raise the temperature of 200.0 g of aluminum by 10°C ? (specific heat of aluminum = $0.21 \text{ cal/g}^\circ\text{C}$)

- a. 420 cal
- b. 4200 cal
- c. 42,000 cal
- d. 420,000 cal

*q = ?
 ΔT*

$q = C \times m \times \Delta T$
 $= 0.21 \text{ cal/g}^\circ\text{C} \times 200 \text{ g} \times 10^\circ\text{C}$
 $= 420 \text{ cal}$

24. Which of the following is a valid unit for specific heat?

- a. $\frac{\text{cal}}{\text{g}^\circ\text{C}}$ or $\frac{\text{J}}{\text{g}^\circ\text{C}}$
- b. cal
- c. $\frac{\text{cal}}{\text{g}}$
- d. $^\circ\text{C}$

25. How can you describe the specific heat of olive oil if it takes approximately 420 J of heat to raise the temperature of 7 g of olive oil by 30°C ? ΔT

- a. greater than the specific heat of water
- b. less than the specific heat of water
- c. equal to the specific heat of water
- d. Not enough information is given.

C = ?



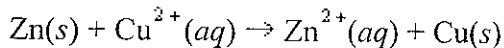
$C = \frac{q}{m \times \Delta T}$
 $= \frac{420 \text{ J}}{7 \text{ g} \times 30^\circ\text{C}}$
 $= 2 \text{ J/g}^\circ\text{C}$
vs water
 $= 4.18 \text{ J/g}^\circ\text{C}$

26. What does the symbol ΔH stand for?

- a. the specific heat of a substance
- b. the heat capacity of a substance
- c. the heat of reaction for a chemical reaction
- d. one Calorie given off by a reaction

or change in enthalpy

27. What is the standard heat of reaction for the following reaction?



(ΔH_f° for $\text{Cu}^{2+} = +64.4 \text{ kJ/mol}$; ΔH_f° for $\text{Zn}^{2+} = -152.4 \text{ kJ/mol}$)

$$\begin{array}{r} 64.4 \text{ kJ/mol} \\ -152.4 \text{ kJ/mol} \\ \hline -88 \text{ kJ/mol} \end{array}$$

- a. 216.8 kJ released per mole
 b. 88.0 kJ released per mole
 c. 88.0 kJ absorbed per mole
 d. 216.8 kJ absorbed per mole

→ exothermic or ΔH

28. Which of the following is NOT a form of energy?

- a. light
 b. pressure
 c. heat
 d. electricity

29. Which of the following is transferred due to a temperature difference?

- a. chemical energy
 b. mechanical energy
 c. electrical energy
 d. heat

30. The specific heat capacity of graphite is $0.71 \frac{\text{J}}{\text{g}^\circ\text{C}}$. Calculate the energy required to raise the temperature of 750 g of graphite by 160°C .

q = ?

$$q = C \times m \times \Delta T$$

$$q = 0.71 \frac{\text{J}}{\text{g}^\circ\text{C}} \times 750 \text{ g} \times 160^\circ\text{C} = 85200 \text{ J}$$

don't need to do these on quiz

31. How much heat is released when 50g of ammonia (NH_3) freezes? *→ $\Delta H_{\text{solid}} = \Delta H_{\text{fus}}$ for ammonia is in book on page 571*

50 g NH_3	1 mol NH_3	5.66 kJ	= -16.65 kJ
17.0 g NH_3	1 mol NH_3		

32. How much heat is required to raise the temperature of $8.4 \times 10^2 \text{ g}$ of aluminum by 42°C ? (specific heat of aluminum = $0.21 \text{ cal/g}^\circ\text{C}$)

$$q = C \times m \times \Delta T$$

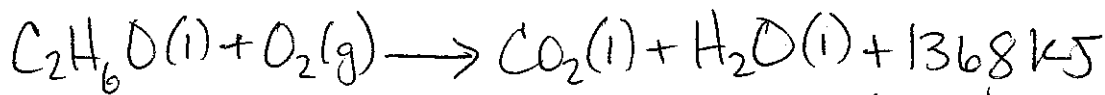
$$q = 0.21 \frac{\text{cal}}{\text{g}^\circ\text{C}} \times 8.4 \times 10^2 \text{ g} \times 42^\circ\text{C} = 7408.8 \text{ cal}$$

33. If $500 \overset{m}{\text{g}}$ of iron absorbs $22,000 \overset{q}{\text{cal}}$ of heat, what will be the change in temperature? (specific heat of iron = $0.11 \text{ cal/g } ^\circ\text{C}$) $\Delta T = ?$

$$\Delta T = \frac{q}{m \times c}$$

$$\Delta T = \frac{22000 \text{ cal}}{500 \text{ g} \times 0.11 \text{ cal/g } ^\circ\text{C}} = \boxed{400 ^\circ\text{C}}$$

34. When ethanol, $\text{C}_2\text{H}_6\text{O}(\text{l})$, burns, it reacts with $\text{O}_2(\text{g})$ to produce $\text{CO}_2(\text{g})$ and $\text{H}_2\text{O}(\text{l})$ and 1368 kJ of heat is released. Write the balanced thermochemical equation for this reaction.



*this equation is unbalanced

35. How much heat is absorbed when 63.7 g of $\text{H}_2\text{O}(\text{l})$ at 100°C and 101.3 kPa is converted to gas at 100°C ? Express your answer in kJ . $\Delta H_{\text{vap}} = 40.7 \text{ kJ/mol}$

$$\frac{63.7 \text{ g H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{O}} \times \frac{40.7 \text{ kJ}}{1 \text{ mol H}_2\text{O}} = \boxed{144 \text{ kJ}}$$

36. How many kilojoules of heat is absorbed when 0.46 g of chloroethane ($\text{C}_2\text{H}_5\text{Cl}$, bp 12.3°C) vaporizes at its normal boiling point? The molar heat of vaporization of chloroethane is 24.7 kJ/mol .

$$\frac{0.46 \text{ g C}_2\text{H}_5\text{Cl}}{64 \text{ g C}_2\text{H}_5\text{Cl}} \times \frac{1 \text{ mol C}_2\text{H}_5\text{Cl}}{1 \text{ mol C}_2\text{H}_5\text{Cl}} \times \frac{24.7 \text{ kJ}}{1 \text{ mol C}_2\text{H}_5\text{Cl}} = \boxed{0.18 \text{ kJ}}$$

Wont see these Q's on quiz