Name Key Date _____ Period ___

GenChem Practice Test: Thermochemistry 3.3 - 3.5, 10.5

Equations

$q = mSH\Delta T$

$q = m\Delta H_{fus}$

$q = m\Delta H_{vap}$

$+q_{system} = -q_{surroundings}$

$\Delta T = T_f - T_i$

Properties of water

c_{ice} = 2.03 J/g-K

c_{water} = 4.184 J/g-K

c_{steam} = 1.841 J/g-K

ΔH_{fus} = 334 J/g

ΔH_{vap} = 2260 J/g

MATCHING

Match each item with the correct statement below. Not all answers will be used.

a. calorimeter
b. calorie
c. joule
d. enthalpy
f. heat capacity
g. specific heat
h. heat of fusion
i. heat of vaporization
j. heat of solution

G 1. quantity of heat needed to raise the temperature of 1 g of water by 1 °C

C 2. SI unit of energy

G 3. quantity of heat needed to change the temperature of 1 g of a substance by 1 °C

A 4. device used to measure the heat absorbed or released during a chemical or physical process

D 5. heat of a system at constant pressure

J 6. the enthalpy change caused by dissolving a substance

H 7. the energy required to melt a solid at its melting point

MULTIPLE CHOICE

8. How does a calorie compare to a joule?
   a. A calorie is smaller than a joule.
   b. A calorie is larger than a joule.
   c. A calorie is equal to a joule.
   d. The relationship cannot be determined.

9. Which of the following is transferred due to a temperature difference?
   a. chemical energy
   b. mechanical energy
   c. electrical energy
   d. heat

10. A process that absorbs heat is a(n) ____.
   a. endothermic process
   b. polythermic process
   c. exothermic process
   d. ectothermic process

$q = mC_{Al}\Delta T \rightarrow (200)(0.21)(10) = 420$ cal

11. 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 $\frac{cal}{g°C}$)

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

12. The heat capacity of an object depends in part on its ____.

a. mass
b. enthalpy
c. shape
d. potential energy

13. The specific heat of silver is 0.24 $\frac{J}{g°C}$. How many joules of energy are needed to warm 4.37 g of silver from 25.0°C to 27.5°C?

$q = mC_{Ag}\Delta T \rightarrow (4.37)(0.24)(2.5) = 2.62$ J

a. 2.62 J
b. 0.14 J
c. 45.5 J
d. 0.022 J

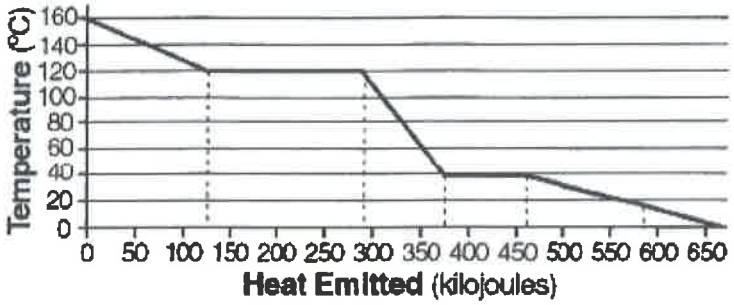
14. What does the symbol ΔH stand for?

a. temperature
b. enthalpy
c. specific heat
d. internal enrgy

15. How can the enthalpy change be determined for a reaction in an aqueous solution?

a. by knowing the specific heat of the reactants
b. by mixing the reactants in a calorimeter and measuring the temperature change
c. by knowing the mass of the reactants
d. The enthalpy change for this type of reaction cannot be determined.

The graph below represents the uniform cooling of a substance starting as a gas at 160°C. Use the graph to answer Questions 16-17.



16. At which temperature does a phase change occur for this substance?

A) 20°C
B) 40°C
C) 80°C
D) 0°C
E) 160°C

17. Which of the following temperatures would represent H_{fus} for this substance?

A) 20°C
B) 40°C
C) 80°C
D) 0°C
E) 160°C

The following table lists the specific heats for a few substances. Use this table to answer Question 18

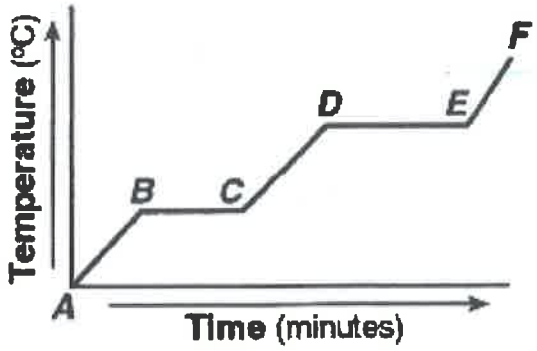
Substance	Specific Heat $(\frac{J}{g-K})$
Copper (Cu)	0.385
Iron (Fe)	0.452
Silver (Ag)	0.235
Sodium chloride (NaCl)(s)	0.864
Ammonia (NH_3)(g)	2.04

18. If the same amount of heat is supplied to 10.0 g of each substance all at 21.0°C, which substance would reach the highest temperature?
    A) Cu
    B) Fe
    C) Ag
    D) NaCl
    E) NH_3

19. What is the name of the process which occurs when snow is formed?
    A) sublimation
    B) condensation
    C) melting
    D) freezing
    E) deposition

20. Another name for ***heat energy*** is ___.
    A) internal energy
    B) potential energy
    C) thermal energy
    D) enthalpy
    E) chemical energy

21. The graph below represents the uniform heating of a solid, starting below its melting point.



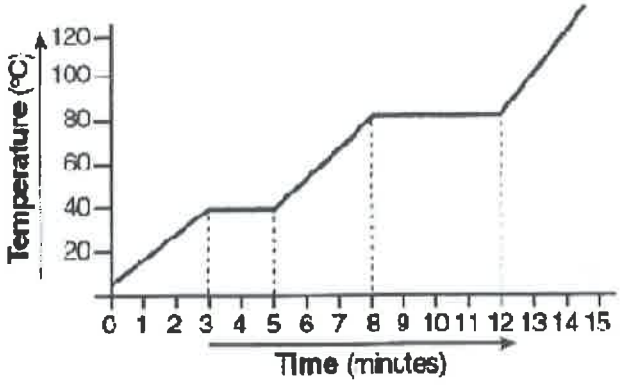
What portion of the graph shows the solid and liquid phases of the substance existing in equilibrium?
    A) EF
    B) AB
    C) DE
    D) CD
    E) BC

22. As ice at 0°C changes to water at 0°C, the ***average kinetic energy*** of the ice molecules
    A) increases
    B) decreases
    C) remains the same

23. The heat of fusion is defined as the energy required, at constant temperature, to change 1 unit mass of a
    A) solid to a liquid
    B) gas to a solid
    C) solid to a gas
    D) gas to a liquid
    E) liquid to a gas

24. A solid is dissolved in a coffee cup calorimeter. Which of the following observations suggests that the process is ***endothermic***?
    A) temperature of the solution decreases
    B) temperature of the solution increases
    C) temperature of the solution stays the same

25. The sum of the E_P and E_K of all of the particles of a substance is called ___.
    A) thermal energy
    B) heat energy
    C) enthalpy
    D) internal energy
    E) average kinetic energy



26. According to the heating curve above, this substance begins to boil at ___.
    A) 110°C
    B) 40°C
    C) 80°C
    D) 10°C
    E) >120°C

27. Which term in the equation $q = mSH\Delta T$ represents heat energy?
    A) q
    B) m
    C) SH
    D) ΔT
    E) none of these