Thermochemistry practice test 1

1. How much energy does a copper sample absorb as energy in the form of heat if its specific heat is 0.384 J/(g·°C), its mass is 8.00 g, and it is heated from 10.0°C to 40.0°C?

- Q = mcΔT

- C = 0.384 J/gC

- M(mass) = 8.00 g

- ΔT(final T – starting T) = 40 – 10 = 30

- Q = (8.00)(0.384 J/gC)(30)

- Q = 92.16 J

- B

2. In an exothermic reaction, the total energy at the beginning of the reaction is

a. greater than the total energy at the end of the reaction.

b. equal to the total energy at the end of the reaction.

c. less than the total energy at the end of the reaction.

d. None of the above

3. For an exothermic reaction, ΔH is always

a. positive.

b. negative.

c. zero.

d. small.

4. At its triple point, water can

a. exist only as a solid.

b. have only three pressure values.

c. only be present as vapor.

d. exist in equilibrium in three different phases.

5. What is the critical POINT?

a. the pressure at which the attractive forces in matter break down

b. the lowest pressure under which a substance can exist as a liquid and a gas

c. the pressure at which all substances are solids

d. the highest pressure under which a solid can exist

6. What is the process of a substance changing from a solid to a vapor without passing through the liquid phase?

a. condensation

b. Sublimation

c. evaporation

d. vaporization

7. At pressures greater than 1 atm, water will boil at

a. 4 C.

b. 100 C.

c. a temperature lower than 100 C.

d. a temperature higher than 100 C.

8. The standard molar enthalpy of vaporization for water is 40.79 kJ/mol. What mass of steam is required to release 500. kJ of energy upon condensation? (Molar mass of water is 18.02 g/mol.)

- $Q = H_v m$

- $Q = 500$ kJ

- $H_v = 40.79$ kJ/mol

- M (moles) = ?

- 500 kJ $= (40.79$ kJ/mol$)$M

- M $= 500 / 40.79 = 12.26$ moles H_2O

- 12.26 moles H_2O x $18.02 = 220.89$ grams H_2O

- A

9. Find the specific heat of a material if a 6.0 g sample absorbs 50. J when it is heated from 30°C to 50°C.

- $Q = mc\Delta T$
- $Q = 50 \, J$
- M (mass) = 6.0 g
- $\Delta T = 50-30 = 20 \, C$
- 50 J = (6.0 g)c(20 C)
- 50/(6.0)(20) = C = 0.417 J/gC
- A

10. Spontaneous reactions are driven by

a.   increasing enthalpy and increasing entropy.

b.   decreasing enthalpy and decreasing entropy.

c.   increasing enthalpy and decreasing entropy.

d.   decreasing enthalpy and increasing entropy.

11. What does S stand for?

a. free-energy change

b. enthalpy change

c. temperature change

d. entropy change

12. Which expression defines the change in free energy?

a. $\Delta H + T\Delta S$ c. $\Delta H + T\Delta G$

b. $\Delta S - T\Delta H$ d. $\Delta H - T\Delta S$

13. Suppose that a chemical equation can be written as the sum of two other chemical equations. If two reactions have ΔH values of −658 kJ and +458 kJ, what is ΔH for the reaction that is their sum?

a.   +1116 kJ   c.   +200 kJ

b.   −200 kJ   d.   −1116 kJ

14. What is the value of ΔG at 200 K for a reaction in which ΔH = −150 kJ/mol and ΔS = +2.00 kJ/(mol•K)?

a.　　−250 kJ/mol　　　　c.　　+550 kJ/mol

b.　　+250 kJ/mol　　　　d.　　−550 kJ/mol

$\Delta H = -150 \ kJ/mol$

$\Delta S = +2.00 \ kJ/mol \cdot k$

$T = 200 \ k$

$\Delta G = \Delta H - T \Delta S$

$\Delta G = (-150) - (200)(2) =$

$-150 - (400) = -550$　　　　kJ/mol

15. The enthalpy change that favors a spontaneous reaction

a. cannot be determined from the information given.

b. is a large negative change.

c. is a large positive change.

d. is a change equal to zero.
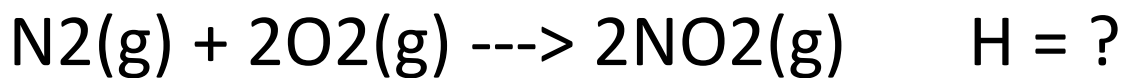
16. The q in thermodynamic equations is
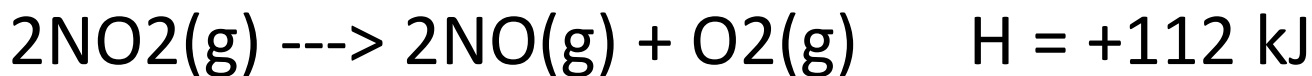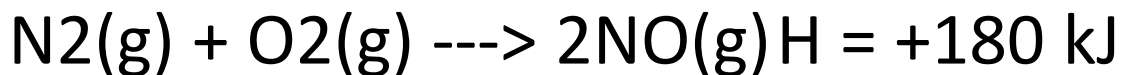
a. temperature.

c. energy lost or gained.

b. mass.

d. specific heat.

17. Calculate the enthapy for the following reaction:

$N_2(g) + 2O_2(g) ---> 2NO_2(g)$ H = ?

Using the following two equations:

$N_2(g) + O_2(g) ---> 2NO(g)$ H = +180 kJ

$2NO_2(g) ---> 2NO(g) + O_2(g)$ H = +112 kJ

a.   +292 kJ   c.   -292 kJ
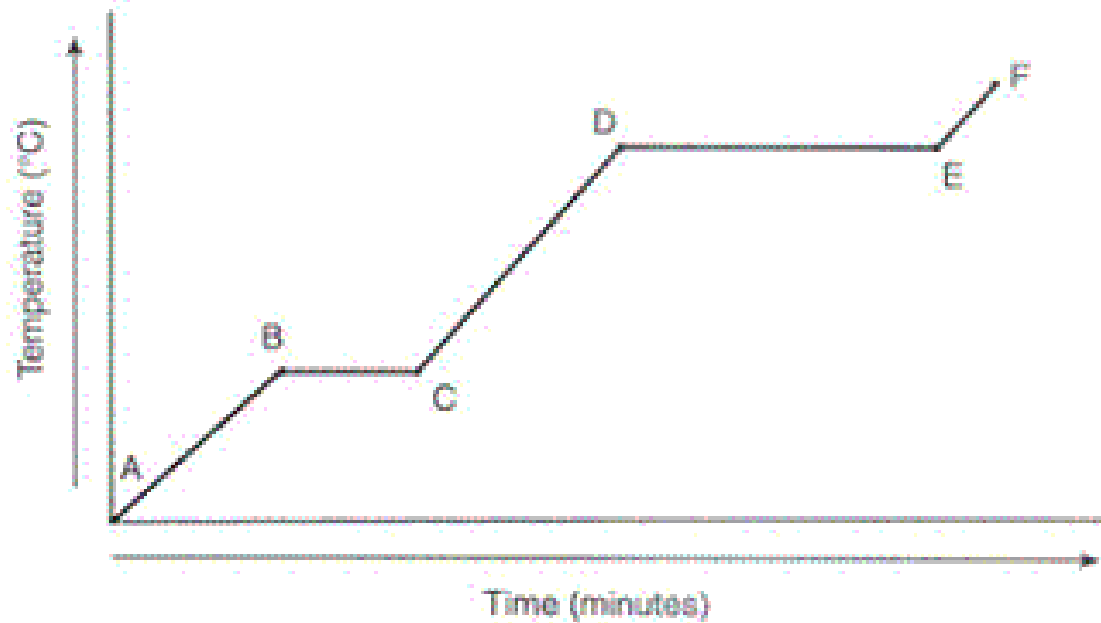
b.   -68 kJ   d.   +68 kJ

18. For a process in which ΔH is −298 kJ and ΔS is 100 J/k, calculate the change in the free energy at 0°C.

- ΔG = ΔH − TΔS

- ΔH = -298 kJ

- T = 0+273 = 273 K

- ΔS = (100 J/K) / (1000) = 0.1 kJ/K

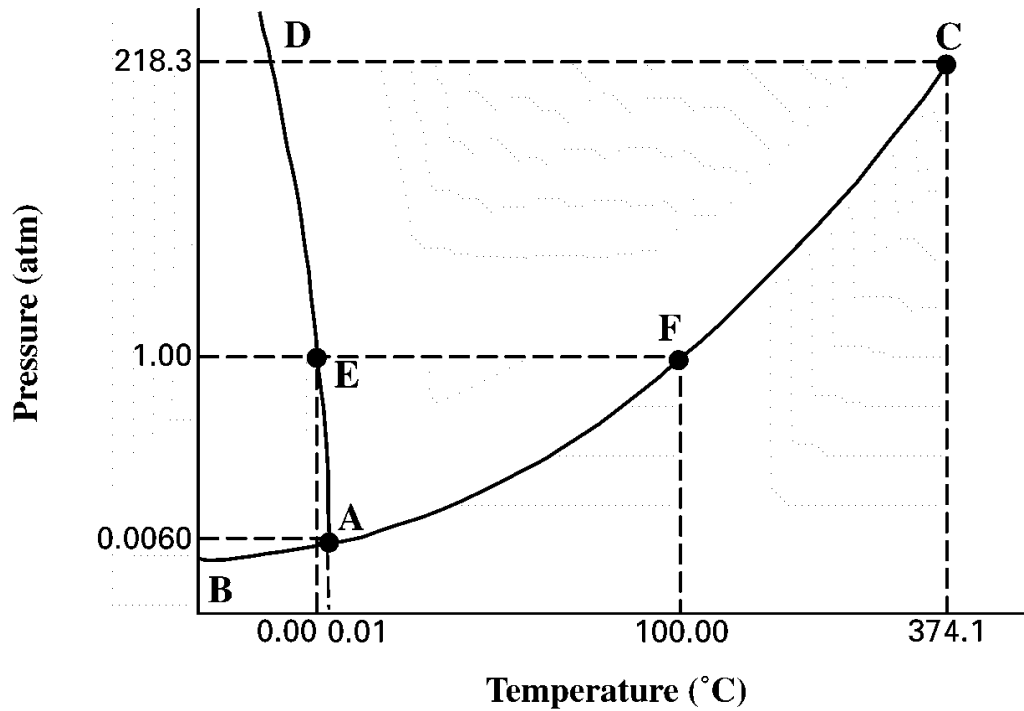
- G = (-298 kJ) − (273K)(0.1 J/K)

- a.   −325 kJ

19. According to figure 12, which part of the curve represents the point at which solid ice begins to change phase to liquid water?

a.   A   c.   C

b.   B   d.   D

20. Which phase is this substance in if it is at 0.80 atm and -51 C?

a.	solid	c.	gas

b.	liquid	d.	none of these