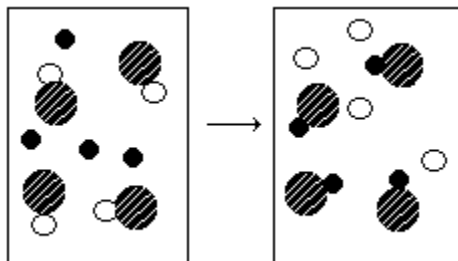| Multiple Choice (4 points each): Answer on blue form; be sure to code in your name and ID. | Answers |
|---|---|

1. The reaction, $C_6H_{12}O_6 \longrightarrow 6C + 6H_2O$, is labelled a

      a. rearrangement reaction        b. direct synthesis reaction

      c. single-displacement reaction      d. decomposition reaction

      e. double-displacement reaction

1. d

2. Consider the following diagram of a chemical reaction



           reactants             products

This type of reaction is labelled a

      a. direct synthesis reaction       b. double-displacement reaction

      c. single-displacement reaction      d. decomposition reaction

      e. hydrolysis reaction

2. c

3. Predict the products if a reaction occurs when Mg(s) and $NiCl_2$(aq) are mixed.

      a. MgCl(aq) and NiCl(aq)       b. Ni(s) and $Cl_2$(g)

      c. Mg(s) and Ni(s)          d. $MgNi_2$(aq) and Ni(s)

      e. $MgCl_2$(aq) and Ni(s)

3. e

4. Many metal carbonates decompose upon heating to produce

      a. the pure metal          b. the metal bicarbonate

      c. the metal and carbonic acid    d. the metal oxide and carbon dioxide gas

      e. carbon monoxide gas

4. d

5. Consider the uncompleted equation: Fe(s) + $H_2SO_4$(aq) --->
The completed equation includes the products

      a. $Fe^{2+}$(aq) + $H_2O$(l) + $SO_3$(g)     b. $FeO_2$(aq) + $H_2S$(aq)

      c. $FeSO_4$(aq) + $H_2SO_3$(aq)      d. FeS(aq) + $H_2O$(l) + $O_2$(g)

      e. $FeSO_4$(aq) + $H_2$(g)

5. e

6. An aqueous waste stream contains the toxic metal $Cr^{3+}$. Which substance, when added to the water, will precipitate the chromium?

      a. NaOH            b. $NaNO_3$

      c. $HNO_3$           d. NaCl

      e. $NaCH_3CO_2$

6. a

          

7. How many moles of $Ca(OH)_2$ are required to neutralize 250 mL of 2.00 M $HNO_3(aq)$?

$$Ca(OH)_2(s) + 2HNO_3(aq) \longrightarrow Ca(NO_3)_2(aq) + 6H_2O(l)$$

  a. 0.500          b. 2.00
  c. 1.00           d. 0.250
  e. 0.125

7. d

8. The oxidation numbers of many elements are variable. The compounds HCl, ClF, $ClF_3$, $ClF_5$, and $ClF_7$ clearly show chlorine with a variety of oxidation numbers. What respective oxidation numbers does chlorine have in these compounds?

  a. +1, +3, +5, +7, +9          b. 0, +1, +2, +3, +4
  c. -1, +1, +3, +5, +7          d. -1, +2, +4, +6, +8
  e. 0, +1, +3, +5, +7

8. c

9. When a charcoal briquette is combusted and the resulting energy is used to cook hot dogs, what form of energy is used?

  a. solar          b. radiant
  c. thermal        d. mechanical
  e. nuclear

9. c

10. A chemical reaction that absorbs heat from the surroundings is said to be _____ and has a _____ value of $\Delta H$.

  a. endothermic, positive          b. endothermic, negative
  c. exothermic, positive           d. exothermic, negative
  e. isothermic, zero

10. a

11. A 1000 g sample of lead shot, at $300^{\circ}C$, is dropped into 100 g of water at a temperature of $5.6^{\circ}C$. The specific heat of lead is 0.129 and of water 4.184 $J/g\text{-}^{\circ}C$. What is the final temperature of the mixture, in $^{\circ}C$?

  a. 100          b. 65
  c. 40           d. 75
  e. 50

11. d

12. When water evaporates at constant pressure, the sign of the enthalpy change for the process

  a. is negative          b. is positive
  c. cannot be determined  d. depends on the container volume
  e. depends on the temperature

12. b

13. Select the one equation shown below for which the enthalpy change is the heat of formation.

  a. $H_2(g) + O_2(g) \longrightarrow H_2O_2(l)$          b. $C_2H_4(g) + H_2(g) \longrightarrow C_2H_6(g)$
  c. $H_2(g) + Br_2(l) \longrightarrow 2HBr(g)$           d. $O_2(g) + 2F_2(g) \longrightarrow 2OF_2(g)$
  e. $2CO(g) + O_2(g) \longrightarrow 2CO_2(g)$

13. a
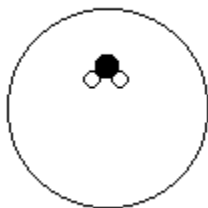
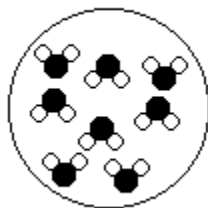14. A sample of water is vaporized in a closed container as shown:

14. a
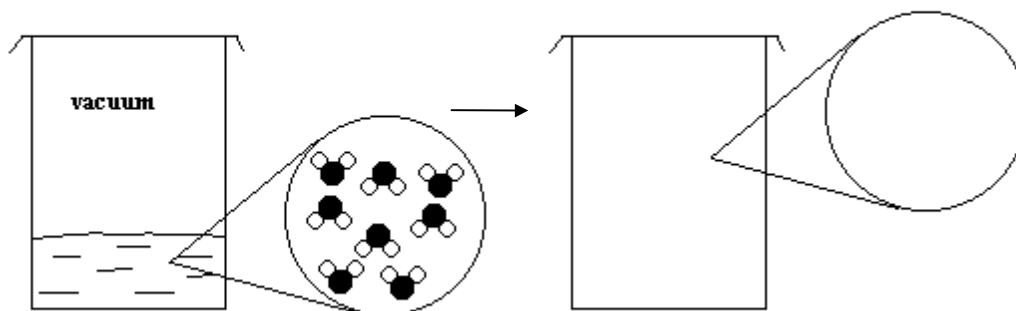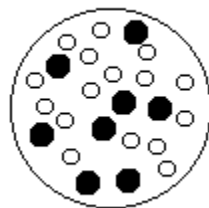


Which of the following diagrams best represents what you would "see" in the magnified view of the vapor?
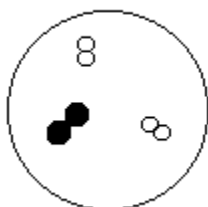


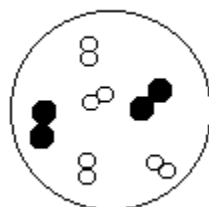a.                                 b.                                 c.
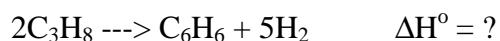


d.                      e.

15. Calculate the $\Delta H^o$ for the reaction:

$$2C_3H_8 \text{ ---> } C_6H_6 + 5H_2 \qquad \Delta H^o = ?$$

$\Delta H^o$ of formation for $C_3H_8$ and $C_6H_6$ is -104 and 490 kJ/mol, respectively.

    a. 386　　　　　　　　　b. -386
    c. 282　　　　　　　　　d. -282
    e. 698

15. e

16. Consider the reaction, $CaCO_3(s) \text{ ---> } CaO(s) + CO_2(g)$ $\Delta H^o = 178.0$ kJ
How much heat would be required to decompose exactly 2 mol $CaCO_3(s)$?

    a. 1780 kJ　　　　　　　b. 356 kJ
    c. 178 kJ　　　　　　　　d. 89.0 kJ
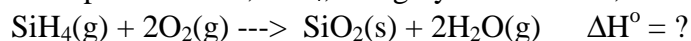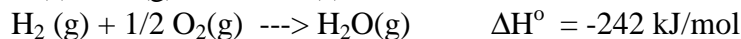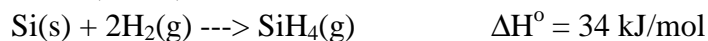    e. 44.5 kJ

16. b

17. The compound silane, $SiH_4$, is highly combustible, as described by the equation:

$SiH_4(g) + 2O_2(g) \rightarrow SiO_2(s) + 2H_2O(g) \quad \Delta H^o = ?$

Calculate $\Delta H^o$, in kJ, for the reaction.

$Si(s) + 2H_2(g) \rightarrow SiH_4(g) \qquad \Delta H^o = 34$ kJ/mol

$Si(s) + O_2(g) \rightarrow SiO_2(s) \qquad \Delta H^o = -911$ kJ/mol

$H_2(g) + 1/2\ O_2(g) \rightarrow H_2O(g) \qquad \Delta H^o = -242$ kJ/mol

a. 1365              b. -1365

c. –1143             d. -1429

e. -733

17. d

18. A student makes the following measurements in lab:

      1. Mass of metal sample

      2. Initial temperature of metal

      3. Final temperature of metal and $H_2O$

The heat capacity of water is given.

What additional information is needed to calculate the specific heat of the metal?

      i. Mass of the water

      ii. Initial temperature of $H_2O$

      iii. Atmospheric pressure

      iv. Room temperature

a. i, ii, iii, and iv are all needed

b. i and ii only

c. i, ii, and iii only

d. i, ii, and iv only

e. ii and iii only

18. b

19. 50 grams of copper pellets at 100°C is added to an insulated cup containing 50 grams of water at 20°C. The final temperature when thermal equilibrium is reached is close to 40°C.

The primary reason for the resulting temperature is:

a. Most of the heat is lost to the surroundings.

b. The mass of water is equal to the mass of copper.

c. Water has a lower heat capacity than copper.

d. Water and copper have similar heat capacities.

e. Water has a higher heat capacity than copper.

19. e

20. The net ionic equation that describes the reaction of silver nitrate with sodium chloride in water is

a. $Ag^+ + Cl^- \rightarrow AgCl$

b. $Na^+ + NO_3^- \rightarrow NaNO_3$

c. $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

d. $Ag^+ + Cl^- + Na^+ + NO_3^- \rightarrow AgCl + Na^+ + NO_3^-$

e. $AgCl + NaNO_3 \rightarrow AgNO_3 + NaCl$

20. a