# CH 121
# General Chemistry

# Exam 2
# June 10, 2003

**KEY**

**Name:**_____
(please print)

**SSN:** * * * - * * - _____
(last 4 digits)

Each question is worth 1 point.
Circle your answer clearly, otherwise no credit will be given.
Circle only one answer. If you circle two or more, you will receive no credit.

1. Identify the spectator ion or ions (if any) in the redox reaction of a solution of lead(II) nitrate with zinc metal.

   c. $NO_3^-$

2. The oxidation number of sulfur in $S_2O_3^{2-}$ is

   e. +2.

3. Which of the following reactions is **NOT** a redox reaction?

   c. $H_2CO_3(aq) \rightarrow CO_2(g) + H_2O(l)$

4. If 4.00 mL of water is added to 6.00 mL of 0.0250 M $CuSO_4$, what is the concentration of copper (II) sulfate in the diluted solution?

   b. 0.0150 M

5. What is the **total** concentration of ions in a 0.0360 M solution of $Na_2CO_3$?

   d. 0.108 M

6. In the photographic process, silver bromide is dissolved by adding sodium thiosulfate.

   $$AgBr(s) + 2Na_2S_2O_3(aq) \rightarrow Na_2Ag(S_2O_3)_2(aq) + NaBr(aq)$$

   If you want to dissolve 0.250 g of AgBr (molar mass = 187.8 g/mol), how many milliliters of 0.0138 M $Na_2S_2O_3$ should you add?

   b. 193 mL

7. A soft drink contains an unknown amount of citric acid, $C_6H_8O_7$. If 100. mL of the soft drink require 33.51 mL of 0.0102 M NaOH to neutralize completely the citric acid, how many grams of citric acid (molar mass = 192.13 g/mol) does the soft drink contain per 100 mL? The reaction of citric acid and NaOH is

   $$C_6H_8O_7(aq) + 3NaOH(aq) \rightarrow Na_3C_6H_5O_7(aq) + 3H_2O(l)$$

   a. 0.0219 g

8. When 80. J of energy is absorbed by 0.50 mol of water, how much does the temperature rise? The specific heat of water is 4.184 J/g•K.

   b. 2.1 K

9. The equation for the standard enthalpy of formation of $N_2O_3$ is

   d. $N_2(g) + 3/2\ O_2(g) \rightarrow N_2O_3(g)$

10. Which of the following equations represents an enthalpy change at 25 ºC and 1 atm that is equal to $\Delta H^o_f$?

   e. $C(s) + H_2(g) + O_2(g) \rightarrow HCOOH(l)$

11. Calculate the enthalpy of reaction for the process

$$D + F \rightarrow G + M$$

   using the following equations and data:

$G + C \rightarrow A + B \qquad \Delta H^o = +277$ kJ

$C + F \rightarrow A \qquad \Delta H^o = +303$ kJ

$D \rightarrow B + M \qquad \Delta H^o = -158$ kJ

   a. -132 kJ

12. Calculate the standard enthalpy change for the reaction

$$C_2H_2(g) + H_2(g) \rightarrow C_2H_4(g)$$

   based on the following standard enthalpies of formation:

$\Delta H^o_f[C_2H_2(g)] = +226.7$ kJ/mol

$\Delta H^o_f[C_2H_4(g)] = +52.3$ kJ/mol

   c. -174.4 kJ

13. Calculate the standard enthalpy of reaction for the process

$$3NO(g) \rightarrow N_2O(g) + NO_2(g)$$

   using the standard enthalpies of formation:

NO = 90 kJ/mol; $N_2O$ = 82.1 kJ/mol; $NO_2$ = 34.0 kJ/mol

   a. -153.9 kJ

14. According to the experiments concerned with the photoelectric effect, what was the result of increasing the intensity of the light striking the metal surface?

   a. The number of electrons emitted was increased.

15. What is the binding energy of an electron in a photosensitive metal in J/mol if light of the frequency of $6.0 \times 10^{14}\ s^{-1}$ impinging on the metal surface is just able to eject electrons?

   c. $2.4 \times 10^5$ J/mol

16. Which of the following electronic transitions in a hydrogen atom would have the longest wavelength?

d. n = 4 to n = 3

17. Which of the following transitions in the hydrogen atom results in the emission of light of the highest energy?

b. n = 3 to n = 1

18. What type of orbital is designated n = 4, l = 3, $m_l$ = -1?

e. 4f

19. What type of orbital (if any) is designated n = 3, l = 1, $m_l$ = -2?

e. no orbital is identified

20. What name is given to a region of an electron probability density graph where the probability of finding the electron is zero?

a. node

21. A precipitate will form when an aqueous solution of lead(II) nitrate is added to an aqueous solution of

e. NaCl

22. The solution which results from the reaction NaOH(aq) and HCl(aq) is the same as the result of the reaction of

d. $Na_2CO_3$(aq) and HCl(aq).

23. How many joules are equivalent to 37.7 cal?

e. 158 J

24. When 115 grams of water at 22.0 ºC is mixed with an unknown mass of water at a temperature of 58.0 ºC, the final temperature of the resulting mixture is 45.0 ºC. What was the mass of the second sample of water?

e. 203 g

25. When two solutions are mixed, the container "feels hot." Thus,

c. the reaction is exothermic.