

# CH 121

## General and Inorganic Chemistry Exam 2 June 3, 2002

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. A precipitate will form when an aqueous solution of lead(II) nitrate is added to an aqueous solution of
  - a.  $\text{NH}_4\text{NO}_3$
  - b.  $\text{Mg}(\text{NO}_3)_2$
  - c.  $\text{NaNO}_3$
  - d.  $\text{KNO}_3$
  - e.  $\text{NaCl}$
2. A white solid is either  $\text{NaCl}$  or  $\text{NaNO}_3$ . If an aqueous solution is prepared, which reagent will allow you to distinguish between the two compounds?
  - a.  $\text{H}_2\text{SO}_4$
  - b.  $\text{HCl}$
  - c.  $\text{AgNO}_3$
  - d.  $(\text{NH}_4)_2\text{SO}_4$
  - e.  $\text{H}_2\text{O}$
3. The solution which results from the reaction  $\text{NaOH}(\text{aq})$  and  $\text{HCl}(\text{aq})$  is the same as the result of the reaction of
  - a.  $\text{Pb}(\text{NO}_3)_2(\text{aq})$  and  $\text{NaCl}(\text{aq})$ .
  - b.  $\text{KOH}(\text{aq})$  and  $\text{HCl}(\text{aq})$ .
  - c.  $\text{NaCl}(\text{aq})$  and  $\text{AgNO}_3(\text{aq})$ .
  - d.  $\text{Na}_2\text{CO}_3(\text{aq})$  and  $\text{HCl}(\text{aq})$ .
  - e.  $\text{HCl}(\text{aq})$  and  $(\text{NH}_4)_2\text{SO}_4(\text{aq})$ .
4. Which equation below best represents the balanced, net ionic equation for the reaction of a solution of barium nitrate with a solution of potassium carbonate?
  - a.  $\text{Ba}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{BaCO}_3(\text{s})$
  - b.  $\text{K}^+(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow \text{KNO}_3(\text{s})$
  - c.  $\text{Ba}^{2+}(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow \text{K}_2\text{CO}_3(\text{aq}) + \text{Ba}^{2+}(\text{s})$
  - d.  $\text{Ba}(\text{NO}_3)_2(\text{aq}) + \text{K}^+(\text{aq}) \rightarrow \text{KNO}_3(\text{s}) + \text{Ba}^{2+}(\text{aq})$
  - e.  $\text{Ba}(\text{NO}_3)_2(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{BaCO}_3(\text{s}) + 2\text{N}_2(\text{g}) + 3\text{O}_2(\text{g})$

5. How many milliliters of 0.123 M NaOH solution contain 25.0 g of NaOH (molar mass = 40.00 g/mol)?

- a. 5.08 mL
- b. 50.8 mL
- c. 508 mL
- d. 625 mL
- e. 5080 mL.

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



If you want to dissolve 0.250 g of AgBr (molar mass = 187.8 g/mol), how many milliliters of 0.0138 M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> should you add?

- a. 96.5 mL
- b. 193 mL
- c. 250 mL
- d. 386 mL
- e. 425 mL

7. Equal masses of two substances, A and B, each absorb 25 joules of energy. If the temperature of A increases by 4 degrees and the temperature of B increases by 8 degrees, one can say that

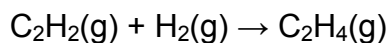
- a. the specific heat of A is double that of B.
- b. the specific heat of B is double that of A.
- c. the specific heat of B is negative.
- d. the specific heat of A is negative.
- e. the specific heat of B is triple that of A.

8. How many grams of lead will absorb the same amount of energy as 15.0 g Ag when each metal is heated from 20.0 °C to 35.0 °C?

<u>Substance</u>	<u>Specific Heat (J/g•K)</u>
Lead	0.129
Silver	0.237

- a. 6.50 g  
b. 27.6 g  
c. 53.3 g  
d. 97.9 g  
e. 225 g
9. How much energy is required to change the temperature of 2.00 g of aluminum from 20.0 °C to 25.0 °C? The specific heat of aluminum is 0.902 J/g•K.
- a. 2.3 J  
b. 9.0 J  
c. 0.36 J  
d. 0.090 J  
e. 7.6 J
10. The standard state of an element or compound is determined at a pressure of \_\_\_\_\_ and a temperature of \_\_\_\_\_.
- a. 760 atm, 0 °C  
b. 1 mmHg, 273 °C  
c. 760 mmHg, 273 K  
d. 760 atm, 0 K  
e. 1 atm, 298 K
11. Which equation represents the standard enthalpy of formation for acrylonitrile, C<sub>3</sub>H<sub>3</sub>N?
- a.  $3 \text{ C}(\text{graphite}) + 3/2 \text{ H}_2(\text{g}) + 1/2 \text{ N}_2(\text{g}) \rightarrow \text{C}_3\text{H}_3\text{N}(\text{l})$   
b.  $3 \text{ C}(\text{graphite}) + \text{NH}_3(\text{g}) \rightarrow \text{C}_3\text{H}_3\text{N}(\text{l})$   
c.  $3 \text{ CH}_4(\text{g}) + \text{NH}_3(\text{g}) \rightarrow \text{C}_3\text{H}_3\text{N}(\text{l}) + 6 \text{ H}_2(\text{g})$   
d.  $3 \text{ CO}_2(\text{g}) + \text{N}_2(\text{g}) + 3 \text{ H}_2\text{O}(\text{g}) \rightarrow \text{C}_3\text{H}_3\text{N}(\text{l}) + \text{NH}_3(\text{g}) + 9/2 \text{ O}_2(\text{g})$   
e.  $3 \text{ CO}_2(\text{g}) + \text{N}_2(\text{g}) + 3 \text{ H}_2(\text{g}) \rightarrow \text{C}_3\text{H}_3\text{N}(\text{l}) + \text{NH}_3(\text{g}) + 3 \text{ O}_2(\text{g})$

12. Calculate the standard enthalpy change for the reaction

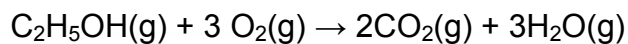


based on the following standard enthalpies of formation:

$$\Delta H^\circ_f[\text{C}_2\text{H}_2(\text{g})] = +226.7 \text{ kJ/mol}$$

$$\Delta H^\circ_f[\text{C}_2\text{H}_4(\text{g})] = +52.3 \text{ kJ/mol}$$

- a. 174.4 kJ
  - b. -56.4 kJ
  - c. -174.4 kJ
  - d. -279.0 kJ
  - e. -321.1 kJ
13. The standard molar enthalpy change is -1277.3 kJ for the combustion of ethanol



Calculate the standard molar enthalpy of formation for ethanol based on the following standard enthalpies of formation:

$$\Delta H^\circ_f [\text{CO}_2(\text{g})] = -393.5 \text{ kJ/mol}$$

$$\Delta H^\circ_f [\text{H}_2\text{O}(\text{g})] = -241.8 \text{ kJ/mol}$$

- a. -642.7 kJ/mol
  - b. -235.1 kJ/mol
  - c. -122.9 kJ/mol
  - d. 235.1 kJ/mol
  - e. 642.7 kJ/mol
14. Which of the following has the longest wavelength?
- a. blue light
  - b. red light
  - c. yellow light
  - d. green light
  - e. orange light

15. What is the energy of a mole of photons of orange light with a wavelength of 585 nanometers?
- a.  $1.20 \times 10^{-52}$  J/mol
  - b.  $7.41 \times 10^{-29}$  J/mol
  - c.  $1.61 \times 10^{-27}$  J/mol
  - d.  $2.78 \times 10^{-18}$  J/mol
  - e.  $2.05 \times 10^5$  J/mol
16. What is the energy of a mole of photons of infrared radiation of wavelength  $1.72 \times 10^{-3}$  cm?
- a.  $6.96 \times 10^3$  J/mol
  - b.  $1.90 \times 10^5$  J/mol
  - c.  $2.83 \times 10^{11}$  J/mol
  - d.  $1.15 \times 10^{20}$  J/mol
  - e.  $1.04 \times 10^{37}$  J/mol
17. For a particular element, a photon of yellow light of wavelength of 585 nm resulted when an electron fell from the third energy level to the second energy level. From this information we can determine
- a. the energy of the  $n = 2$  level.
  - b. the energy of the  $n = 3$  level.
  - c. the sum of the energies of  $n = 2$  and  $n = 3$ .
  - d. the sum of the energies of  $n = 1$ ,  $n = 2$ , and  $n = 3$ .
  - e. the difference in energies between  $n = 2$  and  $n = 3$ .
18. When  $l = 4$ , what set of orbitals is designated?
- a. f
  - b. p
  - c. s
  - d. d
  - e. g

19. Which of the following sets of quantum numbers is not allowed?

- a.  $n = 1, l = 0, m_l = 0$
- b.  $n = 2, l = 0, m_l = 0$
- a.  $n = 2, l = 2, m_l = +1$
- a.  $n = 3, l = 1, m_l = 0$
- a.  $n = 3, l = 1, m_l = +1$

20. According to the Bohr atomic theory, when an electron moves from one energy level to another further from the nucleus

- a. energy is absorbed.
- b. energy is emitted.
- c. light is emitted.
- d. photons are discharged.
- e. no change in energy is observed.