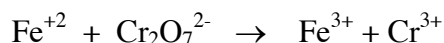


## Chem 121 Practice Questions Chapters 1-5

1. The following unbalanced reaction occurs in basic media:



The coefficient for water in the balanced equation is \_\_\_\_\_ and water appears on the \_\_\_\_\_ side of the equation.

- 14, right
  - 7, left
  - 7, right
  - 14, left
  - none of these
2. A metal M, forms an oxide  $\text{M}_2\text{O}_3$ , containing 68.4% metal by mass. Calculate the atomic mass of the metal.
- 68.4 g/mol
  - 106 g/mol
  - 51.9 g/mol
  - 23.9 g/mol
  - 45.6 g/mol
3. A 0.4647 g sample of a compound known to contain only carbon, hydrogen, and oxygen was burned in oxygen to yield 0.8653 g of  $\text{CO}_2$  and 0.1767 g of  $\text{H}_2\text{O}$ . What is the empirical formula of the compound?
- $\text{C}_3\text{H}_3\text{O}_2$
  - $\text{C}_2\text{H}_2\text{O}$
  - $\text{C}_3\text{H}_6\text{O}_2$
  - CHO
  - $\text{C}_6\text{H}_3\text{O}_2$
4. Consider separate samples of  $\text{Ar}_{(g)}$  and  $\text{Ne}_{(g)}$ . For what ratio of absolute temperatures (Ne:Ar) are the average kinetic energies equal?
- 0.98
  - 0.505
  - 1.00
  - 1.41
  - none of these
5. The following reaction occurs in acidic solution:



What volume of 0.352 M HCl is needed to produce  $2.48 \times 10^{-3}$  moles of iodine,  $\text{I}_2$ , with an excess of  $\text{KIO}_3$  and KI?

- 7.05 mL
- 2.48 mL
- 4.96 mL
- 14.1 mL
- none of these

6. The element rhenium (Re) exists as two stable isotopes and 18 unstable isotopes. Rhenium-185 has in its nucleus
- 110 protons, 75 neutrons
  - 75 protons, 185 neutrons
  - 75 protons, 110 neutrons
  - 75 protons, 75 neutrons
  - not enough information is given
7. The diffusion rate of  $N_2$  gas is 1.73 times as great as a noble gas (both gases are at the same temperature). What is the noble gas?
- Xe
  - Ar
  - Ne
  - He
  - Kr
8. Which of the following is not the correct chemical formula for the compound named?
- $NH_4NO_3$  ammonium nitrate
  - $Cu(C_2H_3O_2)_2$  copper(II) acetate
  - $NH_3$  ammonia
  - $Mg_2O$  magnesium oxide
  - $Na_2SO_3$  sodium sulfite
9. Boron naturally occurs in two isotopic forms. The more common isotope is  $^{11}B$  (atomic mass 11.01 amu). What is the atomic mass of the other isotope?
- 11.01 amu
  - 11.00 amu
  - 10.01 amu
  - 10.81 amu
  - 10.91 amu
10. How many moles of sodium phosphate are required to react completely with 6.0 moles of calcium nitrate to form sodium nitrate and calcium phosphate?
- 1.0 mol
  - 2.0 mol
  - 8.0 mol
  - 6.0 mol
  - 4.0 mol

11. Which of the following are oxidation –reduction reactions?

- I.  $\text{PCl}_3 + \text{Cl}_2 \rightarrow \text{PCl}_5$
- II.  $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$
- III.  $\text{CO}_2 + 2\text{LiOH} \rightarrow \text{Li}_2\text{CO}_3 + \text{H}_2\text{O}$
- IV.  $\text{FeCl}_2 + 2\text{NaOH} \rightarrow \text{Fe}(\text{OH})_2 + 2\text{NaCl}$

- a. III
- b. IV
- c. I and II
- d. I, II, and III
- e. I, II, III, and IV

12. A 0.234 g sample of a gas in a 275 mL container at 23.5°C exerts a pressure of 0.292 atm.

What is the molar mass of the gas?

- a. 5.62 g/mol
- b. 70.9g/mol
- c. 0.0141 g/mol
- d. 32.0 g/mol
- e. none of these

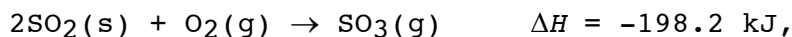
13. When 0.1 M sodium hydroxide and 0.1 M magnesium nitrate are mixed, a precipitate is formed. What is the net ionic equation for the formation of this precipitate?

- a.  $\text{Mg}^{2+}_{(\text{aq})} + 2\text{NO}_3^{-}_{(\text{aq})} \rightarrow \text{Mg}(\text{NO}_3)_{2(\text{s})}$
- b.  $\text{Na}^{+}_{(\text{aq})} + \text{OH}^{-}_{(\text{aq})} \rightarrow \text{NaOH}_{(\text{s})}$
- c.  $\text{Mg}^{2+}_{(\text{aq})} + 2\text{OH}^{-}_{(\text{aq})} \rightarrow \text{Mg}(\text{OH})_{2(\text{s})}$
- d.  $\text{Na}^{+}_{(\text{aq})} + \text{NO}_3^{-}_{(\text{aq})} \rightarrow \text{NaNO}_{3(\text{s})}$
- e. none of the above.

## Chem 121 Practice Questions Chapters 5, 9, 12

- How does the observed pressure of a gas relate to the ideal pressure?
  - the observed pressure is less than the ideal pressure
  - the observed pressure is greater than the ideal pressure
  - they are equal
  - the relationship depends on the gas
  - none of these
- When 0.72 g of a liquid is vaporized at 110°C and 0.967 atm, the gas occupies a volume of 0.559 L. The empirical formula of the gas is CH<sub>2</sub>. What is the molecular formula of the gas?
  - C<sub>2</sub>H<sub>4</sub>
  - C<sub>3</sub>H<sub>6</sub>
  - C<sub>4</sub>H<sub>8</sub>
  - CH<sub>2</sub>
  - none of these
- Which statement is *true* of a process in which one mole of a gas expands from state A to state B?
  - The amount of work done in the process must be the same, regardless of the path.
  - The amount of heat released in the process will depend on the path taken.
  - The final volume of the gas will depend on the path taken.
  - When the gas expands from state A to state B, the surroundings are doing work on the system.
  - It is not possible to have more than one path for a change of state.
- A 40.2 g sample of a metal is heated to 99.3°C and then placed in a calorimeter containing 120.0 g of water ( $c = 4.18\text{J/g}^\circ\text{C}$ ) at 21.8 °C. The final temperature of the water is 24.5 °C. Which metal was used?
  - Aluminum ( $C = 0.89\text{J/g}^\circ\text{C}$ )
  - Copper ( $C = 0.20\text{J/g}^\circ\text{C}$ )
  - Iron ( $C = 0.45\text{J/g}^\circ\text{C}$ )
  - Lead ( $C = 0.14\text{J/g}^\circ\text{C}$ )

Consider the following reaction



- Calculate the energy change associated with 25.0 g of SO<sub>2</sub> reacting with excess O<sub>2</sub>.
  - none of these
  - 198 kJ
  - 77.3 kJ
  - 38.7 kJ
  - 155 kJ

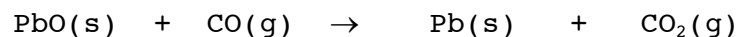
6. Consider the following numbered processes:

1.  $A \rightarrow 2B$
2.  $B \rightarrow C + D$
3.  $E \rightarrow 2D$

$\Delta H$  for the process  $A \rightarrow 2C + E$  is

- a.  $\Delta H_1 + 2\Delta H_2 - \Delta H_3$
- b.  $\Delta H_1 + \Delta H_2 - \Delta H_3$
- c.  $\Delta H_1 + \Delta H_2$
- d.  $\Delta H_1 + 2\Delta H_2 + \Delta H_3$
- e.  $\Delta H_1 + \Delta H_2 + \Delta H_3$

7. Using the information below, calculate  $\Delta H^\circ$  for the reaction:



$$\Delta H_f^\circ \text{ for PbO(s)} = -151.6 \text{ kJ/mol}$$

$$\Delta H_f^\circ \text{ for CO}_2\text{(g)} = -393.5 \text{ kJ/mol}$$

$$\Delta H_f^\circ \text{ for CO(g)} = -110.5 \text{ kJ/mol}$$

- a. -283.0 kJ/mol
- b. +252.1 kJ/mol
- c. -372.6 kJ/mol
- d. -131.4 kJ/mol
- e. +283.0 kJ/mol

8. Green light has a wavelength of  $5.50 \times 10^2$  nm. The energy of a photon of green light is

- a.  $5.45 \times 10^{12}$  J
- b.  $2.17 \times 10^5$  J
- c.  $3.64 \times 10^{-38}$  J
- d.  $3.61 \times 10^{-19}$  J
- e.  $1.09 \times 10^{-27}$  J

9. What is the wavelength of light that is emitted when an excited electron in the hydrogen atom falls from  $n = 5$  to  $n = 2$ ?

- a.  $5.82 \times 10^{-7}$  m
- b. none of these
- c.  $4.34 \times 10^{-7}$  m
- d.  $5.12 \times 10^{-7}$  m
- e.  $6.50 \times 10^{-7}$  m

From the following list of observations,

- a. Emission spectrum of hydrogen
- b. The photoelectric effect
- c. Scattering of alpha particles by metal foil
- d. Diffraction
- e. Cathode rays

Which one most clearly supports the following conclusions:

10. electrons have wave properties
11. electromagnetic radiation has wave characteristics
12. electrons in atoms have quantized energies
13. the mass of the atom is located mainly in the nucleus

**Some data that you would be given if needed:**

$$\left[ P_{\text{obs}} + a \left( \frac{n}{V} \right)^2 \right] (V - nb) = nRT$$

$$\Delta E = -2.178 \times 10^{-18} \text{ J} \left( \frac{Z^2}{n_{\text{final}}^2} - \frac{Z^2}{n_{\text{initial}}^2} \right)$$

$$h = 6.62608 \times 10^{-34} \text{ J s}$$

$$R = 0.08206 \text{ L atm K}^{-1} \text{ mol}^{-1} = 8.31451 \text{ J K}^{-1} \text{ mol}^{-1}$$

$$c = 2.9979 \times 10^8 \text{ m s}^{-1}$$

$$\text{K} = ^\circ\text{C} + 273.15$$

## Answers to Chem 121 Midterm Practice Questions 2015-2

### Chapters 1-5 questions

1. b
2. c
3. a
4. c
5. d
6. c
7. e
8. d
9. c
10. e
11. c
12. b
13. c

### Chapters 5-12 questions

1. a
2. b
3. b
4. c
5. d
6. a
7. d
8. d
9. c
10. d
11. d
12. a
13. c