AP Chemistry Practice Test 1

Real AP Past Papers with Multiple-Choice Questions

1. $2ClF(g) + O_2(g) \leftrightarrow Cl_2O(g) + F_2O(g)$ &DELTA;H = 167 kJ/mol$_{rxn}$
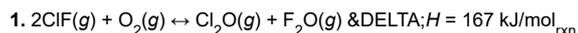
During the reaction above, the product yield can be increased by increasing the temperature of the reaction. Why is this effective?

○ A. The reaction is endothermic; therefore adding heat will shift it to the right.

○ B. Increasing the temperature increases the speed of the molecules, meaning there will be more collisions between them.

○ C. The reactants are less massive than the products, and an increase in temperature will cause their kinetic energy to increase more than that of the products.

○ D. The increase in temperature allows for a higher percentage of molecular collisions to occur with the proper orientation to create the product.

2. $CH_3NH_2(aq) + H_2O(l) \leftrightarrow OH^-(aq) + CH_3NH_3^+(aq)$
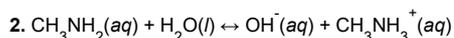
The above equation represents the reaction between the base methylamine (K_b = 4.38 × 10^{-4}) and water. Which of the following best represents the concentrations of the various species at equilibrium?

○ A. $[OH^-] > [CH_3NH_2] = [CH_3NH_3^+]$

○ B. $[OH^-] = [CH_3NH_2] = [CH_3NH_3^+]$

○ C. $[CH_3NH_2] > [OH^-] > [CH_3NH_3^+]$

○ D. $[CH_3NH_2] > [OH^-] = [CH_3NH_3^+]$

3. The following diagram shows the relative atomic sizes of three different elements from the same period. Which of the following statements must be true?
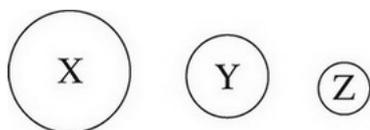
○ A. The effective nuclear charge would be the greatest in element X.

○ B. The first ionization energy will be greatest in element X.

○ C. The electron shielding effect will be greatest in element Z.

○ D. The electronegativity value will be greatest in element Z.

4. A sealed, rigid container contains three gases: 28.0 g of nitrogen, 40.0 g of argon, and 36.0 g of water vapor. If the total pressure exerted by the gases is 2.0 atm, what is the partial pressure of the nitrogen?

○ A. 0.33 atm

○ B. 0.40 atm

○ C. 0.50 atm

○ D. 2.0 atm

5. A sample of liquid NH_3 is brought to its boiling point. Which of the following occurs during the boiling process?

○ A. The N-H bonds within the NH_3 molecules break apart.

○ B. The overall temperature of the solution rises as the NH_3 molecules speed up.

○ C. The amount of energy within the system remains constant.

○ D. The hydrogen bonds holding separate NH_3 molecules together break apart.
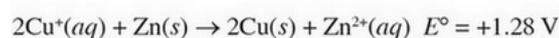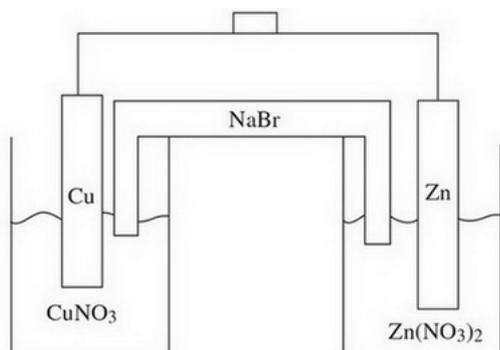
Questions 6-10 refer to the following information.

Two half-cells are set up as follows:

Half-Cell A: Strip of Cu(s) in $CuNO_3(aq)$

Half-Cell B: Strip of Zn(s) in $Zn(NO_3)_2(aq)$

When the cells are connected according to the following diagram, the following reaction occurs:

$$2Cu^+(aq) + Zn(s) \rightarrow 2Cu(s) + Zn^{2+}(aq) \quad E° = +1.28 \text{ V}$$

6. Correctly identify the anode and cathode in this reaction as well as where oxidation and reduction are taking place.

○ A. Cu is the anode where oxidation occurs, and Zn is the cathode where reduction occurs.

○ B. Cu is the anode where reduction occurs, and Zn is the cathode where oxidation occurs.

○ C. Zn is the anode where oxidation occurs, and Cu is the cathode where reduction occurs.

○ D. Zn is the anode where reduction occurs, and Cu is the cathode where oxidation occurs.

7. How many moles of electrons must be transferred to create 127 g of copper?

○ A. 1 mole of electrons

○ B. 2 moles of electrons

○ C. 3 moles of electrons

○ D. 4 moles of electrons

8. If the $Cu^+ + e^- \rightarrow Cu(s)$ half reaction has a standard reduction potential of +0.52 V, what is the standard reduction potential for the $Zn^{2+} + 2e^- \rightarrow Zn(s)$ half reaction?

○ A. +0.76 V

○ B. -0.76 V

○ C. +0.24 V

○ D. -0.24 V

9. As the reaction progresses, what will happen to the overall voltage of the cell?

○ A. It will increase as $[Zn^{2+}]$ increases.

○ B. It will increase as $[Cu^+]$ increases.

○ C. It will decrease as $[Zn^{2+}]$ increases.

○ D. The voltage will remain constant.

10. What will happen in the salt bridge as the reaction progresses?

○ A. The Na^+ ions will flow to the Cu/Cu^+ half-cell.

○ B. The Br^- ions will flow to the Cu/Cu^+ half-cell.

○ C. Electrons will transfer from the Cu/Cu^+ half-cell to the Zn/Zn^{2+} half-cell.

○ D. Electrons will transfer from the Zn/Zn^{2+} half-cell to the Cu/Cu^+ half-cell.

11. For a reaction involving nitrogen monoxide inside a sealed flask, the value for the reaction quotient (Q) was found to be 1.1×10^2 at a given point. If, after this point, the amount of NO gas in the flask increased, which reaction is most likely taking place in the flask?

○ A. $NOBr(g) \leftrightarrow NO(g) + \frac{1}{2}Br_2(g)$
$K_c = 3.4 \times 10^{-2}$

○ B. $2NOCl(g) \leftrightarrow 2NO(g) + Cl_2(g)$
$K_c = 1.6 \times 10^{-5}$

○ C. $2NO(g) + 2H_2(g) \leftrightarrow N_2(g) + 2H_2O(g)$
$K_c = 4.0 \times 10^6$

○ D. $N_2(g) + O_2(g) \leftrightarrow 2NO(g)$
$K_c = 4.2 \times 10^2$

12. Which of the following substances has an asymmetrical molecular structure?

○ A. SF_4

○ B. PCl_5

○ C. BF_3

○ D. CO_2