AP Chemistry Practice Test 3

Real AP Past Papers with Multiple-Choice Questions

Questions 1-4 refer to the following information.

Inside a calorimeter, 100.0 mL of 1.0 *M* hydrocyanic acid (HCN), a weak acid, and 100.0 mL of 0.50 *M* sodium hydroxide are mixed. The temperature of the mixture rises from 21.5 °C to 28.5 °C. The specific heat of the mixture is approximately 4.2 J/g°C, and the density is identical to that of water.

1. Identify the correct net ionic equation for the reaction that takes place.

- A. $HCN(aq) + OH^-(aq) \leftrightarrow CN^-(aq) + H_2O(l)$
- B. $HCN(aq) + NaOH(aq) \leftrightarrow NaCN(aq) + H_2O(l)$
- C. $H^+(aq) + OH^-(aq) \leftrightarrow H_2O(l)$
- D. $H^+(aq) + CN^-(aq) + Na^+(aq) + OH^-(aq) \leftrightarrow H_2O(l) + CN^-(aq) + Na^+(aq)$

2. What is the approximate amount of heat released during the reaction?

- A. 1.5 kJ
- B. 2.9 kJ
- C. 5.9 kJ
- D. 11.8 kJ

3. As ΔT increases, what happens to the equilibrium constant and why?

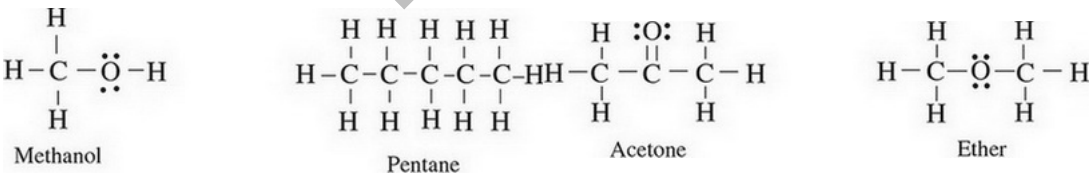
- A. The equilibrium constant increases because more products are created.
- B. The equilibrium constant increases because the rate of the forward reaction increases.
- C. The equilibrium constant decreases because the equilibrium shifts to the left.
- D. The value for the equilibrium constant is unaffected by temperature and will not change.

4. If the experiment is repeated with 200.0 mL of 1.0 *M* HCN and 100. mL of 0.50 *M* NaOH, what would happen to the values for ΔT and ΔH_{rxn}?

ΔT ΔH_{rxn}

- A. Increase Increase
- B. Stay the same Stay the same
- C. Decrease Stay the same
- D. Stay the same Increase

5. The following diagrams show the Lewis structures of four different molecules. Which molecule would travel the farthest in a paper chromatography experiment using a polar solvent?



- A. Methanol
- B. Pentane
- C. Acetone

○ D. Ether

6. The first ionization energy for a neutral atom of chlorine is 1.25 MJ/mol and the first ionization energy for a neutral atom of argon is 1.52 MJ/mol. How would the first ionization energy value for a neutral atom of potassum compare to those values?

○ A. It would be greater than both because potassium carries a greater nuclear charge then either chlorine or argon.

○ B. It would be greater than both because the size of a potassium atom is smaller than an atom of either chlorine or argon.

○ C. It would be less than both because there are more electrons in potassium, meaning they repel each other more effectively and less energy is needed to remove one.

○ D. It would be less than both because a valence electron of potassium is farther from the nucleus than one of either chlorine or argon.

7. Which net ionic equation below represents a possible reaction that takes place when a strip of magnesium metal is oxidized by a solution of chromium (III) nitrate?

○ A. $Mg(s) + Cr(NO_3)_3(aq) \rightarrow Mg^{2+}(aq) + Cr^{3+}(aq) + 3NO_3^-(aq)$

○ B. $3Mg(s) + 2Cr^{3+} \rightarrow 3Mg^{2+} + 2Cr(s)$

○ C. $Mg(s) + Cr^{3+} \rightarrow Mg^{2+} + Cr(s)$

○ D. $3Mg(s) + 2Cr(NO_3)_3(aq) \rightarrow 3Mg^{2+}(aq) + 2Cr(s) + NO_3^-(aq)$

8. $PCl_3(g) + Cl_2(g) \leftrightarrow PCl_5(g)$ ΔH = -92.5 kJ/mol

In which of the following ways could the reaction above be manipulated to create more product?

○ A. Decreasing the concentration of PCl_3

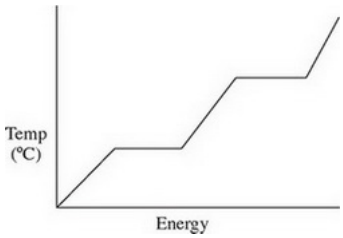
○ B. Increasing the pressure

○ C. Increasing the temperature

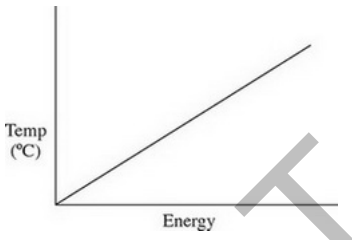
○ D. None of the above

9. A pure solid substance is heated strongly. It first melts into a liquid, then boils and becomes a gas. Which of the following heating curves correctly shows the relationship between temperature and heat added?

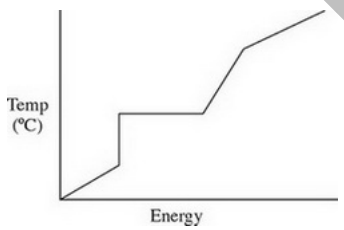
○ A.



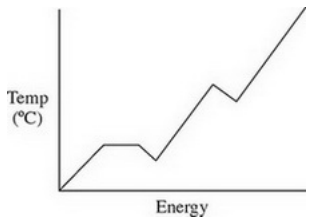
○ B.



○ C.



○ D.



10. Consider the following reaction showing photosynthesis:

$6CO_2(g) + 6H_2O(l) \rightarrow C_6H_{12}O_6(s) + 6O_2(g)$ DH = + 2800 kJ/mol

Which of the following is true regarding the thermal energy in this system?

○ A. It is transferred from the surroundings to the reaction.

- B. It is transferred from the reaction to the surroundings.
- C. It is transferred from the reactants to the products.
- D. It is transferred from the products to the reactants.

11. $SO_2Cl_2 \rightarrow SO_2(g) + Cl_2(g)$

At 600 K, SO_2Cl_2 will decompose to form sulfur dioxide and chlorine gas via the above equation. If the reaction is found to be first order overall, which of the following will cause an increase in the half life of SO_2Cl_2?

- A. Increasing the initial concentration of SO_2Cl_2
- B. Increasing the temperature at which the reaction occurs
- C. Decreasing the overall pressure in the container
- D. None of these will increase the half life