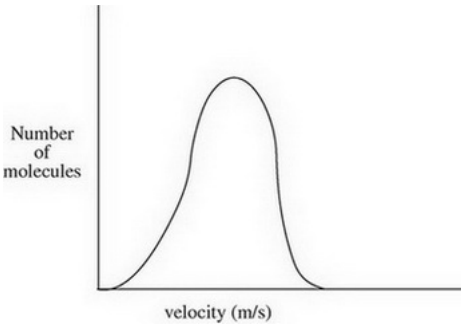
AP Chemistry Practice Test 2

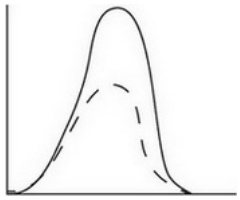
Real AP Past Papers with Multiple-Choice Questions

1.

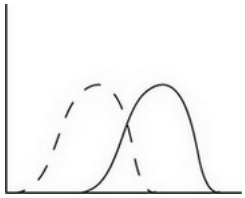


The diagram above shows the speed distribution of molecules in a gas held at 200 K. Which of the following representations would best represent the gas at a higher temperature? (Note: The original line is shown as a dashed line in the answer options.)

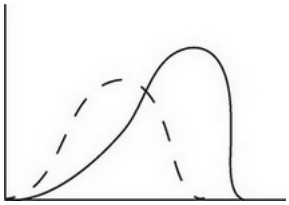
○ A.



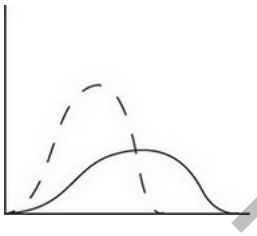
○ B.



○ C.



○ D.



2. Nitrogen's electronegativity value is between those of phosphorus and oxygen. Which of the following correctly describes the relationship between the three values?

○ A. The value for nitrogen is less than that of phosphorus because nitrogen is larger, but greater than that of oxygen because nitrogen has a greater effective nuclear charge.

○ B. The value for nitrogen is less than that of phosphorus because nitrogen has fewer protons but greater than that of oxygen because nitrogen has less valence electrons.

○ C. The value for nitrogen is greater than that of phosphorus because nitrogen has less electrons, but less than that of oxygen because nitrogen is smaller.

○ D. The value for nitrogen is greater than that of phosphorus because nitrogen is smaller, but less than that of oxygen because nitrogen has a smaller effective nuclear charge.

3. A sample of a compound known to consist of only carbon, hydrogen, and oxygen is found to have a total mass of 29.05 g. If the mass of the carbon is 18.02 g and the mass of the hydrogen is 3.03 g, what is the empirical formula of the compound?

○ A. C_2H_4O

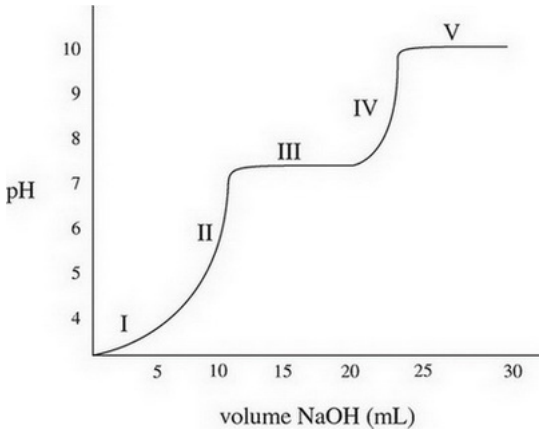
○ B. C_3H_6O

○ C. $C_2H_6O_3$

○ D. $C_3H_8O_2$

Questions 4-6 refer to the following information.

A solution of carbonic acid, H_2CO_3, is titrated with sodium hydroxide, NaOH. The following graph is produced:



4. In addition to OH^-, what species are present in the solution during section III of the graph?

○ A. H_2CO_3, HCO_3^-, and CO_3^{2-}

○ B. H_2CO_3 and HCO_3^-

○ C. HCO_3^- and CO_3^{2-}

○ D. H_2CO_3 and CO_3^{2-}

5. What is the magnitude of the first dissociation constant?

○ A. 10^{-2}

○ B. 10^{-4}

○ C. 10^{-6}

○ D. 10^{-8}

6. If the concentration of the sodium hydroxide is increased prior to repeating the titration, what effect, if any, would that have on the graph?

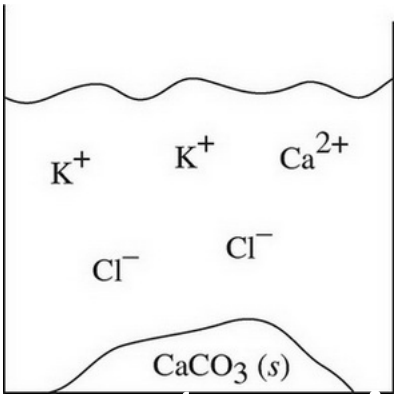
○ A. The graph would not change at all.

○ B. The pH values at the equivalence points would increase.

○ C. The equivalence points would be reached with less volume of NaOH added.

○ D. The slope of the equivalence points would decrease.

7. Two solutions of potassium carbonate and sodium chloride are mixed together, and the particulate representation below shows what is present after the reaction has gone to completion.



Which of the two original solutions is the limiting reagent and why?

- A. The potassium carbonate, because of the polyatomic anion
- B. The potassium carbonate, because there is no carbonate left after the reaction
- C. The calcium chloride, because there is an excess of calcium ions post-reaction
- D. The calcium chloride, because the component ions are smaller than those in potassium carbonate

8. In which of the following circumstances is the value for K_{eq} always greater than 1?

&DELTA;*H* &DELTA;*S*

- A. Positive Positive
- B. Positive Negative
- C. Negative Negative
- D. Negative Positive

9. The structure of two oxoacids is shown below:

Which would be a stronger acid, and why?

- A. HOCl, because the H–O bond is weaker than in HOF as chlorine is larger than fluorine
- B. HOCl, because the H–O bond is stronger than in HOF as chlorine has a higher electronegativity than fluorine
- C. HOF, because the H–O bond is stronger than in HOCl as fluorine has a higher electronegativity than chlorine
- D. HOF, because the H–O bond is weaker than in HOCl as fluorine is smaller than chlorine

10. During a chemical reaction, NO(*g*) gets reduced and no nitrogen-containing compound is oxidized. Which of the following is a possible product of this reaction?

- A. $NO_2(g)$
- B. $N_2(g)$
- C. $NO_3^-(aq)$
- D. $NO_2^-(aq)$

11. Which of the following pairs of substances would make a good buffer solution?

- A. $HC_2H_3O_2(aq)$ and $NaC_2H_3O_2(aq)$
- B. $H_2SO_4(aq)$ and $LiOH(aq)$
- C. $HCl(aq)$ and $KCl(aq)$
- D. $HF(aq)$ and $NH_3(aq)$