# SAT Chemistry Practice Test 18

## SAT Chemistry Practice Test 2: Part C

**1.** $HCN(aq) \rightarrow H^+(aq) + CN^-(aq)$
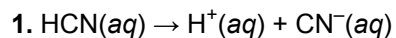
Hydrocyanic acid dissociates according to the reaction given above. Which of the following expressions is equal to the acid dissociation constant for HCN?
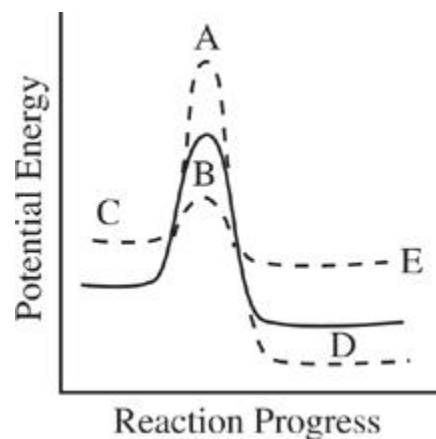
A. $[H^+][CN^-]$

B. $[H^+][CN^-][HCN]$

C. $\dfrac{[HCN]}{[H^+][CN^-]}$

D. $\dfrac{[H^+][CN^-]}{[HCN]}$

E. $\dfrac{1}{[H^+][CN^-][HCN]}$

**2.** The reaction progress diagram of an uncatalyzed reaction is shown by the solid line. Which dotted line presents the same reaction in the presence of a catalyst?



Reaction Progress

A.

B.

C.

D.

E.

**3.** In a hydrogen atom, when an electron jumps from an excited energy state to a more stable energy state,

A. electromagnetic radiation is emitted by the atom

B. electromagnetic radiation is absorbed by the atom

C. the atom becomes a positively charged ion

D. the atom becomes a negatively charged ion

E. the atom undergoes nuclear decay

**4.** A closed 5-liter vessel contains a sample of neon gas. The temperature inside the container is 25°C, and the pressure is 1.5 atmospheres. (The gas constant, $R$, is equal to 0.08 L?atm/mol?K.)

Which of the following expressions is equal to the molar quantity of gas in the sample?

A. $\dfrac{(1.5)(5.0)}{(0.08)(25)}$ moles

B. $\dfrac{(0.08)(25)}{(1.5)(5.0)}$ moles

C. $\dfrac{(1.5)(25)}{(0.08)(5.0)}$ moles

D. $\dfrac{(0.08)(298)}{(1.5)(5.0)}$ moles

E. $\dfrac{(1.5)(5.0)}{(0.08)(298)}$ moles

**5.** A closed 5-liter vessel contains a sample of neon gas. The temperature inside the container is 25°C, and the pressure is 1.5 atmospheres. (The gas constant, $R$, is equal to 0.08 L?atm/mol?K.)

If the neon gas in the vessel is replaced with an equal molar quantity of helium gas, which of the following properties of the gas in the container will be changed?

I. Pressure

II. Temperature

III. Density

A. I only

B. II only

C. III only

D. I and II only

E. II and III only

**6.** A closed 5-liter vessel contains a sample of neon gas. The temperature inside the container is 25°C, and the pressure is 1.5 atmospheres. (The gas constant, $R$, is equal to 0.08 L?atm/mol?K.)

The volume of the vessel was gradually changed while temperature was held constant until the pressure was measured at 1.6 atmospheres. Which of the following expressions is equal to the new volume?

A. $5.0 \times \dfrac{1.5}{1.6}$ liters

B. $5.0 \times \dfrac{1.6}{1.5}$ liters

C. $25 \times \dfrac{1.5}{1.6}$ liters

D. $0.08 \times \dfrac{1.6}{1.5}$ liters

E. $0.08 \times \dfrac{1.5}{1.6}$ liters

**7.** An oxidation-reduction reaction takes place in a chemical cell, and the flow of electrons is used to provide energy for a lightbulb. Which of the following statements is true of the reaction?

A. The reaction is nonspontaneous and has a positive voltage.

B. The reaction is nonspontaneous and has a negative voltage.

C. The reaction is at equilibrium and has a voltage of zero.

D. The reaction is spontaneous and has a positive voltage.

E. The reaction is spontaneous and has a negative voltage.

**8.** A solution containing which of the following pairs of species could be a buffer?

A. $H^+$ and $Cl^-$

B. $H_2CO_3$ and $HCO_3^-$

C. $Na^+$ and $NO_3^-$

D. $Na^+$ and $OH^-$

E. $HNO_3$ and $NO_3^-$

**9.** Which of the following species is the conjugate acid of ammonia ($NH_3$)?

A. $N_2$

B. $H_2$

C. $NH_2^-$

D. $NH_2^-$

E. $NH_4^+$

**10.** A solution of $H_2SO_3$ is found to have a hydrogen ion concentration of $1 \times 10^{-3}$ molar at 25°C. What is the hydroxide ion concentration in the solution?

A. $1 \times 10^{-13}$ molar

B. $1 \times 10^{-11}$ molar

C. $1 \times 10^{-7}$ molar

D. $1 \times 10^{-4}$ molar

E. $1 \times 10^{-3}$ molar

**11.** Which of the following expressions is equal to the number of iron (Fe) atoms present in a pure sample of solid iron with a mass of 10 grams? (The atomic mass of iron is 55.9.)

A. $(10.0)(55.9)(6.02 \times 10^{23})$ atoms

B. $\dfrac{(6.02 \times 10^{23})}{(10.0)(55.9)}$ atoms

C. $\dfrac{(10.0)(6.02 \times 10^{23})}{(55.9)}$ atoms

D. $\dfrac{(55.9)}{(10.0)(6.02 \times 10^{23})}$ atoms

E. $\dfrac{(10.0)}{(55.9)(6.02 \times 10^{23})}$ atoms

**12.** A radioactive material is undergoing nuclear decay. After 40 minutes, 25 percent of the sample remains. What is the half-life of the sample?

A. 10 minutes

B. 20 minutes

C. 40 minutes

D. 80 minutes

E. 160 minutes

| Element | First Ionization Energy (kJ/mol) |
|---------|----------------------------------|
| Lithium | 520 |
| Sodium | 496 |
| Rubidium | 403 |
| Cesium | 376 |

**13.** Based on the table above, which of the following is most likely to be the first ionization energy for potassium?
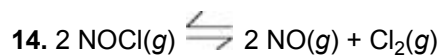
A. 536 kJ/mol

B. 504 kJ/mol

C. 419 kJ/mol

D. 391 kJ/mol

E. 358 kJ/mol

**14.** $2 \text{ NOCl}(g) \rightleftharpoons 2 \text{ NO}(g) + \text{Cl}_2(g)$

Which of the following expressions gives the equilibrium constant for the reaction above?
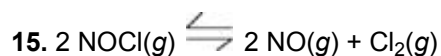
A. $\dfrac{[\text{NOCl}]}{[\text{NO}][\text{Cl}_2]}$

B. $\dfrac{[\text{NO}][\text{Cl}_2]}{[\text{NOCl}]}$

C. $\dfrac{[\text{NOCl}]^2}{[\text{NO}]^2[\text{Cl}_2]}$

D. $\dfrac{[\text{NO}]^2[\text{Cl}_2]}{[\text{NOCl}]^2}$

E. $\dfrac{[\text{NOCl}]^2}{[\text{NO}]^2[\text{Cl}_2]^2}$

**15.** $2 \text{ NOCl}(g) \rightleftharpoons 2 \text{ NO}(g) + \text{Cl}_2(g)$

Which of the following changes to the equilibrium above would serve to decrease the concentration of $Cl_2$?

I. The addition of NOCl(g) to the reaction vessel

II. The addition of NO(g) to the reaction vessel

III. A decrease in the volume of the reaction vessel

A. I only

B. II only

C. I and II only

D. I and III only

E. II and III only

**16.** 2 NOCl(g) $\rightleftharpoons$ 2 NO(g) + $Cl_2$(g)
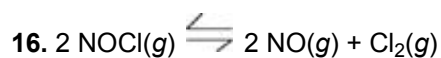
Which of the following is true of the reaction above as it proceeds in the forward direction?

A. NO(g) is produced at the same rate that NOCl(g) is consumed.

B. NO(g) is produced at half the rate that NOCl(g) is consumed.

C. NO(g) is produced at twice the rate that NOCl(g) is consumed.

D. $Cl_2$(g) is produced at the same rate that NOCl(g) is consumed.

E. $Cl_2$(g) is produced at twice the rate that NOCl(g) is consumed.

**17.** Which of the following is an organic molecule?

A. $SiO_2$

B. $NH_3$

C. $H_2O$

D. $CH_4$

E. $BeF_2$
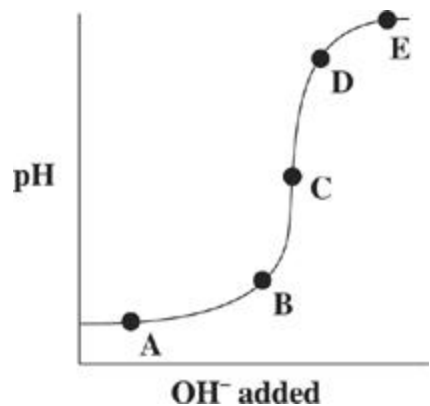
**18.** The graph above represents the titration of a strong acid with a strong base. Which of the points shown on the graph indicates the equivalence point in the titration?

A. A

B. B

C. C

D. D

E. E

**19.** Which of the following statements about fluorine is NOT true?

A. It is the most electronegative element.

B. It contains 19 protons in its nucleus.

C. Its compounds can engage in hydrogen bonding.

D. It takes the oxidation state –1.

E. It is found in nature as a diatomic gas.

**20.** The reactivity and chemical behavior of an atom is governed by many factors. The most important factor is

A. the number of protons in the atom's nucleus

B. the number of neutrons in the atom's nucleus

C. the number of protons and neutrons in the atom's nucleus

D. the ratio of protons to neutrons in the atom's nucleus

E. the number of electrons in the atom's valence shell

**21.** A beaker contains a saturated solution of copper(I) chloride, a slightly soluble salt with a solubility product of $1.2 \times 10^{-6}$. The addition of which of the salts listed below to the solution would cause the precipitation of copper(I) chloride?

A. Sodium chloride

B. Potassium bromide

C. Silver(I) nitrate

D. Lead(II) acetate

E. Magnesium iodide

**22.** Bromothymol blue is an acid/base indicator with a p$K_a$ of 6.8. Therefore, at approximately what pH will bromothymol blue undergo a color change during an acid/base titration?

A. 1

B. 3

C. 5

D. 7

E. 13

**23.** Which of the following is necessarily true of a nonionic substance with a high boiling point?

A. It has a large vapor pressure.

B. It has strong intermolecular attractive forces.

C. It has a low freezing point.

D. It has a low heat of vaporization.

E. It will be present in the gas phase at very low temperatures.