

SAT Chemistry Practice Test 11

Stoichiometry and Solution Chemistry

1. What is the mass of 3.0×10^{23} atoms of neon gas?
 - A. 0.50 grams
 - B. 1.0 grams
 - C. 5.0 grams
 - D. 40.0 grams
 - E. 10.0 grams
2. A compound has a composition of 40% sulfur and 60% oxygen by mass. What is the empirical formula of this compound?
 - A. SO
 - B. S₂O₃
 - C. S₂O₇
 - D. SO₃
 - E. SO₂
3. What is the total number of atoms represented in one molecule of (CH₃)₂NH?
 - A. 5
 - B. 8
 - C. 9
 - D. 10
 - E. 12
4. A hydrocarbon has the empirical formula CH₃. A probable molecular formula for this compound could be
 - A. C₃H₃
 - B. C₂H₆
 - C. C₃H₈
 - D. C₄H₈
 - E. C₅H₁₀

5. The chemical symbol Ar could stand for

- A. one mole of argon
- B. one atom of argon
- C. both a mole or an atom of argon
- D. neither a mole or an atom of argon
- E. one molecule of argon

6. Which salt has a solubility that is different from the other four?

- A. AgCl
- B. PbBr₂
- C. Ca₃(PO₄)₂
- D. Na₂CO₃
- E. Al(OH)₃

7. A solution of a salt and 100 grams of water that can still dissolve more solute at a given temperature is classified as

- A. unsaturated
- B. supersaturated
- C. saturated
- D. dilute
- E. concentrated

8. The net ionic equation for the reaction between CaCl₂ and Na₂CO₃ to form calcium carbonate and sodium chloride would include all of the following except:

- A. Ca²⁺
- B. CO₃²⁻
- C. 2Na¹⁺
- D. CaCO₃
- E. All of the substances above would be in the net ionic equation.

9. Which solution listed below is going to have the highest boiling point?

- A. 1.5 m NaCl
- B. 1.5 m AgCl

C. 2.0 m $C_6H_{12}O_6$

D. 2.0 m $CaCl_2$

E. 1.0 m $Al_2(SO_4)_3$

10. Which equation is correctly balanced?

A. $Na + Cl_2 \rightarrow 2NaCl$

B. $CH_4 + 3O_2 \rightarrow CO_2 + H_2O$

C. $2KI + Pb(NO_3)_2 \rightarrow 2KNO_3 + PbI_2$

D. $H_2SO_4 + KOH \rightarrow K_2SO_4 + H_2O$

E. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + H_2O$

11. 110 grams of KF are dissolved in water to make 850 ml of solution. What is the molarity of the solution?

A. 0.129 M

B. 0.620 M

C. 0.002 M

D. 0.068 M

E. 2.23 M

12. Given one mole of $CH_4(g)$ as STP. Which statements are true?

I. There are 6.02×10^{23} molecules present.

II. The sample will occupy 22.4 l.

III. The sample will weigh 16 g.

A. I only.

B. II only.

C. I and III only.

D. II and III only.

E. I, II, and III.

Energy and Chemical Reactions

1. Two systems at different temperatures come in contact. The heat will flow from the system at

A. $30^\circ C$ to a system at 317 K

- B. 40°C to a system at 323 K
- C. 50°C to a system at 303 K
- D. 60°C to a system at 358 K
- E. 70°C to a system at 370 K

2. How many joules of heat are released by a 150-gram sample of water that that cools from 25°C to 5°C? (c for H₂O is 4.18 J/gK)

- A. 78,375 joules
- B. 83.6 joules
- C. 720 joules
- D. 627 joules
- E. 12,540 joules

3. Calculate the number of joules required to completely evaporate 18 grams of water at 98°C. (H_v = 2259 J/g and c = 4.18 J/gK)

- A. 40,812 joules
- B. 40,512 joules
- C. 150 joules
- D. 40,662 joules
- E. 6.12×10^6 joules

4. Which process below has been described correctly for a temperature above 274K?

- A. H₂O(l) → H₂O(s) is exothermic and spontaneous.
- B. H₂O(l) → H₂O(s) is endothermic and spontaneous.
- C. H₂O(g) → H₂O(l) is endothermic and spontaneous.
- D. H₂O(s) → H₂O(l) is endothermic and spontaneous.
- E. H₂O(s) → H₂O(l) is exothermic and spontaneous.

5. Based on Gibbs Free Energy equation $\Delta G = \Delta H - T\Delta S$, a process will occur spontaneously when

- A. ΔG is positive and ΔS is positive
- B. ΔH is positive and ΔT is negative
- C. ΔH is negative and ΔS is positive
- D. ΔH is negative and ΔS is negative

E. ΔG is positive and ΔS is negative

6. The overall reaction: $A + B + 1.5C \rightarrow D$ has three individual reactions that take place,

Step 1: $A + 2B \rightarrow E$

Step 2: $F \rightarrow B + C$

Step 3: ?

What is the reaction that takes place in Step 3?

A. $D + F \rightarrow C + E$

B. $E + 5/2C \rightarrow D + F$

C. $D + 3/2C \rightarrow A + E$

D. $B + C \rightarrow F + E$

E. $A + B + 1.5C \rightarrow D$

7. Calculate the heat for the overall reaction:

$Mg(s) + 1/2O_2 \rightarrow MgO(s)$ given the heats of reaction below:

$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

$\Delta H = -143 \text{ kJ}$

$MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(g)$

$\Delta H = -216 \text{ kJ}$

$H_2(g) + 1/2O_2 \rightarrow H_2O(l)$

$\Delta H = -285 \text{ kJ}$

A. -644 kJ

B. -212 kJ

C. +644 kJ

D. -74 kJ

E. +74 kJ

Reaction Rates and Chemical Equilibrium

1. Given the reaction: $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

Why is the reaction slower when a single piece of zinc is used than when powdered zinc of the same mass is used?

- A. The powdered zinc is more concentrated.
- B. The single piece of zinc is more reactive.
- C. The powdered zinc requires less activation energy
- D. The powdered zinc generates more heat energy.
- E. The powdered zinc has a greater surface area.

2. Which takes place when a catalyst is added to a reaction at equilibrium?

- A. The point of equilibrium is shifted to the right.
- B. The point of equilibrium is shifted to the left.
- C. The forward and reverse reactions rates are increased unequally.
- D. The forward and reverse reactions rates are increased equally.
- E. The value of ΔH has the same magnitude but a different sign.

3. As the frequency and the number of effective collisions between reacting particles increases, the rate of the reaction

- A. increases
- B. decreases
- C. remains the same
- D. approaches zero
- E. none of the above

4. Which factors are equal in a reversible chemical reaction that has reached equilibrium?

- A. The number of moles of the reactants and products.
- B. The potential energies of the reactants and products.
- C. The activation energies of the forward and reverse reactions.
- D. The rates of reaction for the forward and reverse reactions.
- E. The concentrations of the reactants and products.

5. A catalyst is added to a system at equilibrium. The concentration of the reactants will then

- A. decrease
- B. increase
- C. remain the same
- D. approach zero

E. none of the above

6. Given the following reaction that has reached equilibrium: $\text{NaCl(s)} \rightleftharpoons \text{NaCl(aq)}$.

For the phase equilibrium to exist, the NaCl(aq) must be a solution that is

A. concentrated

B. saturated

C. dilute

D. heated

E. unsaturated

7. In an effort to speed up a reaction between a solid and a gas one would not:

A. make an effort to concentrate the reactants as best as possible

B. add a catalyst

C. cool the reaction down

D. increase the pressure on the system

E. use a powdered solid instead of one big lump of the same solid

8. Which reaction below is expected to go to completion?

I. $\text{Zn} + \text{HCl}$

II. $\text{HCl} + \text{NaOH}$

III. $\text{Ag}^{1+}(\text{aq}) + \text{Cl}^{1-}(\text{aq})$

A. II only.

B. III only.

C. I and II only.

D. II and III only.

E. I, II, and III.

9. Which salt listed in Appendix 4 of this book has the greatest solubility in water under equal conditions?

A. Lead iodide

B. Lead sulfate

C. Magnesium hydroxide

D. Silver chloride

E. The salts are all equally soluble.

Acids and Bases

1. A stronger base

A. is also a stronger acid

B. is also a stronger electrolyte

C. tastes sour

D. yields fewer OH^{1-} ions in solution

E. is easier to neutralize

2. When $\text{HCl}(\text{aq})$ reacts with $\text{Zn}(\text{s})$ the products formed are

A. water and a salt

B. an acid and a base

C. a salt and hydrogen gas

D. a nonmetal oxide

E. a metal oxide

3. A substance is added to a solution containing two drops of phenolphthalein. The solution then turns pink. Which substance would produce this color change?

A. HCl

B. H_2CO_3

C. KOH

D. $\text{CH}_3\text{CH}_2\text{OH}$

E. CH_3OH

4. Litmus is red when the H^+ concentration in the solution is

A. $1 \times 10^{-11} \text{ M}$

B. $1 \times 10^{-9} \text{ M}$

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

D. $1 \times 10^{-5} \text{ M}$

E. $1 \times 10^{-14} \text{ M}$

5. A substance is dissolved in water and the only positive ions in the solution are H^+ ions. This substance is

A. KOH

B. NaH

C. H_2SO_4

D. NH_3

E. CH_4