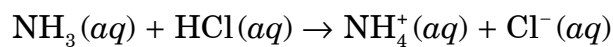


1. Consider this reaction:
- $$\text{NH}_3(g) + \text{HCl}(g) \rightarrow \text{NH}_4\text{Cl}(s)$$
- Which type of reaction does this equation represent?
- A combustion
B decomposition
C single replacement
D synthesis
2. Which equation represents a single replacement reaction that can occur?
- A $\text{F}_2 + 2\text{NaCl} \rightarrow 2\text{NaF} + \text{Cl}_2$
B $\text{Cl}_2 + 2\text{NaF} \rightarrow 2\text{NaCl} + \text{F}_2$
C $\text{Cu} + 2\text{NaCl} \rightarrow \text{CuCl}_2 + 2\text{Na}$
D $\text{Zn} + 2\text{NaF} \rightarrow \text{ZnF}_2 + 2\text{Na}$
3. What products are formed when the metal potassium is added to water?
- A K and H_2O
B KOH and H_2O
C K_2O and H_2
D KOH and H_2
4. When Na_2O reacts with H_2O , what is produced?
- A HNaO_2
B $\text{Na} + \text{H}_2\text{O}$
C $\text{NaO} + \text{H}_2$
D NaOH
5. Which equation is correctly balanced?
- A $\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O} + \text{SO}_2$
B $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
C $2\text{Fe} + 3\text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$
D $4\text{Cu} + \text{S}_8 \rightarrow 8\text{Cu}_2\text{S}$
6. What coefficients are required to balance this equation?
- $$_ \text{Fe}_2\text{O}_3 + _ \text{CO} \rightarrow _ \text{Fe} + _ \text{CO}_2$$
- A 2, 6, 3, 6
B 1, 3, 2, 3
C 1, 1, 2, 2
D 1, 1, 2, 1

7. An aqueous solution of silver nitrate is added to an aqueous solution of iron(II) chloride. Which is the net ionic equation for the reaction that occurs?
- A $\text{AgNO}_2(aq) + \text{FeCl}(aq) \rightarrow \text{AgCl}(s) + \text{FeNO}_2(aq)$
- B $2\text{AgNO}_3(aq) + \text{FeCl}_2(aq) \rightarrow 2\text{AgCl}(s) + \text{Fe}(\text{NO}_3)_2(aq)$
- C $2\text{Ag}^{+1}(aq) + \text{NO}_3^{-1}(aq) + \text{Fe}^{+2}(aq) + \text{Cl}_2(g) \rightarrow 2\text{AgCl}(s)$
- D $2\text{Ag}^{+}(aq) + 2\text{Cl}^{-}(aq) \rightarrow 2\text{AgCl}(s)$
-
8. Which example indicates that a chemical change has occurred?
- A When two aqueous solutions are mixed, a precipitate is formed.
- B As ammonium nitrate dissolves in water, it causes the temperature of the water to decrease.
- C Alcohol evaporates when left in an open container.
- D Water is added to blue copper(II) chloride solution. The resulting mixture is lighter blue in color.

9. Consider this chemical equation:



In this reaction, why is the ammonia considered a base?

- A NH_3 increases the hydronium ion concentration.
- B NH_3 decreases the hydroxide ion concentration.
- C NH_3 accepts a proton.
- D NH_3 donates a proton.

10. Phenolphthalein is an indicator that turns pink when added to a basic solution. In which solution would phenolphthalein turn pink?

- A NaOH
- B HCl
- C H_2O
- D NaCl

11. A water sample was found to have a pH of 6 at 25°C . What is the hydroxide concentration in the water sample?

- A $1 \times 10^{-8} M$
- B $6 \times 10^{-8} M$
- C $1 \times 10^{-6} M$
- D $6 \times 10^{-6} M$

12. What is the pH of a solution of KOH with a hydroxide concentration of $[\text{OH}] = 1 \times 10^{-4} M$?

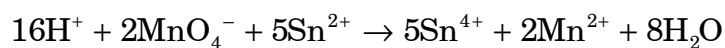
- A -10
- B -4
- C 4
- D 10

13. In a titration experiment, if 30.0 mL of an HCl solution reacts with 24.6 mL of a 0.50-M NaOH solution, what is the concentration of the HCl solution?

- A 0.41 M
- B 0.61 M
- C 1.5 M
- D 370 M

14. What is the oxidation number of the chromium atom in the $\text{Cr}_2\text{O}_7^{2-}$ ion?
- A -6
- B -4
- C +4
- D +6
-

15. Consider this oxidation-reduction reaction:



Which represents the oxidation half-reaction?

- A $\text{Sn}^{4+} + 2\text{e}^- \rightarrow \text{Sn}^{2+}$
- B $\text{Mn}^{6+} + 4\text{e}^- \rightarrow \text{Mn}^{2+}$
- C $\text{Sn}^{2+} \rightarrow \text{Sn}^{4+} + 2\text{e}^-$
- D $\text{Mn} \rightarrow \text{Mn}^{2+} + 2\text{e}^-$
-

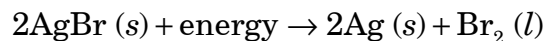
16. This balanced equation represents a chemical reaction:



Which substance undergoes reduction?

- A Ag^0
- B H^+
- C N^{5+}
- D O^{2-}
-

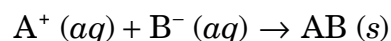
17. Consider this chemical equation:



Which is true about the reaction?

- A Silver is reduced.
 - B Bromine is reduced.
 - C Silver loses electrons.
 - D Bromine gains electrons.
18. Consider this balanced chemical equation:
- $$2\text{H}_2\text{O}_2 (aq) \rightarrow 2\text{H}_2\text{O} (l) + \text{O}_2 (g)$$
- Which will increase the rate of the reaction?
- A increasing pressure on the reaction
 - B decreasing concentration of the reactants
 - C adding a catalyst to the reaction
 - D decreasing the temperature of the reaction

19. For the reaction



increasing the temperature increases the rate of the reaction. Which is the **best** explanation for this happening?

- A The pressure increases, which in turn increases the production of products.
- B The concentration of reactants increases with an increase in temperature.
- C The average kinetic energy increases, so the likelihood of more effective collisions between ions increases.
- D Systems are more stable at high temperatures.

20. Which statement explains why the speed of some reactions is increased when the surface area of one or all the reactants is increased?
- A increasing surface area changes the electronegativity of the reactant particles
 - B increasing surface area changes the concentration of the reactant particles
 - C increasing surface area changes the conductivity of reactant particles
 - D increasing surface area enables more reactant particles to collide

End of Goal 5 Sample Items

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Chemistry Goal 5

Sample Items Key Report

- 1 Objective: 5.01**
Evaluate various types of chemical reactions.
a. Analyze reactions by types: Single replacement, double replacement (including acid-base neutralization), decomposition, synthesis, and combustion of simple
b. predict products
Thinking Skill: Applying **Correct Answer:** D
- 2 Objective: 5.01**
Evaluate various types of chemical reactions.
a. Analyze reactions by types: Single replacement, double replacement (including acid-base neutralization), decomposition, synthesis, and combustion of simple
b. predict products
Thinking Skill: Analyzing **Correct Answer:** A
- 3 Objective: 5.01**
Evaluate various types of chemical reactions.
a. Analyze reactions by types: Single replacement, double replacement (including acid-base neutralization), decomposition, synthesis, and combustion of simple
b. predict products
Thinking Skill: Analyzing **Correct Answer:** D
- 4 Objective: 5.01**
Evaluate various types of chemical reactions.
a. Analyze reactions by types: Single replacement, double replacement (including acid-base neutralization), decomposition, synthesis, and combustion of simple
b. predict products
Thinking Skill: Analyzing **Correct Answer:** D
- 5 Objective: 5.02**
Apply the law of conservation of matter to the balancing of chemical equations.
Thinking Skill: Applying **Correct Answer:** B
- 6 Objective: 5.02**
Apply the law of conservation of matter to the balancing of chemical equations.
Thinking Skill: Analyzing **Correct Answer:** B
- 7 Objective: 5.02**
Apply the law of conservation of matter to the balancing of chemical equations.
Thinking Skill: Analyzing **Correct Answer:** D
- 8 Objective: 5.03**
Identify the indicators of chemical change:
-

Chemistry Goal 5

Sample Items Key Report

- a. Formation of a
- b. Evolution of a
- c. Color
- d. Absorption or release of heat.

Thinking Skill: Applying

Correct Answer: A

9 Objective: 5.04

Identify the physical and chemical behaviors of acids and bases.

- a. General properties of acids and
- b. Ionization and the degree of dissociation (strengths) of acids and bases.
- c. Indicators, acid-base titration, and/or ionization and the degree of dissociation (strengths) of acids and
- d. Concentration and dilution of acids and bases, and/or pH and
- e. Acid-base
- f. pH and pOH.

Thinking Skill: Analyzing

Correct Answer: C

10 Objective: 5.04

Identify the physical and chemical behaviors of acids and bases.

- a. General properties of acids and
- b. Ionization and the degree of dissociation (strengths) of acids and bases.
- c. Indicators, acid-base titration, and/or ionization and the degree of dissociation (strengths) of acids and
- d. Concentration and dilution of acids and bases, and/or pH and
- e. Acid-base
- f. pH and pOH.

Thinking Skill: Knowledge

Correct Answer: A

11 Objective: 5.04

Identify the physical and chemical behaviors of acids and bases.

- a. General properties of acids and
- b. Ionization and the degree of dissociation (strengths) of acids and bases.
- c. Indicators, acid-base titration, and/or ionization and the degree of dissociation (strengths) of acids and
- d. Concentration and dilution of acids and bases, and/or pH and
- e. Acid-base
- f. pH and pOH.

Thinking Skill: Applying

Correct Answer: A

12 Objective: 5.04

Identify the physical and chemical behaviors of acids and bases.

- a. General properties of acids and
- b. Ionization and the degree of dissociation (strengths) of acids and bases.
- c. Indicators, acid-base titration, and/or ionization and the degree of dissociation

Chemistry Goal 5

Sample Items Key Report

(strengths) of acids and

d. Concentration and dilution of acids and bases, and/or pH and

e. Acid-base

f. pH and pOH.

Thinking Skill: Applying

Correct Answer: D

13 Objective: 5.04

Identify the physical and chemical behaviors of acids and bases.

a. General properties of acids and

b. Ionization and the degree of dissociation (strengths) of acids and bases.

c. Indicators, acid-base titration, and/or ionization and the degree of dissociation (strengths) of acids and

d. Concentration and dilution of acids and bases, and/or pH and

e. Acid-base

f. pH and pOH.

Thinking Skill: Applying

Correct Answer: A

14 Objective: 5.05

Analyze oxidation/reduction reactions with regard to the transfer of electrons.

a. Assign oxidation numbers to elements in REDOX reactions, and /or assess the practical applications of oxidation and reduction

b. Identify the elements oxidized and

c. Write simple half

d. Assess the practical applications of oxidation and reduction reactions.

Thinking Skill: Analyzing

Correct Answer: D

15 Objective: 5.05

Analyze oxidation/reduction reactions with regard to the transfer of electrons.

a. Assign oxidation numbers to elements in REDOX reactions, and /or assess the practical applications of oxidation and reduction

b. Identify the elements oxidized and

c. Write simple half

d. Assess the practical applications of oxidation and reduction reactions.

Thinking Skill: Analyzing

Correct Answer: C

16 Objective: 5.05

Analyze oxidation/reduction reactions with regard to the transfer of electrons.

a. Assign oxidation numbers to elements in REDOX reactions, and /or assess the practical applications of oxidation and reduction

b. Identify the elements oxidized and

c. Write simple half

d. Assess the practical applications of oxidation and reduction reactions.

Thinking Skill: Analyzing

Correct Answer: C

Chemistry Goal 5

Sample Items Key Report

- 17 Objective: 5.05**
Analyze oxidation/reduction reactions with regard to the transfer of electrons.
a. Assign oxidation numbers to elements in REDOX reactions, and /or assess the practical applications of oxidation and reduction
b. Identify the elements oxidized and
c. Write simple half
d. Assess the practical applications of oxidation and reduction reactions.
Thinking Skill: Analyzing **Correct Answer:** A
- 18 Objective: 5.05**
Analyze oxidation/reduction reactions with regard to the transfer of electrons.
a. Assign oxidation numbers to elements in REDOX reactions, and /or assess the practical applications of oxidation and reduction
b. Identify the elements oxidized and
c. Write simple half
d. Assess the practical applications of oxidation and reduction reactions.
Thinking Skill: Analyzing **Correct Answer:** C
- 19 Objective: 5.06**
Assess the factors that affect the rates of chemical reactions:
a. The nature of the reactants.
b. Temperature.
c. Concentration.
d. Surface Area
e. Catalyst.
Thinking Skill: Analyzing **Correct Answer:** C
- 20 Objective: 5.06**
Assess the factors that affect the rates of chemical reactions:
a. The nature of the reactants.
b. Temperature.
c. Concentration.
d. Surface Area
e. Catalyst.
Thinking Skill: Analyzing **Correct Answer:** D