

***** ANSWER KEY *******Student Name:****Grade:** 09**Test Name:** November- 4th Chemistry for All: Unit 10 - Acid/Base**Version:** 1

1. Which of the following inorganic acid formulas represents hydrochloric acid?

- (a) H_2Cl
- (b) HCl_2
- (c) HClO_3
- ✓ (d) HCl

Standard:

MI_CHEM_HS-0912-C5-7-A

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7A Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from families I and II.

2. What is the formula for magnesium hydroxide?

- (a) $\text{Mg}(\text{OH}_2)$
- ✓ (b) $\text{Mg}(\text{OH})_2$
- (c) Mg_2OH
- (d) MgOH_2

Standard:

MI_CHEM_HS-0912-C5-7-A

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7A Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from families I and II.

3. Which of the following is the formula for stomach acid?

- ✓ (a) HCl
- (b) HNO_3
- (c) KOH
- (d) NaOH

Standard:

MI_CHEM_HS-0912-C5-7-A

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7A Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from families I and II.

4. Which of the following is an acid used in car batteries?

- (a) HBr
- (b) HCl
- (c) HNO_3
- ✓ (d) H_2SO_4

Standard:

MI_CHEM_HS-0912-C5-7-A

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7A Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from families I and II.

5. Which of the following formulas is commonly known as vinegar?

- (a) HCl
- (b) H_2CO_3
- ✓ (c) CH_3COOH
- (d) $\text{C}_6\text{H}_5\text{COOH}$

Standard:

MI_CHEM_HS-0912-C5-7-A

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7A Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from families I and II.

6. WhichWhich of the following formulas represents an acid?

- ✓ (a) CH_3COOH
- (b) $\text{Ca}(\text{OH})_2$
- (c) $\text{Al}(\text{OH})_3$
- (d) NH_4OH

Standard:

MI_CHEM_HS-0912-C5-7-A

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7A Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from families I and II.

7. Which of the following is the correct balanced equation for $\text{HCl} + \text{NaOH}$

- (a) $\text{HCl} + \text{OHNa}$
- ✓ (b) $\text{HOH} + \text{NaCl}$
- (c) $\text{HOH} + \text{ClNa}$
- (d) $\text{HNa} + \text{ClOH}$

Standard:

MI_CHEM_HS-0912-C5-7-B

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7B Predict products of an acid-base neutralization.

8. Which of the following is the correct balanced equation for $\text{HNO}_3 + \text{KOH}$
 $\rightarrow ?$

- (a) $\text{HK} + \text{NO}_3\text{OH}$
- (b) $\text{H}_2 + \text{KNO}_3$
- (c) $\text{KNO}_3 + \text{HO}_3\text{OH}$
- ✓ (d) $\text{KNO}_3 + \text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7-B

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7B Predict products of an acid-base neutralization.

9. Which of the following is the correct balanced equation for $\text{Ca(OH)}_2 + \text{H}_2\text{SO}_4 \rightarrow ?$
- (a) $\text{CaH}_2 + \text{SO}_4(\text{OH})_2$
- (b) $\text{CaH}_2 + 2\text{SO}_4(\text{OH})_2$
- (c) $\text{CaSO}_4 + \text{HOH}$
- ✓ (d) $\text{CaSO}_4 + 2 \text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7-B

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7B Predict products of an acid-base neutralization.

10. Which of the following is the correct balanced equation for $3\text{Mg(OH)}_2 + 2\text{H}_3\text{PO}_4 \rightarrow ?$
- (a) $\text{Mg}_3\text{PO}_4 + 3 \text{HOH}$
- ✓ (b) $\text{Mg}_3(\text{PO}_4)_2 + 6\text{HOH}$
- (c) $3\text{MgH}_3 + \text{PO}_4(\text{OH})_2$
- (d) $3\text{MgPO}_4 + 2\text{H}_3(\text{OH})_2$

Standard:

MI_CHEM_HS-0912-C5-7-B

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7B Predict products of an acid-base neutralization.

11. Which of the following is the correct balanced equation for $\text{H}_2\text{CO}_3 + \text{Ca}(\text{OH})_2 \rightarrow ?$

- (a) $\text{CaCO}_3 + \text{HOH}$
✓ (b) $\text{CaCO}_3 + 2\text{HOH}$
(c) $2\text{CaCO}_3 + \text{HOH}$
(d) $2\text{CaCO}_3 + 2\text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7-B

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7 Acids and Bases

C5.7B Predict products of an acid-base neutralization.

12. Which of the following is the correct balanced equation for $2\text{NH}_4\text{OH} + \text{H}_2\text{S} \rightarrow ?$

- ✓ (a) $(\text{NH}_4)_2\text{S} + 2\text{HOH}$
(b) $(\text{NH}_4)_2\text{S} + \text{HOH}$
(c) $2\text{NH}_4\text{S} + 2\text{HOH}$
(d) $2\text{NH}_4\text{S} + \text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7-B

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7 Acids and Bases

C5.7B Predict products of an acid-base neutralization.

13. Which substances produce hydrogen ions (H^+) in a solution?

- ✓ (a) acids
- (b) bases

Standard:

MI_CHEM_HS-0912-C5-7-C

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7C Describe tests that can be used to distinguish an acid from a base.

14. Which substance has a bitter taste?

- (a) acid
- ✓ (b) base

Standard:

MI_CHEM_HS-0912-C5-7-C

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7C Describe tests that can be used to distinguish an acid from a base.

15. Which substance has a slippery, soapy feel?

- (a) acid
✓ (b) base

Standard:

MI_CHEM_HS-0912-C5-7-C

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7C Describe tests that can be used to distinguish an acid from a base.

16. Which substance produced hydroxide ions (OH⁻) in solution?

- (a) acid
✓ (b) base

Standard:

MI_CHEM_HS-0912-C5-7-C

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7C Describe tests that can be used to distinguish an acid from a base.

17. Which substance has a sour taste?

- ✓ (a) acid
- (b) base

Standard:

MI_CHEM_HS-0912-C5-7-C

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7C Describe tests that can be used to distinguish an acid from a base.

18. Pure water has a pH of 7, how would you classify it?

- (a) acidic
- ✓ (b) neutral
- (c) basic

Standard:

MI_CHEM_HS-0912-C5-7-D

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7 Acids and Bases

└─ C5.7D Classify various solutions as acidic or basic, given their pH.

19. The pH of tomatoes is 4.2, how would you classify it?

- ✓ (a) acidic
- (b) neutral
- (c) basic

Standard:

MI_CHEM_HS-0912-C5-7-D

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7 Acids and Bases

C5.7D Classify various solutions as acidic or basic, given their pH.

20. The pH of bleach is 12, how would you classify it?

- (a) acidic
- (b) neutral
- ✓ (c) basic

Standard:

MI_CHEM_HS-0912-C5-7-D

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7 Acids and Bases

C5.7D Classify various solutions as acidic or basic, given their pH.

21. The pH of eggs is 7.8, how would you classify this?

- (a) acidic
- (b) neutral
- ✓ (c) basic

Standard:

MI_CHEM_HS-0912-C5-7-D

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7 Acids and Bases

C5.7D Classify various solutions as acidic or basic, given their pH.

22. The pH of milk is 6.4, how would you classify this?

- ✓ (a) acidic
- (b) neutral
- (c) basic

Standard:

MI_CHEM_HS-0912-C5-7-D

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7 Acids and Bases

C5.7D Classify various solutions as acidic or basic, given their pH.

23. What is the pH of a substance with a hydronium ion concentration $[H_3O^+]$ of 1.3×10^{-4} ?
- (a) -3.9
✓ (b) 3.9
(c) -10.1
(d) 10.1

Standard:

MI_CHEM_HS-0912-C5-7x-g

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7x Brønsted-Lowery

C5.7g Calculate the pH from the hydronium ion or hydroxide ion concentration.

24. What is the pH of a substance with a hydroxide concentration $[OH^-]$ of 3.5×10^{-4} ?
- (a) 3.5
(b) -3.5
✓ (c) 10.5
(d) -10.5

Standard:

MI_CHEM_HS-0912-C5-7x-g

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7x Brønsted-Lowery

C5.7g Calculate the pH from the hydronium ion or hydroxide ion concentration.

25. What is the pH of a substance with a hydronium ion concentration $[H_3O^+]$ of 2.6×10^{-8} ?
- (a) -6.4
(b) 6.4
(c) -7.6
✓ (d) 7.6

Standard:

MI_CHEM_HS-0912-C5-7x-g

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7x Brønsted-Lowery

C5.7g Calculate the pH from the hydronium ion or hydroxide ion concentration.

26. What is the pH of a substance given the hydroxide concentration $[OH^-]$ of 7.4×10^{-8} ?
- (a) -7.1
(b) 7.1
(c) -6.9
✓ (d) 6.9

Standard:

MI_CHEM_HS-0912-C5-7x-g

MI HSCEs Science - Chemistry

09-12

STANDARD C5: CHANGES IN MATTER

Topic C5.7x Brønsted-Lowery

C5.7g Calculate the pH from the hydronium ion or hydroxide ion concentration.

27. Identify the correct balanced equation for the neutralization reaction between sulfuric acid and sodium hydroxide.

- (a) $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \text{HOH}$
(b) $\text{H}_2\text{SO}_4 + \text{Na}_2\text{OH}_2 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{HOH}$
✓ (c) $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{HOH}$
(d) $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow 2\text{NaSO}_4 + 2\text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

28. Identify the correct balanced equation for the neutralization reaction between sulfuric acid and sodium hydroxide.

- (a) $\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{HOH}$
✓ (b) $2\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{HOH}$
(c) $\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H} + \text{OH}$
(d) $2\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H} + \text{OH}$

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

29. Identify the correct balanced neutralization reaction between hydrochloric acid and potassium hydroxide.

- ✓ (a) $\text{HCl} + \text{KOH} \rightarrow \text{KCl} + \text{HOH}$
(b) $\text{HCl}_2 + \text{K}_2\text{OH} \rightarrow 2\text{KCl} + \text{HOH}$
(c) $\text{HCl} + 2\text{KOH} \rightarrow \text{K}_2\text{Cl} + 2\text{HOH}$
(d) $\text{HCl}_2 + \text{K}_2\text{OH} \rightarrow \text{K}_2\text{Cl} + 2\text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

30. 65 mL of an unknown concentration of KOH (aq) base are used to titrate a 15.0 mL sample of 1.50 M H₂SO₄ (aq) to the endpoint (equivalence point).

Identify the correctly balanced neutralization equation for the reaction of KOH (aq) with H₂SO₄(aq).

- (a) $\text{H}_2\text{SO}_4 + \text{KOH} \rightarrow \text{KSO}_4 + \text{HOH}$
(b) $2\text{H}_2\text{SO}_4 + \text{KOH} \rightarrow \text{K}(\text{SO}_4)_2 + 2\text{HOH}$
(c) $2\text{H}_2\text{SO}_4 + 2\text{KOH} \rightarrow 2\text{KSO}_4 + 2\text{HOH}$
✓ (d) $\text{H}_2\text{SO}_4 + 2\text{KOH} \rightarrow \text{K}_2\text{SO}_4 + 2\text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

└─ 09-12

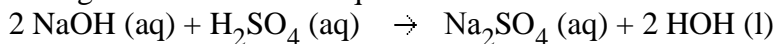
└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

31. 65.0 ml of an unknown concentration of NaOH (aq) base are used to titrate a 15.0 ml sample of 1.50 M H₂SO₄ (aq) to the endpoint (equivalence point).

Using the neutralization equation calculate the concentration of NaOH (aq).



- (a) 0.346 M NaOH
- (b) 0.65 M NaOH
- ✓ (c) 0.692 M NaOH
- (d) 0.731 M NaOH

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

..... 09-12

..... STANDARD C5: CHANGES IN MATTER

..... Topic C5.7x Brønsted-Lowery

..... C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

32. Identify the balanced neutralization equation for the reaction of Ca(OH)_2 (aq) with H_2SO_4 (aq).

- ✓ (a) $\text{H}_2\text{SO}_4 + \text{Ca(OH)}_2 \rightarrow \text{CaSO}_4 + 2\text{HOH}$
(b) $\text{H}_2\text{SO}_4 + 2\text{CaOH} \rightarrow 2\text{CaSO}_4 + 2\text{HOH}$
(c) $2\text{H}_2\text{SO}_4 + 2\text{CaOH} \rightarrow 2\text{CaSO}_4 + 2\text{HOH}$
(d) $2\text{H}_2\text{SO}_4 + \text{Ca(OH)}_2 \rightarrow \text{Ca(SO}_4)_2 + 2\text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

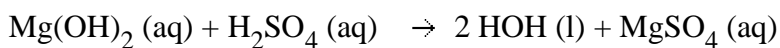
└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

33. Using the neutralization equation below, calculate the concentration of sulfuric acid if an average volume of 24.5 ml of 0.560 mol/L $\text{Mg}(\text{OH})_2$ was required to titrate 10.0 ml samples of sulfuric acid (H_2SO_4) to their endpoints.



- (a) 0.137 M H_2SO_4
(b) 0.274 M H_2SO_4
✓ (c) 1.37 M H_2SO_4
(d) 2.74 M H_2SO_4

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

34. Identify the correctly balanced neutralization equation between the acid and base.

- ✓ (a) $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{HOH}$
(b) $\text{HCl} + 2\text{NaOH} \rightarrow \text{Na}_2\text{Cl} + 2\text{HOH}$
(c) $2\text{HCl} + \text{NaOH} \rightarrow \text{NaCl}_2 + \text{HOH}$
(d) $2\text{HCl} + \text{Na}_2\text{OH} \rightarrow 2\text{NaCl} + \text{HOH}$

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

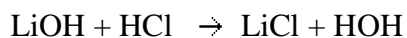
└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

35. Using the neutralization equation below, calculate the volume needed to neutralize the reaction if 0.060 mol/L LiOH (aq) is needed to titrate 25.0 ml samples of 0.075 mol/L HCl (aq) to the endpoint.



- (a) 1.125 ml of NaOH
- (b) 15.625 ml of NaOH
- ✓ (c) 31.25 ml of NaOH
- (d) 62.5 ml of NaOH

Standard:

MI_CHEM_HS-0912-C5-7x-f

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7f Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.

36. Which of the following is a leading cause of acid rain?
- ✓ (a) increased sulfur oxide production by manufacturers
 - (b) increased carbonic acid production by manufacturers
 - (c) decreased sulfur oxide production by manufacturers
 - (d) decreased carbonic acid production by manufacturers

Rubric:

Burning of fossil fuels.

Standard:

MI_CHEM_HS-0912-C5-7x-h

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7h Explain why sulfur oxides and nitrogen oxides contribute to acid rain.

37. Automobile exhaust is a contributor to acid rain production. How does this exhaust emission result in increased acid rain production?
- (a) nitric acid from the exhaust mixes with rainwater creating an increase in nitrogen oxides in the atmosphere.
 - (b) carbonic acid from the exhaust mixes with rainwater creating an increase in carbon dioxide.
 - ✓ (c) nitrogen oxides from the exhaust mix with rainwater creating an increase in nitrogen acids.
 - (d) carbon dioxide from the exhaust mixes with rainwater creating an increase in carbonic acids.

Rubric:

sulfuric acid mixing with rain water to form increase sulfur oxides in the atmosphere

Standard:

MI_CHEM_HS-0912-C5-7x-h

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7h Explain why sulfur oxides and nitrogen oxides contribute to acid rain.

38. How do factory smokestacks contribute to an increase in acid rain?

- (a) The phosphoric acid emitted is converted to phosphates.
- (b) The sulfuric acid emitted is converted to sulfur dioxide.
- (c) The phosphate emitted is converted to phosphoric acid.
- ✓ (d) The sulfur dioxide emitted is converted into sulfuric acid.

Standard:

MI_CHEM_HS-0912-C5-7x-h

MI HSCEs Science - Chemistry

└─ 09-12

└─ STANDARD C5: CHANGES IN MATTER

└─ Topic C5.7x Brønsted-Lowery

└─ C5.7h Explain why sulfur oxides and nitrogen oxides contribute to acid rain.