Science 10: Chemistry Review

Main Topics:

* Bohr model: Draw a complete Bohr diagram for elements 1-20 on the periodic table.
* Patterns in the periodic table. Know the significance of the groups and families on the periodic table in terms of properties and electron arrangement.
* Understand the meaning and importance of valence shells and valence electrons. Understand the meaning of a stable octet.
* **Draw Lewis diagrams of elements 1-20 and any element in group 1, 2, 16, 17 or 18**
* **Use valence structure to determine ion formation.**
* **Draw Lewis diagrams to represent ionic compounds.**
* Name and write formulas for ionic compounds, **including ionic compounds with transition (multi-valent) metals and polyatomic ions.**
* Name and write formulas for covalent compounds.
* Identify compounds as: Ionic vs. Covalent

**Acid vs. Base vs. Salt**

**Organic vs. Inorganic**

* **Describe the properties of acids and bases, including reference to the pH scale.**
* **Determine pH based on acid/base indicators.**
* **Name and give formulas for acids.**
* Recognize and describe evidence of chemical change.
* Understand conservation of mass in chemical reactions.
* **Recognize the similarities and differences between chemical and nuclear reactions.**
* Classify chemical reactions as: Synthesis, Decomposition, Single Replacement, Double Replacement, **Neutralization** or Combustion of a Hydrocarbon.
* **Predict the products of a reaction based on the classifications.**
* Balance chemical reactions.
* **Name, give formulas (regular and structural), for alkanes and alcohols.**

Pre-Test Chemistry Practice:

**1. Write the chemical formula for the following compounds:**

a. sodium oxide b. aluminum carbonate c. disilicon hexahydride

d. nitric acid e. calcium hydroxide f. hydroiodic acid

g. carbon monoxide h. carbonic acid i. lead(IV) oxide

j. pentane k. trinitrogen dichloride l. beryllium fluoride

m. iron(II) nitrite n. sulphurous acid o. butanol

p. nickel (III) sulfide q. tetrasilicon octabromide r. manganese(IV) sulfite

**2. Identify each of the above as: Ionic (I), Covalent (C), Acid (A), Base (B), Organic (O).** More than one classification may apply to each.

**3. Write the chemical name for each of the following:** For ionic compounds with hydrogen as the metal, use the acid name. For organic compounds use the organic compound name.

**A.** a. Li2S b. N2F4 c. Al2O3

d. K2S e. Ca(OH)2 f. Mg3(PO4)2

g. CH3OH h. KOH i. HCl

j. CuOH k. CoO l. FeS

m. CaS n. P3Cl5 o. N2O2

p. Be(ClO)2 q. C8H18 r. H2SO3

s. CH3CH2CH2OH t. CaCl2 u. K3P

v. P2O4 w. Na2Cr2O7 x. HClO3

y. Cl2 z. NiPO3

**B. Identify each of the above as: Ionic (I), Covalent (C), Acid (A), Base (B), Organic (O).** More than one classification may apply to each.

**4. Count the number of atoms or poly atomic ions of each element in the following.**

a. magnesium fluoride \_\_\_ Mg \_\_\_ F

b. Pb(CrO4)2 \_\_\_ Pb \_\_\_ CrO4

c. carbon dioxide \_\_\_ C \_\_\_ O

d. H2 \_\_\_ H

e. Ba(OH)2 \_\_\_ Ba \_\_\_ OH

f. sodium nitrite \_\_\_ Na \_\_\_ NO2

g. chromic acid \_\_\_ H \_\_\_ CrO4

h. nitrous acid \_\_\_ \_\_ \_\_\_ \_\_

i. iron(III) hydroxide \_\_\_ \_\_ \_\_\_ \_\_

**5. Count the number of atoms or poly atomic ions in each of the following collections of atoms. You will need to write the formula for each compound first:**

a. 2 molecules of hydrochloric acid \_\_\_ H \_\_\_ Cl

b. 4 molecules of acetic acid \_\_\_ H \_\_\_ CH3COO

c. 3 molecules of O2 and 2 molecules of CaCO3

\_\_\_ O \_\_\_ Ca \_\_\_ C

d. 2 molecules of potassium hydroxide and 3 molecules of sodium nitride

\_\_\_ Na \_\_\_ OH \_\_\_ N \_\_\_ K

e. 10 molecules of nickel(II) chlorite and 50 molecules of hydrogen gas

\_\_\_ H \_\_\_ Ni \_\_\_ ClO2

f. 5 molecules of copper(I) carbonate and 3 molecules of ammonium oxide

\_\_\_ Cu \_\_\_ O \_\_\_ N \_\_\_ H \_\_\_ C

**6. Balance the following chemical equations. For some you will need to predict the products first. Classify each reaction.**

1. \_\_\_\_ KClO3 → \_\_\_\_ KCl + \_\_\_\_ O2 TYPE: \_\_\_\_\_
2. \_\_\_\_ K3PO4 + \_\_\_\_ HCl → \_\_\_\_ KCl + \_\_\_\_ H3PO4 TYPE: \_\_\_\_\_
3. \_\_\_\_ H2SO4 + \_\_\_\_ Ca(OH)2 → \_\_\_\_ CaSO4 + \_\_\_\_ H2O TYPE: \_\_\_\_\_
4. \_\_\_\_ H2SO3 + \_\_\_\_ Cu(OH)2 → TYPE: \_\_\_\_\_

**7. Write each as a chemical equation then BALANCE AND CLASSIFY!**

1. Nitrogen plus hydrogen produce ammonia. TYPE: \_\_\_\_\_
2. Sodium oxide combines with water to form sodium hydroxide. TYPE: \_\_\_\_\_
3. Hydrochloric acid and calcium hydroxide yield water and calcium chloride. TYPE: \_\_\_\_\_

1. Carbonic acid and aluminum hydroxide yield aluminum carbonate and water. TYPE: \_\_\_\_\_
2. Sodium hydroxide and nitrous acid react to form… TYPE: \_\_\_\_\_
3. Tetracarbon decahydride and oxygen yield… TYPE: \_\_\_\_\_
4. Nickel(III) oxide and potassium nitride react to form nickel(III) nitride and… TYPE: \_\_\_\_\_
5. Trinitrogen monoxide breaks down into nitrogen and oxygen. TYPE: \_\_\_\_\_
6. Sulfuric acid is neutralized by lithium hydroxide. TYPE: \_\_\_\_\_
7. Zinc hydroxide is neutralized by sulfurous acid. TYPE: \_\_\_\_\_

K. Acetic acid and vanadium(V) hydroxide yield… TYPE: \_\_\_\_\_

Use the diagram below to answer the following questions:

1. When a chemical reaction occurs, atoms are never \_\_\_\_\_\_\_\_\_.

a. ionized b. rearranged c. vaporized (turned to gas)

d. destroyed e. moved

2. A metal is placed into an unknown solution. Over a period of 4 minutes the metal disintegrates and a new solid substance is seen to form and then fall out of the solution No bubbles are seen to form. Which of the following best describes what has probably occurred?

a. The metal has melted.

b. The metal has dissolved.

c. There has been a reaction between the acid solution and the metal.

d. There has been a combustion reaction with one metal replacing another.

e. There has been a single replacement reaction with one metal replacing another.

3. What is true of an ionic compound?

a. ionic compounds involve two metals

b. ionic compounds result from the sharing of electrons.

c. ionic compounds are formed between a metal and a non-metal.

d. ionic compounds form when electrons transfer from a non-metal to a metal.

e. ionic compounds are highly corrosive.

1. An H+ ion is the same as what other particle?
2. proton
3. neutron
4. electron
5. base
6. acid
7. What are the products of an acid base neutralization reaction?
8. carbon dioxide and water
9. hydrogen gas and salt
10. carbon dioxide and salt
11. salt and hydrogen gas
12. salt and water
13. What is true of the following seven elements: hydrogen, oxygen, fluorine, bromine, iodine, nitrogen and chlorine?
14. These are the noble gases and they do not form ions
15. These are the diatomic elements and they form covalent bonds with themselves
16. These elements all must gain 2 electrons in order to have a stable octet
17. These elements all have a slight cherry flavour
18. These elements are all very rare and are not found on Earth
19. Which of the following is NOT a property of an acid?
20. They taste sour
21. They conduct electricity
22. They will react with (some) metals and release hydrogen gas
23. They have a pH lower than 7
24. They feel slippery
25. The general equation A + B → AB represents what type of chemical reaction?
26. decomposition
27. single replacement
28. synthesis
29. double replacement
30. combustion
31. The general equation AB + C → AC + B represents what type of chemical reaction?
32. decomposition
33. single replacement
34. synthesis
35. double replacement
36. combustion
37. A chemical that gives off protons when dissolved in water is known as:
38. A protonagist
39. A metal
40. A non-metal
41. An acid
42. A base
43. The general equation AB + CD → AD + CB represents what type of chemical reaction?
44. decomposition
45. single replacement
46. synthesis
47. double replacement
48. combustion
49. The general equation AB ⟶ A + B represents what type of chemical reaction?
50. decomposition
51. single replacement
52. synthesis
53. double replacement
54. combustion
55. In the general equation AB + C → AC + B what does C represent?
56. any metal or polyatomic cation
57. any non-metal or polyatomic anion
58. carbon
59. any chemical compound
60. a base
61. C4H10 reacts completely with oxygen gas. What are the products of this reaction?
62. water and salt
63. salt and hydrogen gas
64. water and hydrogen gas
65. carbon dioxide and water
66. carbon dioxide and salt
67. Which of the following will lower the pH when added to pure water?
68. SO2
69. Mg(OH)2
70. Na2O
71. HOH
72. H2SO3
73. What is the following particle: 26p+, 32no, 23e-?
    1. An iron(III) atom (neutral)
    2. An iron(III) ion
    3. An iron(II) ion
    4. An iron(II) atom (neutral)
    5. An iron (IV) ion



1. How many valence electrons are illustrated?

A. 6

B. 7

C. 16

D. 17

E. 18

1. When an atom forms an ion there is a change in the number of:

A. protons B. electrons

C. neutrons D. nuclei

E. molecules

7p

8n

1. What is the particle in the diagram to the right:
   1. A neutral nitrogen atom
   2. A nitride (N-3) ion
   3. A nitride (N-2) ion
   4. A sodium (Na+1) ion
   5. An atom of neon
2. Which of the following atoms will lose 2 electrons to form a stable ion?

a. Oxygen b. Nitrogen c. Beryllium d. Chlorine e. Potassium

1. In order to form a stable ion, an atom of sodium must:

a. Lose 2 electrons b. Gain 2 electrons c. Lose 1 electron

d. Gain 1 electron e. None of the above

1. A stable phosphide ion has how many valence electrons?

a. 8 b. 15 c. 18 d. 3 e. 5 f. 0 g. 6

1. A stable nitrogen ion has how many electrons?

a. 3 b. 7 c. 8 d. 14 e. 4 f. 5 g. 10

1. A neutral atom of nitrogen has how many electrons?

a. 3 b. 7 c. 8 d. 14 e. 4 f. 5 g. 10

1. Which of the following are found within the nucleus of an atom?

a. Only electrons b. Only protons c. Only neutrons

d. Protons and electrons e. Protons and neutrons

1. Which of the following sub-atomic particles carry charge?

a. Only electrons b. Only protons c. Only neutrons

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1. Which subatomic particle(s) make up most of the mass of an atom?
   1. Electrons and protons
   2. Neutrons and protons
   3. Electrons and neutrons
   4. Neutrons only
   5. Protons only

Yellow

Red

Blue

Yellow

Blue

Yellow

Red

Green

Red

Blue

Colombo Blue (CB)

Red Tillium (RT)

Bimini Yellow (BY)

Chyamalystrophol (Chsp)

Fluffmustard Red (FR)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

1. What colour is Colombo blue at a pH of 7?
2. What colour is Bimini Yellow at a pH of 13.3?
3. What colour is Fluffmustard Red at a pH of 3?
4. What colour is Chyamalystrophol at a pH of 4?
5. An unknown solution is blue in CB, red in RT and red in FR. What is the pH range?
6. An unknown is orange in Chsp. What colour will it be in FR?

**Answer the following multiple choice questions. Only one choice for each question**

1. When a chemical reaction occurs, atoms are never \_\_\_\_\_\_\_\_\_.

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1. Which subatomic particle(s) make up most of the mass of an atom?
   1. Electrons and protons
   2. Neutrons and protons
   3. Electrons and neutrons
   4. Neutrons only
   5. Protons only

Pre-Test Chemistry Practice KEY:

**1. Write the chemical formula for the following compounds:**

a. Na2O b. Al2(CO3)3 c. Si2H6

d. HNO3 e. Ca(OH)2 f. HI

g. CO h. H2CO3 i. PbO2

j. C5H12 k. N3Cl2 l. BeF2

m. Fe(NO2)2 n. H2SO4 o. C4H9OH or C4H10O or CH3(CH2)2CH2OH

p. Ni2S3 q. Si4Br8 r. Mn(SO3)2

**2. Identify each of the above as: Ionic (I), Covalent (C), Acid (A), Base (B), Organic (O).** More than one classification may apply to each.

a. I b. I c. C

d. I, A e. I, B f. I, A

g. C h. I, A i. I

j. C, O k. C l. I

m. I n. I, A o. C, O

p. I q. C r. I

**3. Write the chemical name for each of the following:** For ionic compounds with hydrogen as the metal, use the acid name. For organic compounds use the organic compound name.

**A.** a. Lithium sulfide b. dinitrogen tetrafluoride c. aluminum oxide

d. potassium sulfide e. calcium hydroxide f. magnesium phosphate

g. methanol h. potassium hydroxide i. hydrochloric acid

j. copper(I) hydroxide k. cobalt(II) oxide l. iron(II) sulfide

m. calcium sulfide n. triphosphorous pentachloride o. dinitrogen dioxide

p. beryllium chlorite q. octane r. sulfurous acid

s. propanol t. calcium chloride u. potassium phosphide

v. diphosphorous tetraoxide w. sodium dichromatex. chloric acid

y. chlorine gas z. nickel(III) phosphite

**B. Identify each of the above as: Ionic (I), Covalent (C), Acid (A), Base (B), Organic (O).** More than one classification may apply to each.

a. I b. C c. I d. I e. I, B f. I

g. C, O h. I, B i. I, A j. I, B k. I l. I

m. I n. C o. C p. I q. C, O r. I, A

s. C, O t. I u. I v. C w. I x. I, A

y. C z. I

**4. Count the number of atoms or poly atomic ions of each element in the following. The first three are done for you as examples:**

a. magnesium fluoride 1 Mg 2 F

b. Pb(CrO4)2 1 Pb 2 CrO4

c. carbon dioxide 1 C 2 O

d. H2 2 H

e. Ba(OH)2 1 Ba 2 OH

f. sodium nitrite 1 Na 1 NO2

g. chromic acid 2 H 1 CrO4

h. nitrous acid 1 H 1 NO3

i. iron(III) hydroxide 1 Fe 3 OH

**5. Count the number of atoms or poly atomic ions in each of the following collections of atoms:**

a. 2 molecules of hydrochloric acid 2 H 2 Cl

b. 4 molecules of acetic acid 4 H 4 CH3COO

c. 3 molecules of O2 and 2 molecules of CaCO3

12 O 2 Ca 2 C

d. 2 molecules of potassium hydroxide and 3 molecules of sodium nitride

9 Na 2 OH 3 N 2 K

e. 10 molecules of nickel(II) chlorite and 50 molecules of hydrogen gas

100 H 10 Ni 20 ClO2

f. 5 molecules of copper(I) carbonate and 3 molecules of ammonium oxide

10 Cu 18 O 6 N 24 H 5 C

**6. Balance the following chemical equations. For some you will need to predict the products first. Classify each reaction.**

1. 2 KClO3 → 2 KCl + 3 O2 TYPE: D
2. 1 K3PO4 + 3 HCl → 3 KCl + 1 H3PO4 TYPE: DR
3. 1 H2SO4 + 1 Ca(OH)2 → 1CaSO4 + 2H2O TYPE: N
4. 1 H2SO3 + 1 Cu(OH)2 → 1 CuSO3 + 2 H2O TYPE: N

**7. Write each as a chemical equation then BALANCE AND CLASSIFY!**

1. 1 N2 + 3 H2 → 2 NH3 TYPE: S
2. 1 Na2O + 1 H2O → 2 NaOH TYPE: S
3. 2 HCl + 1 Ca(OH)2 → 2 H2O + 1 CaCl2 TYPE: N

1. 3 H2CO3 + 2 Al(OH)3 → 1 Al2(CO3)3 + 6 H2O TYPE: N
2. Sodium hydroxide and nitrous acid react to form **WATER and SODIUM NITRITE** TYPE: N

1 NaOH + 1 HNO2 → 1 H2O + 1 NaNO2

1. Tetracarbon decahydride and oxygen yield **CARBON DIOXIDE and WATER** TYPE: C

2 C4H10 + 13 O2 → 8 CO2 + 10 H2O

1. Nickel(III) oxide and potassium nitride react to form nickel(III) nitride and **POTASSIUM OXIDE** TYPE: DR

1 Ni2O3 + 2 K3N → 2 NiN + 3 K2O

1. Trinitrogen monoxide breaks down into nitrogen and oxygen. TYPE: D

2 N3O → 3 N2 + 1 O2

1. Sulfuric acid is neutralized by lithium hydroxide. TYPE: N

1 H2SO4 +2 LiOH →2 H2O + 1 Li2SO4

1. Zinc hydroxide is neutralized by sulfurous acid. TYPE: N

1 Zn(OH)2 + 1 H2SO3 → 2 H2O + 1 ZnSO3

K. Acetic acid and vanadium(V) hydroxide yield **WATER and VANADIUM(V) ACETATE** TYPE: N

5 HCH3COO + 1 V(OH)5 → 1 V(CH3COO)5 + 5 H2O

Yellow

Red

Blue

Yellow

Blue

Yellow

Red

Green

Red

Blue

Colombo Blue (CB)

Red Tillium (RT)

Bimini Yellow (BY)

Chyamalystrophol (Chsp)

Fluffmustard Red (FR)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

1. What colour is Colombo blue at a pH of 7?  **BLUE**
2. What colour is Bimini Yellow at a pH of 13.3? **YELLOW**
3. What colour is Fluffmustard Red at a pH of 3? **RED**
4. What colour is Chyamalystrophol at a pH of 4? **ORANGE**
5. An unknown solution is blue in CB, red in RT and red in FR. What is the pH range? **2.7 - 6**
6. An unknown is orange in Chsp. What colour will it be in FR? **RED**

**Answer the following multiple choice questions. Only one choice for each question**

1. When a chemical reaction occurs, atoms are never \_\_\_\_\_\_\_\_\_.

**d. destroyed**

2. A metal is placed into an unknown solution. Over a period of 4 minutes the metal disintegrates and a new solid substance is seen to form and then fall out of the solution No bubbles are seen to form. Which of the following best describes what has probably occurred?

**e. There has been a single replacement reaction with one metal replacing another.**

3. What is true of an ionic compound?

**c. ionic compounds are formed between a metal and a non-metal.**

1. An H+ ion is the same as what other particle?
2. **proton**
3. What are the products of an acid base neutralization reaction?
4. **salt and water**
5. What is true of the following seven elements: hydrogen, oxygen, fluorine, bromine, iodine, nitrogen and chlorine?
6. **These are the diatomic elements and they form covalent bonds with themselves**
7. Which of the following is NOT a property of an acid?
8. **They feel slippery**
9. The general equation A + B → AB represents what type of chemical reaction?
10. **synthesis**
11. The general equation AB + C → AC + B represents what type of chemical reaction?
12. **single replacement**
13. A chemical that gives off protons when dissolved in water is known as:
14. **An acid**
15. The general equation AB + CD → AD + CB represents what type of chemical reaction?
16. **double replacement**
17. The general equation AB ⟶ A + B represents what type of chemical reaction?
18. **decomposition**
19. In the general equation AB + C → AC + B what does C represent?
20. **any non-metal or polyatomic anion**
21. C4H10 reacts completely with oxygen gas. What are the products of this reaction?
22. **carbon dioxide and water**
23. Which of the following will lower the pH when added to pure water?
24. **H2SO3**
25. What is the following particle: 26p+, 32no, 23e-?

**B. An iron(III) ion**



1. How many valence electrons are illustrated?

**A. 6**

1. When an atom forms an ion there is a change in the number of:

**B. electrons**

7p

8n

1. What is the particle in the diagram to the right:

**B. A nitride (N-3) ion**

1. Which of the following atoms will lose 2 electrons to form a stable ion?

**c. Beryllium**

1. In order to form a stable ion, an atom of sodium must:

**c. Lose 1 electron**

1. A stable phosphide ion has how many valence electrons?

**a. 8**

1. A stable nitrogen ion has how many electrons?

**g. 10**

1. A neutral atom of nitrogen has how many electrons?

**b. 7**

1. Which of the following are found within the nucleus of an atom?

**e. Protons and neutrons**

1. Which of the following sub-atomic particles carry charge?

**d. Protons and electrons**

1. Which subatomic particle(s) make up most of the mass of an atom?

**B. Neutrons and protons**