

**Science 1206  
Chemistry Unit  
Sample Final Exam – Key**

1.

A gas is proved to be carbon dioxide if:

- (a) a glowing splint bursts into flames in the gas.
- (b) a wet piece of red litmus goes blue in the gas.
- (c) limewater goes milky when shaken with the gas.
- (d) a burning splint causes a small explosion in the gas.
- (e) an unlit splint ignites in the gas.

**Answer**

**The correct answer is (c).**

2.

Ionic bonds are generally formed between:

- (a) two different gases.
- (b) alkali metals and the halogens.
- (c) elements in the top horizontal row of the periodic table.
- (d) alkaline earth metals and the noble gases.
- (e) two different metals.

**Answer**

**The correct answer is (b).**

3.

When atoms form chemical bonds they can:

- (a) gain electrons only;
- (b) lose electrons only;
- (c) lose, gain, or share electrons;
- (d) lose or gain electrons only;
- (e) share electrons only.

**Answer**

**The correct answer is (c).**

4.

An atom has a total of 18 electrons. These electrons are found in 3 orbits that have:

- (a) 6 electrons each;
- (b) 8, 8, and 2 electrons, moving out from the nucleus;
- (c) 2, 8, and 8 electrons, moving out from the nucleus;
- (d) 2, 10, and 6 electrons, moving out from the nucleus;
- (e) 4, 8, and 6 electrons, moving out from the nucleus.

**Answer**

**The correct answer is (c).**

5.

Classify the following reactions as physical, chemical, or neither.

- (a) zinc is added to hydrochloric acid \_\_\_\_\_
- (b) sodium bicarbonate is added to water \_\_\_\_\_
- (c) calcium carbonate is added to water \_\_\_\_\_
- (d) sugar is added to water \_\_\_\_\_
- (e) calcium carbonate is added to hydrochloric acid \_\_\_\_\_

**Answer**

**(a) chemical (b) physical (c) neither - calcium carbonate does not dissolve in water (d) physical (e) chemical**

6.

When a burning splint "pops" in the mouth of a test tube, which one of the following is present?

- (a) water vapour
- (b) oxygen
- (c) carbon dioxide
- (d) hydrogen
- (e) air

**Answer**

**The correct answer is (d).**

7.

In a chemical reaction, a metallic element usually:

- (a) loses electrons;
- (b) gains electrons;
- (c) shares electrons;
- (d) gains protons;
- (e) loses protons.

**Answer**

**The correct answer is (a).**

8.

An atom becomes an ion with a charge of +2 when it:

- (a) gains 2 proton;
- (b) loses 2 neutrons;
- (c) loses 2 electrons;
- (d) gains 2 electrons;
- (e) loses 2 protons.

**Answer**

**The correct answer is (c).**

9.

The set of elements containing only nonmetals is:

- (a) I, H, Ag
- (b) C, Cl, Li
- (c) Al, Sr, K
- (d) Br, Fe, He
- (e) Cl, S, P

**Answer**

**The correct answer is (e).**

10.

Covalent bonds are due to the:

- (a) transfer of electrons from one atom to another;
- (b) attraction between ions of opposite charge;
- (c) gain or loss of electrons by atoms;
- (d) sharing of two electrons by two atoms;
- (e) magnetic force of attraction between two atoms.

**Answer**

**The correct answer is (d).**

11.

A gas can be proved to be oxygen by means of:

- (a) a burning splint, which causes a small explosion or "pop";
- (b) a glowing splint, which bursts into flame;
- (c) a burning or glowing splint which goes out completely;
- (d) limewater, which goes milky when shaken with the gas;
- (e) a wet piece of litmus paper, which goes pink in the gas.

12.

A chemical change is distinguished from a physical change because, in a chemical change, the original substance changes its:

- (a) composition
- (b) size
- (c) shape
- (d) mass
- (e) state

**Answer**

**The correct answer is (a).**

13.

Which of the following polyatomic ions have names that end in "ate"?

- 1.  $\text{ClO}_3^-$
- 2.  $\text{OH}^-$
- 3.  $\text{PO}_4^{3-}$
- 4.  $\text{HCO}_3^{2-}$
- 5.  $\text{SO}_3^{2-}$

- (a) 2, 3, and 4 only
- (b) 2, 3, and 5 only
- (c) 1 and 5 only
- (d) 1, 2, 4, and 5 only
- (e) 1, 3, and 4 only

**Answer**

**The correct answer is (e).**

14.

Select the correct corresponding name.

- (a)  $\text{Sn}_2\text{SO}_4$  - tin(II) sulfate;
- (b)  $\text{PbCO}_3$  - lead(IV) carbonate;
- (c)  $\text{Fe}(\text{ClO}_3)_3$  - iron(III) chlorate;
- (d)  $\text{Cu}_2\text{PO}_4$  - copper(I) phosphate;
- (e) None of these is named correctly.

**Answer**

**The correct answer is (c).**

15.

There is no doubt that a chemical reaction has occurred if:

- (a) there has been an overall volume change.
- (b) the form or state has been changed.
- (c) a new substance has been formed.
- (d) there has been a change of state.
- (e) heat has been given off.

**Answer**

**The correct answer is (c).**

16.

An atom of element X has 11 electrons and an atom of element Y has 8 electrons. The formula of the product of the reaction of these elements is expected to be:

- (a) XY
- (b) XY<sub>2</sub>
- (c) XY<sub>3</sub>
- (d) X<sub>2</sub>Y
- (e) X<sub>2</sub>Y<sub>3</sub>

**Answer**

**The correct answer is (d).**

17.

Which of the following is a chemical property of a substance? The substance:

- (a) floats on the surface of mercury;
- (b) is clear and colourless;
- (c) is attracted by a magnet;
- (d) is soluble in water.
- (e) coats itself with an oxide when exposed to air.

**Answer**

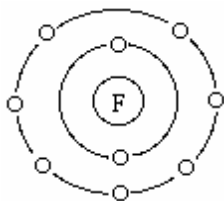
**The correct answer is (e).**

18.

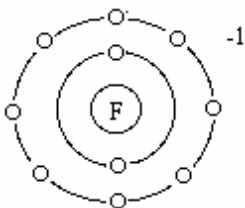
- (a) Select a halogen and sketch its Bohr diagram.
- (b) Sketch the stable ion this halogen forms and indicate its electric charge.
- (c) Give the name of this ion.

**Answer**

**(a) The sketch will depend on the specific halogen selected, probably fluorine or chlorine.**



**(b)**



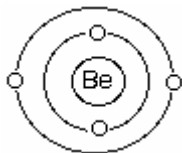
**(c) fluoride or chloride**

19.

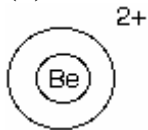
- (a) Select an alkaline earth metal and sketch its Bohr diagram.
- (b) Sketch the stable ion this halogen forms and indicate its electric charge.

**Answer**

**(a) The sketch will depend on the specific metal selected, probably beryllium or magnesium.**



**(b)**



20.

Which of the following atoms or ions has an electron orbit arrangement that is different from the others in the list?

- (a) Ar
- (b)  $\text{Mg}^{2+}$
- (c)  $\text{K}^{1+}$
- (d)  $\text{S}^{2-}$
- (e)  $\text{Ca}^{2+}$

**Answer**

**The correct answer is (b).**

21.

Give the compound name or formula as required.

$\text{Na}_2\text{CO}_3$ _____	$\text{Sn}(\text{NO}_3)_2$ _____
$\text{Cu}(\text{OH})_2$ _____	$\text{Al}(\text{HCO}_3)_3$ _____
zinc chlorate _____	calcium phosphate _____
potassium sulfate _____	lead(IV) carbonate _____

**Answer**

$\text{Na}_2\text{CO}_3$  - sodium carbonate

$\text{Sn}(\text{NO}_3)_2$  - tin(II) nitrate

$\text{Cu}(\text{OH})_2$  - copper(II) hydroxide

$\text{Al}(\text{HCO}_3)_3$  - aluminum hydrogen carbonate

zinc chlorate -  $\text{Zn}(\text{ClO}_3)_2$

calcium phosphate -  $\text{Ca}_3(\text{PO}_4)_2$

potassium sulfate -  $\text{K}_2\text{SO}_4$

lead(IV) carbonate -  $\text{Pb}(\text{CO}_3)_2$

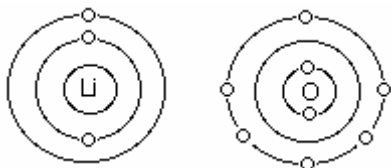
22.

Lithium and oxygen react to form a compound.

- (a) Draw Bohr diagrams of lithium and oxygen.
- (b) Which is the metal and which is the nonmetal?
- (d) What are the charges on the lithium and oxygen ions?
- (e) Give the chemical formula and the chemical name of the compound formed.

**Answer**

(a)



(b) **lithium is the metal and oxygen is the nonmetal.**

(d) **lithium - 1+      oxygen - 2-**

(e)  **$\text{Li}_2\text{O}$     lithium oxide**

23.

Two particles have the following compositions, respectively:

1. 10 protons, 9 electrons
2. 11 protons, 10 electrons

Both of the particles are best described as:

- (a) neutral atoms
- (b) positive ions
- (c) negative ions
- (d) noble gases
- (e) compound neutrons

**Answer**

**The correct answer is (b).**

24.

A decomposition chemical reaction can be compared to:

- (a) two dancing couples switching partners;
- (b) eight couples doing a square dance;
- (c) a dancing couple breaking up;
- (d) two single people joining for a dance;
- (e) a single person "cutting in" on a dancing couple.

**Answer**

**The correct answer is (c).**

25.

A balanced chemical equation takes into account the theory that:

- (a) compounds and elements remain unchanged in a chemical reaction.
- (b) atoms are neither created nor destroyed in chemical reactions.
- (c) the total mass always increases during a chemical reaction.
- (d) the mass of any gases involved can be ignored.
- (e) atoms react by shifting or sharing protons.

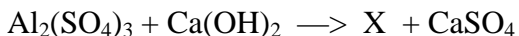
**Answer**

**The correct answer is (b).**



26.

In the following equation, the " X " represents:



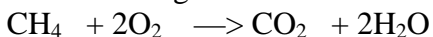
- (a)  $\text{H}_2\text{O}$
- (b)  $\text{Al}(\text{OH})_3$
- (c)  $\text{Al}$
- (d)  $\text{SO}_2$
- (e)  $\text{Al}_2(\text{OH})_3$

**Answer**

**The correct answer is (b).**

27.

The following reaction is an example of the reaction type called:



- (a) synthesis
- (b) combustion
- (c) decomposition
- (d) single displacement
- (e) double displacement

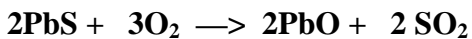
**Answer**

**The correct answer is (b).**

28.

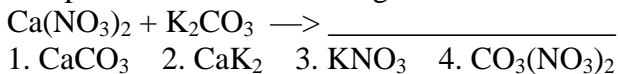
Balance the following equation:  $\text{PbS} + \text{O}_2 \longrightarrow \text{PbO} + \text{SO}_2$

**Answer**



29.

The products of the following reaction carried out in solution are:



1.  $\text{CaCO}_3$  2.  $\text{CaK}_2$  3.  $\text{KNO}_3$  4.  $\text{CO}_3(\text{NO}_3)_2$

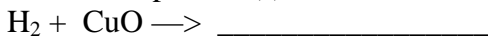
- (a) 1, 2, and 3
- (b) 2, 3, and 4
- (c) 1, 2, and 4
- (d) 2 and 4
- (e) 1 and 3

**Answer**

**The correct answer is (d).**

30.

Predict the product(s) for the following reaction.



1.  $\text{CuH}_2$  2.  $\text{CuO}_2$  3.  $\text{H}_2\text{O}$  4.  $\text{Cu}$  5.  $\text{Cu}(\text{OH})_2$

(a) 3 and 4 only

(b) 5 only

(c) 1 and 2 only

(d) 4 and 5 only

(e) 1 and 3 only

**Answer**

**The correct answer is (a).**

31.

In all chemical reactions the:

(a) mass and volume of both the reactants and the products must be equal.

(b) masses of the combining chemicals must be equal.

(c) volume of the reactants equals the volume of the products.

(d) volumes of the combining reactants must be equal.

(e) mass of the reactants equals the mass of the products.

**Answer**

**The correct answer is (e).**

32.

The product(s) of the combustion of a hydrocarbon is/are:

(a) water, carbon dioxide, and nitrogen dioxide

(b) water only

(c) carbon dioxide only

(d) water and carbon dioxide

(e) nitrogen dioxide only

**Answer**

**The correct answer is (d).**

33.

An example of a double displacement reaction would be:

(a)  $2\text{H}_2\text{O} \longrightarrow 2\text{H}_2 + \text{O}_2$

(b)  $2\text{KI} + \text{Pb}(\text{NO}_3)_2 \longrightarrow 2\text{KNO}_3 + \text{PbI}_2$

(c)  $2\text{KClO}_3 \longrightarrow 2\text{KCl} + 3\text{O}_2$

(d)  $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$

(e) None of these is a double displacement reaction.

**Answer**

**The correct answer is (b).**

34.

A single displacement chemical reaction can be compared to:

- (a) two dancing couples switching partners;
- (b) a person "cutting in" on a dancing couple;
- (c) eight couples doing a square dance;
- (d) two single people joining for a dance.
- (e) a couple breaking up.

**Answer**

**The correct answer is (b).**

35.

What does the "  $\longrightarrow$  " mean in the chemical equation: water  $\longrightarrow$  hydrogen + oxygen

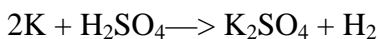
- (a) to produce
- (b) reacts with
- (c) a skeleton equation
- (d) is balanced
- (e) a coefficient

**Answer**

**The correct answer is (a).**

36.

Which chemical reaction type does the following belong to?



- (a) synthesis
- (b) decomposition
- (c) combustion
- (d) single displacement
- (e) double displacement

**Answer**

**The correct answer is (d).**

37.

A chemical reaction is represented by the following word equation:

magnesium + sulfuric acid  $\longrightarrow$  hydrogen + magnesium sulfate

- (a) What are the products of this reaction?
- (b) What are the reactants in this reaction?

**Answer**

**(a) The products are hydrogen and magnesium sulfate.**

**(b) The reactants are magnesium and sulfuric acid.**

38.

A double displacement chemical reaction is the:

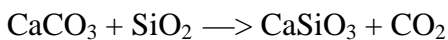
- (a) exchange of two different atoms between two compounds;
- (b) displacement of one element in a compound by another element;
- (c) breaking up of a compound to produce two different elements;
- (d) joining together of two elements to form a compound;
- (e) absorption of heat in a chemical reaction.

**Answer**

**The correct answer is (a).**

39.

What is the reaction type classification for the following equation?



- (a) double displacement
- (b) synthesis
- (c) decomposition
- (d) single displacement
- (e) none of these classifications

**Answer**

**The correct answer is (e).**

40.

Which of the following represents a combustion reaction?

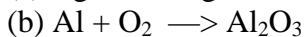
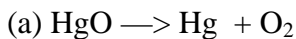
- (a)  $2\text{H}_2\text{O} \longrightarrow 2\text{H}_2 + \text{O}_2$
- (b)  $2\text{KClO}_3 \longrightarrow 2\text{KCl} + 3\text{O}_2$
- (c)  $\text{C}_2\text{H}_6 + \text{O}_2 \longrightarrow 3\text{H}_2\text{O} + 2\text{CO}_2$
- (d)  $2\text{KI} + \text{Pb}(\text{NO}_3)_2 \longrightarrow 2\text{KNO}_3 + \text{PbI}_2$
- (e)  $2\text{Cu} + \text{S} \longrightarrow \text{Cu}_2\text{S}$

**Answer**

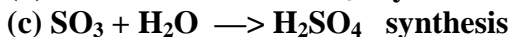
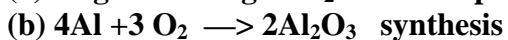
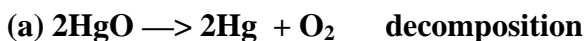
**The correct answer is (c).**

41.

Balance and classify each of the following as either a synthesis or a decomposition reaction.



**Answer**



42.

What does the "+" mean in the chemical equation: phosphorus + oxygen  $\rightarrow$  phosphorus(V) oxide

(a) a skeleton equation

(b) to produce

(c) reacts with

(d) a coefficient

(e) is balanced

**Answer**

**The correct answer is (c).**

43.

Pentane,  $\text{C}_5\text{H}_{12}$ , is a hydrocarbon gas easily kept as a liquid under pressure.

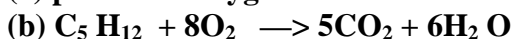
(a) Write out a word equation for the complete combustion of pentane.

(b) Write out the balanced chemical equation for the complete combustion of pentane.

(c) What else is produced that is not written as a chemical formula?

**Answer**

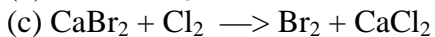
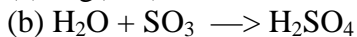
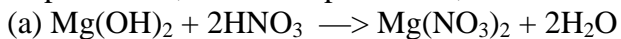
(a) pentane + oxygen  $\rightarrow$  carbon dioxide + water



(c) heat or energy

44.

Identify each of the following reactions as a synthesis, decomposition, single displacement, double displacement, or combustion.



**Answer**

**(a) double displacement**

**(b) synthesis**

**(c) single displacement**

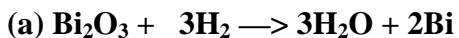
**(d) combustion**

45.

(a) Complete the following equation and balance it.  $\text{Bi}_2\text{O}_3 + \text{H}_2 \longrightarrow$

(b) Classify the reaction type.

**Answer**



**(b) single displacement**

46.

An acid would have which of the following properties? An acid solution:

(a) turns litmus blue and red cabbage indicator yellow;

(b) tastes sour;

(c) feels slippery;

(d) could have a pH of 12;

(e) would not react with baking soda.

**Answer**

**The correct answer is (b).**

47.

A solution with a pH of 2 is said to be:

(a) strongly acidic

(b) slightly basic

(c) slightly acidic

(d) strongly basic

(e) neutral

**Answer**

**The correct answer is (a).**

48.

A solution with a pH of 7 is said to be:

- (a) strongly acidic
- (b) slightly basic
- (c) slightly acidic
- (d) strongly basic
- (e) neutral

**Answer**

**The correct answer is (e).**

49.

A solution has a pH of 8. How is this solution best described?

- (a) strongly basic
- (b) slightly basic
- (c) slightly acidic
- (d) strongly acidic
- (e) neutral

**Answer**

**The correct answer is (b).**

50.

Fill in the blanks in the following statements concerning the pH scale.

The pH scale represents how (a) \_\_\_\_\_ or (b) \_\_\_\_\_ a solution is. If the pH is (c) \_\_\_\_\_ than 7, then the solution is acidic. If the pH is 7, then the solution is (d) \_\_\_\_\_. A solution of pH 9 is (e) \_\_\_\_\_ times more (f) \_\_\_\_\_ than a solution of pH 8.

**Answer**

**(a) acidic (or basic) (b) basic (or acidic) (c) less (d) neutral (or neither acidic or basic) (e) ten (f) basic**

51.

The following list contains properties of common acids and bases in water. Which of these properties describe a base?

1. turns litmus blue;
2. turns red cabbage indicator red;
3. feels slippery;
4. tastes sour;
5. reacts with chalk (calcium carbonate).

- (a) 1 and 3 only
- (b) 1, 2, 3, 4, and 5
- (c) 1, 4, and 5 only
- (d) 2 and 5 only
- (e) 3 and 4 only

**Answer**

**The correct answer is (a).**