Science 10- Course Review
Unit 1-Chemistry - KEY

Name _____

Date _____

Date due _____

The Science 10 Chemistry Unit covers:

- Chapter 8-Elements and the Periodic Table
- Chapter 9-Chemical Formulas and Compounds
- Chapter 10-Chemical Reactions

You can also consult the "Chemistry Outline" which shows all of the activities (Worksheets and Labs) If you don't have one or if you want to view or print any of the activities, go to the Science 10 Web page at http://sd67.bc.ca/teachers/dcolgur and click "Science 10"

1. When zinc metal is placed in a solution of hydrochloric acid, it fizzes producing hydrogen gas and zinc chloride.

   a) The reactants are _____**zinc & hydrochloric acid**_____

   b) The products are _____ **hydrogen gas and zinc chloride** _____

   c) A word equation is: _ **zinc + hydrochloric acid → hydrogen + zinc chloride**

2. In the following table, name the 3 major particles in the atom, state where they are located (in the nucleus or on the outside), state their relative mass compared to a proton (assume mass of a proton = 1) and their charge.

Particle	Location	Mass (*Proton = 1*)	Charge
Proton	**nucleus**	**1**	**+**
Neutron	**nucleus**	**1**	**0**
Electron	**outside**	**1/1837**	**-**

3. List the four main points in John Dalton's **atomic theory**.

   1. **All matter is made up of atoms**

   2. **Each element has its own kind of atom. Atoms of the same element have the same mass. Atoms of different elements have different masses.**

   3. **Compounds are created when atoms of different elements link to form "compound atoms"**

   4. **Atoms cannot be created or destroyed**

4. **Isotopes** of an element are two different forms which have the same number of **_protons** and **_electrons____**, but with different numbers of **neutrons_____**.

5. The **atomic __mass___** of an element is the average mass of the isotopes which occur in nature.

6. In a **neutral atom**, the number of **electrons** is always equal to the number of **___protons_____** or the **____atomic_____** number.

7. According to the model of the atom proposed by Neils Bohr, electrons move around the atom in **_____orbits_____** or **_____shells_____**. When one orbit is filled, the electrons start filling the **__next higher___** orbit.

8. The first orbit holds **_____2___** electrons.

   The second orbit holds **_____8_____** electrons.

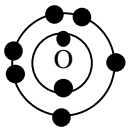
   The third orbit holds **____8_____** electrons.

9. Give the total number of electrons and the number of electrons in each orbit for each of the following elements:

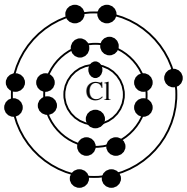
Element	Total # of electrons	Electrons in Level 1	Electrons in Level 2	Electrons in Level 3	Electrons in Level 4
Aluminum (Al)	**13**	**2**	**8**	**3**	**-**
Nitrogen (N)	**7**	**2**	**5**	**-**	**-**
Calcium (Ca)	**20**	**2**	**8**	**8**	**2**
Lithium (Li)	**3**	**2**	**1**	**-**	**-**
Argon (Ar)	**18**	**2**	**8**	**8**	**-**

10. Draw the **Bohr models** for neutral atoms of each of the following elements.

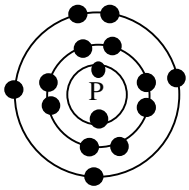
a) oxygen (8 e^-)



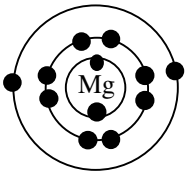
b) chlorine (17 e^-)



c) phosphorus (15 e^-)



d) magnesium (12 e^-)



11. According to Bohr, when a sample of an element is energized by heat or electricity, the electrons jump to **higher** orbits. When they jump back down to lower orbits, they give off the energy in the form of **light**

The amount of energy released in each jump corresponds to a certain **wavelength (colour)** of light. The pattern of different colours of light given off is called the **spectrum** for that element and can be seen through a device called a **spectroscope**. Because every element has its own set of electrons and orbits, the spectrum given off by each element will be **different** from that of any other element. What can this be used for? **identification**

12. What are some practical uses for pure oxygen? **Welding (oxy-acetylene) First aid for drowning, heart attack etc. victims. Rockets (eg space shuttle)**

What is the main danger of pure oxygen? **Makes flammable materials burn faster or explosively**

13. Phosphorus is stored in **___water_____**. Suggest why? **It is highly flammable and undergoes spontaneous combustion**.

14. Why is phosphorus considered a dangerous element? **_can cause severe burns and cause fires__**

    Suggest a practical use for elemental phosphorus **_flares, match heads_____**

15. In order to have the same number of electrons as the noble gas neon, sodium

    would have to **lose 1** electron.

    Sodium is stored in **_oil or kerosene__**. Suggest why? **It reacts with oxygen in the air and violently with water to produce hydrogen gas**.

16. Is potassium more or less reactive than sodium **__more_____**. Find rubidium on your periodic table. Do you think rubidium would be more or less reactive

    than potassium? **__even more reactive_____**.

17. Name iodine Symbol **_I_** Atomic number **_53__** # of electrons **_53__**
    In order to have the same number of electrons as the noble gas xenon, iodine

    would have to **gain 1** electron. Is iodine a *metal* or *non-metal*? **non-metal**

18. Classify each of the following elements as an **alkali metal**, **alkaline earth**, **halogen**, **noble gas** or **transition metal**:

Element	Family
Fe	**Transition metal**
Br	**Halogen**
K	**Alkali metal**
Kr	**Noble gas**
Ba	**Alkaline earth**
F	**Halogen**
Pt	**Transition metal**
Li	**Alkali metal**
Ne	**Noble gas**
Ra	**Alkaline earth**

19. Mendeleev arranged the elements in order of **atomic mass**

    and also put them in groups based on similar **chemical and physical properties**_.

20. What did Mendeleev do when he came to a space where no known element would fit?

    He left it blank, predicted properties for it using nearby elements, predicted that the element would be found.

21. Vertical columns of the Periodic Table are known as Groups or Chemical **Families**.

22. Elements are no longer listed in order of atomic mass, but in order of atomic **number**.

23. What is similar about elements in the same family? **Similar chemical & physical properties**

24. What is the main use of helium?**Lighter than air balloons, welding**, **lasers**

25. What are some uses of argon?**Fills incandescent light bulbs, also used in welding**

26. Where is neon used?**Mainly neon signs – used in some lasers**

27. Where are krypton and xenon used? **Strobe lights, high intensity flash bulbs**

28. Why is the element radon considered dangerous even though it is not chemically reactive? **It is radioactive and could cause lung cancer**

29. What would alkali metal atoms need to do in order to end up with the same stable electron

    arrangements as the noble gases? **Lose 1 electron**

30. What can be said about the chemical reactivity of the alkali metals?**highly reactive with O_2 , H_2O , halogens and other elements**

31. When alkali metals are put into water, what happens? **They react to form hydrogen gas and the alkali metal hydroxide. (eg. $2Na + 2H_2O \rightarrow H_2 + 2NaOH$)**

32. The outer orbits of halogen atoms each have **7** electrons. This is one

    (*more/less*) **less** than the nearest noble gas atom.

33. In order to achieve the stable arrangement of noble gas atoms, each halogen atom would

    have to **gain 1** electron.

34. Are the halogens metals or non-metals? **Non-metals**

35. What can be said about the chemical reactivity of the halogens? **very reactive**

36. Why, other than reactivity, are halogens considered dangerous to work with? **very toxic**

37. Fill in the following table:

Indicators in Known Acids and Bases

Indicator	Colour in Acid	Colour in Base
Phenolphthalein	**Colourless**	**Pink**
Bromthymol Blue	**Yellow**	**Blue**
Red Litmus	**Red**	**Blue**
Blue Litmus	**Red**	**Blue**

38. Are the pH's of **Acid** Solutions < 7, >7 or = 7? **< 7**

    Are the pH's of **Base** Solutions < 7, >7 or = 7? **>7**

39. The more **acidic** a solution is, the (*lower/higher)* the pH? **lower**

40. The more **basic** a solution is, the (*lower/higher)* the pH? **higher**

41. A solution with a pH = 7 is said to be **neutral**

42. An acid **HCl** is mixed with a base **KOH**. Predict the **chemical formulas** for the two products of this reaction. **H_2O** and **KCl**. This type of reaction of an acid reacting with a base is called **neutralization**

43. List 4 properties (characteristics) **all acids** have in common:

    taste sour

    turn litmus red, bromthymol blue-yellow and colourless in phenolphthalein

    conduct electricity in solution

    neutralize bases
    react with active metals to produce hydrogen gas

44. List 4 properties (characteristics) **all bases** have in common:

    taste bitter

    feel slippery

    turns litmus blue, bromthymol blue-blue and pink in phenolphthalein

    neutralize acid

45. What is the name of the acid found in sour milk? **Lactic acid**

46. What is the name of the acid found in pop? **Carbonic acid**

47. What is the name of the acid found in lemons and grapefruit? **Citric acid**

48. What is the name of the acid found in your stomach? **Hydrochloric acid**

49. What is the name of the acid found in car batteries? **Sulphuric acid**

50. What is the name of the acid found in rhubarb? **Oxalic acid**

51. What is the name of the acid found in apples? **Malic acid**

52. What is the name of the acid found in vinegar? **Acetic acid**

53. What is the name of the base found in oven cleaner? **Sodium hydroxide**

54. Acid spills can sometimes be neutralized by which common compound? **Sodium hydrogen carbonate (sodium bicarbonate) (baking soda)**

55. Base spills can sometimes be neutralized by which common compound? **vinegar**

56. What is the chemical formula for common table salt? **NaCl**

57. What is the chemical name for baking soda? **Sodium hydrogen carbonate (sodium bicarbonate)**

58. What is the chemical formula for baking soda? **$NaHCO_3$**

59. Which family of elements has just enough electrons in their highest orbits to completely fill them up? **noble gases**

60. If Lithium is combined with Fluorine, the Lithium atom will **give** an electron to the Fluorine atom.

61. When Fluorine has **gained** an electron, it now has **9** protons (*remember, it doesn't lose any protons*), and **10** electrons. Because protons are positive (+) and electrons are negative (-), the charge left over is **-1**. The Fluorine is no longer a neutral atom, but is a charged atom, which is called a Fluor**ide ion**.

62. Because the lithium ion (Li^+) and the fluoride ion (F^-) have opposite charges, they **attract** each other. This attraction forms an **ionic** bond.

63. Generally, ***combining capacity*** means the number of **electrons** an atom needs to **lose** or **gain** in order to have the same number of electrons as a **noble gas**

64. The combining capacity of chromium (III) is **3+**

    The combining capacity of manganese (IV) is **4+**

    The combining capacity of iron (II) is ……..... **2+**

    The combining capacity of copper (I) is ……. **+ (1)**

65. Use the Periodic Table and the method shown to you by the teacher to write the correct formulas for the following ionic compounds.

    a) magnesium iodide .....

    MgI_2

    b) aluminum fluoride .....

    AlF_3

    c) calcium sulphide .....

    CaS

d) rubidium oxide .....

Rb_2O

e) sodium phosphide .....

Na_3P

f) iron (III) sulphate .....

$Fe_2(SO_4)_3$

g) manganese (IV) oxide .....

MnO_2

h) copper (II) phosphate .....

$Cu_3(PO_4)_2$

i) calcium nitrate .....

$Ca(NO_3)_2$

j) ammonium chloride .....

NH_4Cl

k) lithium oxalate .....

$Li_2C_2O_4$

l) nickel (III) carbonate .....

$Ni_2(CO_3)_3$

m) copper (I) permanganate .....

$CuMnO_4$

n) ammonium sulphate .....

$(NH_4)_2SO_4$

66. Compounds with only **two** elements are called **binary** compounds.

67. In a **binary** compound, the non-metal changes it's name so it ends in the letters **IDE**

68. In a compound containing a ***polyatomic ion,*** the name of the polyatomic ion *(always/sometimes/never)* **never** changes.

69. Write the correct names for the following ionic compounds Spelling counts!

    a) Na_3PO_4 ..... **sodium phosphate**

    b) K_2S ..... **potassium sulphide**

    c) Rb_2SO_3 ..... **rubidium sulphite**

    d) $(NH_4)_2CO_3$ ..... **ammonium carbonate**

    e) $Ba(OH)_2$ ..... **barium hydroxide**

    f) $MgSO_4$ ..... **magnesium sulphate**

    g) Cs_2HPO_4 ..... **cesium monohydrogen phosphate**

    h) $NaHCO_3$ ..... **sodium bicarbonate (hydrogen carbonate)**

    i) $AgNO_3$ ..... **silver nitrate**

    j) Na_3As ..... **sodium arsenide**

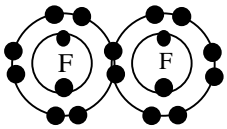
    k) NH_4NO_3 ..... **ammonium nitrate**

    l) $Ag_2Cr_2O_7$ ..... **silver dichromate**

70. In an ***ionic compound***, electrons are **transferred** from one atom to the other. The element that lost electron(s) becomes a (+/-) **+** ion and the element than gains electron(s) becomes a (+/-) **-** ion. The two oppositely charged ions now (attract/repel) **attract** each other.

71. In a ***covalent*** compound, one atom **shares** electrons with another atom.

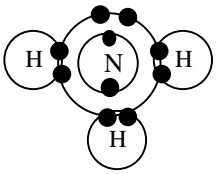
72. Show the Bohr model for a molecule of F_2.



73. Give the formulas for molecules of the seven diatomic elements. The first one is H_2.

H_2 O_2 N_2 F_2 Cl_2 Br_2 I_2 (At_2)

74. Draw the Bohr model for a molecule of ammonia (NH_3).



75. Write the correct formulas for the following **covalent** compounds:

a) nitrogen trioxide **NO_3**

b) silicon tetrafluoride **SiF_4**

c) nitrogen monoxide **NO**

d) selenium hexafluoride **SeF_6**

e) phosphorus pentachloride **PCl_5**

f) sulphur dioxide **SO_2**

g) dinitrogen tetroxide **N_2O_4**

76. Write the correct names for the following **covalent** compounds:

a) PF_5 ..... **phosphorus pentafluoride**

b) SO_3 ..... **sulphur trioxide**

c) ClF_6 ..... **chlorine hexafluoride**

d) SeO_2..... **selenium dioxide**

e) N_2O ..... **dinitrogen monoxide**

f) N_2Cl_4 ..... **dinitrogen tetrachloride**

77. What is meant by a *physical* change? **A change in which the chemical composition of the material does not change**

Give 3 examples of physical changes:

melting, freezing, boiling, condensation, sublimation, dissolving, mixing

cutting, hammering, stretching, etc. etc.

78. What is meant by a *chemical* change? **A change in which existing substance(s) is (are) used up and (a) new substance(s) is (are) formed.**

Give 3 examples of chemical changes:

combustion, photosynthesis, decomposition , cellular respiration, synthesis, single replacement, double replacement, neutralization, explosion etc. etc.

79. Balance the following equations by putting the proper coefficients wherever they are needed.

a) **2**Sr + O_2 → **2**SrO

b) **2**Al + **6**H_2O → **2**$Al(OH)_3$ + **3**H_2

c) **4**Al + **3**O_2 → **2**Al_2O_3

d) C_5H_{12} + **8**O_2 → **5**CO_2 + **6**H_2O

e) **2**Na + **2**H_2O → H_2 + **2**NaOH

f) **2**$NaClO_3$ → **2**NaCl + **3**O_2

g) $Ca(NO_3)_2$ + $(NH_4)_2SO_4$ → $CaSO_4$ + **2**NH_4NO_3

h) $C_2H_5OH + \mathbf{3}O_2 \rightarrow \mathbf{2}CO_2 + \mathbf{3}H_2O$

i) $\mathbf{2}Al(NO_3)_3 + \mathbf{3}K_2CrO_4 \rightarrow Al_2(CrO_4)_3 + \mathbf{6}KNO_3$

j) $\mathbf{2}NH_3 \rightarrow N_2 + \mathbf{3}H_2$

k) $\mathbf{2}C_6H_6 + \mathbf{15}O_2 \rightarrow \mathbf{12}CO_2 + \mathbf{6}H_2O$

l) $S_8 + \mathbf{8}O_2 \rightarrow \mathbf{8}SO_2$

m) $\mathbf{3}HNO_3 + Fe(OH)_3 \rightarrow \mathbf{3}H_2O + Fe(NO_3)_3$

n) $Br_2 + CaCl_2 \rightarrow CaBr_2 + Cl_2$ **(already balanced)**

o) $\mathbf{3}Mg + \mathbf{2}AlCl_3 \rightarrow \mathbf{3}MgCl_2 + \mathbf{2}Al$