SCH4U Review of Grade 11 Concepts

The purpose of this activity is to see how much you remember from the grade 11 course. You are to show all your work and answer the questions to the best of your ability. We will review concepts as needed throughout the course.

1. Without using a calculator, perform the following arithmetic. Show all your simplifications.

(a) $\dfrac{(1.0 \times 10^7) \bullet (4.0 \times 10^5)}{(2.0 \times 10^8)}$

(b) $\dfrac{(4.0 \times 10^{-5}) \bullet (6.0 \times 10^{10})}{(3.0 \times 10^{-2})}$

(c) $\dfrac{(5.0 \times 10^{-4}) \bullet (2.0 \times 10^{-6})}{(1.0 \times 10^{-12})}$

(d) $(3.0 \times 10^4) + (2.1 \times 10^5)$

(e) $(8.0 \times 10^{12}) \bullet (2.0 \times 10^{-3})^2$

2. Trends and groups of the Periodic Table:
   a. In what region of the periodic table are the largest atoms found? Where are the smallest atoms found?

   b. List the 4 major families of the periodic table you studied last year. Give some properties of each family.

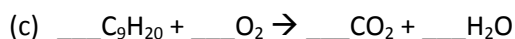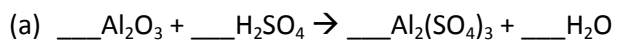3. How are isotopes of the same element alike? How do they differ?

4. Write the formulas and names of the elements that exist in nature as molecules that are each composed of two atoms.

5. Give chemical names for the following:

   (a) $NaClO_3$ (b) $K_2Cr_2O_7$

   (c) $HIO_3(aq)$ (d) $MnCl_2$

   (e) $Ca(H_2PO_4)_2$ (f) $Ca(CN)_2$
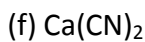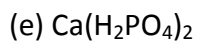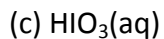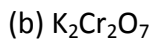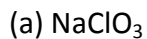
6. Asbestos, a known cancer-causing agent, has a typical formula, $Ca_3Mg_5(Si_4O_{11})_2(OH)_2$. How many atoms of each element are given in this formula?

7. Balance the following equations:
   (a) ____Al_2O_3 + ____H_2SO_4 → ____$Al_2(SO_4)_3$ + ____H_2O

   (b) ____$KHCO_3$ + ____H_3PO_4 → ____K_2HPO_4 + ____ H_2O + ____CO_2

   (c) ____C_9H_{20} + ____O_2 → ____CO_2 + ____H_2O

8. Sodium bicarbonate, $NaHCO_3$, is one ingredient of baking powder. In one experiment in a series of tests of different ratios of ingredients, a scientist used 21.0 g $NaHCO_3$. How many moles of $NaHCO_3$ were in this sample?

9. Analysis shows a hydrocarbon to be composed of 80% C and 20% H.
   a. What is its Empirical formula?

   b. Its density is 1.34 g/L at STP. What is its molecular mass?
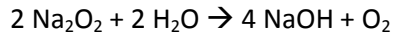

   c. What is its molecular formula?

10. Calculate the mass percentage composition of each compound.
    a) $MgCl_2$ b) Na_2SO_4 c) Fe_2O_3

11. Calculate the number of grams of sodium peroxide, Na_2O_2, that would be required to produce 50 g of oxygen by the following reaction:

$$2\ Na_2O_2 + 2\ H_2O \rightarrow 4\ NaOH + O_2$$

12. Magnesium metal reacts quantitatively with oxygen to give magnesium oxide, MgO. If 5.00 g of Mg and 5.00 g of O_2 are allowed to react, what weight of MgO is formed? If you obtain 6.5 g in your lab; what is your percent yield?

13. Does the label "0.500 M NaCl" tell how much solution is in the bottle? Explain.

14. Calculate the number of grams of each solute that has to be taken to make each of the following solutions:
    a. 250 mL of 0.100 M NaCl

    b. 100 mL of 0.440 M $C_6H_{12}O_6$ (glucose)

15. Degrees Kelvin and Degrees Celcius:
    a. A clinical thermometer registers a patient's temperature to be 37.13 $^{\circ}$C. What is this temperature in K?

    b. The coldest permanently inhabited place on the Earth is the Siberian village of Oymyakon in Russia. In 1964 the temperature reached a shivering -69.12 $^{\circ}$C! What is this temperature in K?

    c. Helium has the lowest boiling point of any liquid. It boils at 4 K. What is it's boiling point in $^{\circ}$C?

16. A gas measuring 525 mL is collected at 104.66 kPa. What volume does this gas occupy at 99.33 kPa?

17. A gas occupies 50.0 mL at standard temperature. What volume will it occupy at 335°C, pressure unchanged?

18. If a steel cylinder with a volume of 1.50 L contains 10.0 mol of oxygen, under what pressure (in atm) is the oxygen if the temperature is 27.0°C?