SCH3U: REVIEW

SCH 4U_07-08

NAME: _____

(TOTAL SCORE = 80)

1. How many significant digits are there in each of the following measurements? *(½ mark each)*

a) 204.45 ha _____ b) 18.23 s _____

c) 380 000 _____ d) 0.00560 g _____

2. Name the following compounds (*½ mark each*).

a) SO _____ b) NH_3 _____

c) $Ca(NO_3)_2$ _____ _____ d) $H_2SO_{4\ (aq)}$ _____

e) $HCl_{(aq)}$ _____ f) $CuSO_4.5H_2O$ _____

3. Give the formula for each compound (½ *mark* each).

a) cupric nitrate _____ b) dintrogen trisulphide _____

c) magnesium carbide _____ d) ammonium phosphate _____

e) chromium (III) bromide _____ f) plumbous acetate _____

4. Write the **complete,** and **short-hand** electronic configuration (in terms of s, p, d) for *(1 mark each*)

(i) $_{15}P$ _____ _____

(ii) $_{26}Fe$ _____ _____

5. Hydrogen has three isotopes: $_1H$, $_1H$, $_1H$. Give the number of **protons, neutrons** and **electrons** found in each isotope *(1 mark)*.

6. Express the answer to each of the following calculations with the **correct number of significant digits and using proper scientific notation.** *(1 mark each)*

a) 13.89cm + 6.7732 cm _____ b) 120 km^3 / 8.56 km _____

c) 3.0899 mm^2 x 22.4 mm _____ c) 3.3 x 10^{-6} m x 1.05 x 10^2 m _____

7. Name the **family (Group)** of each of the following sets of elements *(½ mark each).*

a) Li, Na,Rb,and Fr _____ h) Ne, Ar, Xe and Rn _____

c) Mg, Ca, Ba and Ra _____ d) F, Cl, and At _____

8. Which of the following elements will have the **largest** atomic radius? *(½mark each).*

a) Cs, K, or Li _____ b) F, B or Li _____

c) K^{+1}, Mg^{+1}, Al^{+3} _____ d) O, O^{-1}, O^{-2} _____

9. Which of the following will have the **smallest** first ionization potential energy? (½ *mark each).*

a) Li, B, F _____ b) Si, S, Sb _____

10. Explain the difference between **electron affinity** and **electronegativity**, give an **example** in each case. *(2 marks).*

11. Given the following combinations of elements and their electronegativities, state **what kind of bond** (ionic, polar covalent, or covalent) is formed, *(½ mark each).*

a) potassium (0.9) and chlorine (2.9) _____
b) hydrogen (2.1) and oxygen (3.5) _____
c) two sulphur atoms (2.4) _____
d) phosphorus (2.l) and chlorine (3.0) _____

12. Draw the Lewis structure for each of the following molecules and state the **shape** and indicate if the molecule is **polar or non-polar** (2 *marks each).*

a. Chloroform, $CHCl_3$

b. Ammonia, NH_3

c. Water, H_2O

13. Balance the following equations. Identify the **type of reaction** occurring (i.e. synthesis, decomposition, single displacement, double displacement). *(2 marks each).*

a) __ $Mg(OH)_{2\ (aq)}$ + __ $HNO_{3\ (aq)}$ ⟶ __ $Mg(NO_3)_{2\ (aq)}$ + __ $H_2O_{\ (l)}$

b) __ $Al_{\ (s)}$ + __ $NiCl_{2\ (aq)}$ ⟶ __ $AlCl_{3\ (aq)}$ + __ $Ni_{\ (s)}$

14. Write the **net ionic equation** for **each** of the equations in question 13 above. *(2 marks)*

15. i) Predict the products of the following double displacement reaction.
ii) Use your solubility tables to predict which of the, if any, would form precipitates and which would be soluble in water. Place the subscripts $_{(aq)}$ or $_{(s)}$ beside the appropriate formulas.
iii) Balance the chemical equation.
iv) Write the total dissociated ionic equation.
v) Write the net ionic equation.
vi) State the spectator ion. *(5 marks).*

__ $Al(OH)_{3\ (aq)}$ + __ $Na_2CO_{3\ (aq)}$ ⟶ _____ + _____

16. Of the chemical substance listed below:

$CH_{4\ (g)}$ $MgCl_{2\ (aq)}$ $CCl_{4\ (g)}$ $HI_{\ (aq)}$ $KOH_{(aq)}$

State which is: *(4 marks)*

a base: _____
an acid: _____
an organic compound _____
which will be good conductors of electricity: _____

17. Explain what is meant by a strong electrolyte and a weak electrolyte. Give an example of each. *(2 marks).*

18. i) How many moles in 5.00×10^2 g of iron? *(1mark)*

ii) How many iron atoms in 5.00×10^2 g of iron? *(1 mark).*

19. Calculate the mass of:

a) 1.50 moles of oxygen gas, O_2

b) 750 cm^3 of 0.015 mol dm^{-3} NaOH *(2 marks).*

20. The percentage composition of tartaric acid is: 32.01 % C, 4.03% H, and 63.96 % O. Given that the molecular mass of tartaric acid is 150 amu, determine its **molecular formula.** *(4 marks)*

21. Using the equation below, how many grams of ammonia will be formed if 75.0 g of nitrogen reacts with excess hydrogen? *(4 marks)*

$N_{2\,(g)} + H_{2\,(g)} \longrightarrow NH_3$ **(BALANCE)**

22. A mixture of 5.00 g of $H_{2\,(g)}$ and 10.0 g of $O_{2\,(g)}$ is ignited. Water forms according to the following equation: $2H_{2\,(g)} + O_{2\,(g)} \longrightarrow 2H_2O_{(l)}$

a) Which reactant is limiting?

b) How much water will be produced by the reaction? *(5 marks)*

23. ZnS is the sulphide ore of zinc. ZnS is reduced to elemental zinc by "roasting" it (heating it in air) to give ZnO and then heating the ZnO with carbon monoxide. The two reactions can be written as:

$ZnS + 3/2\ O_2 \longrightarrow ZnO + SO_2$

$ZnO + CO \longrightarrow Zn + CO_2$

Suppose 5.32 g of ZnS is treated in this way and 3.30 g of pure zinc, Zn, is obtained. Calculate the **theoretical yield of Zn** and its actual **percentage yield.** *(6 marks)*

24. Concentrated nitric acid, $HNO_{3\,(aq)}$ acts on copper to give nitrogen dioxide and dissolved copper ions according to the following balanced chemical equation:

$$Cu_{(s)} + 4H^{+1}_{(aq)} + 2\,NO_3^{-1}{}_{(aq)} \longrightarrow 2\,NO_{2(g)} + Cu^{+2}{}_{(aq)} + 2H_2O_{(l)}$$

Suppose that 6.80 g of copper is consumed in this reaction and that the $NO_{2\,(g)}$ is collected at a pressure of 98.5 kPa and a temperature of 45 ^{O}C. Calculate the **volume of $NO_{2\,(g)}$** produced. *(6marks)*

25. Calculate the number of grams of sodium hydroxide required to prepare 5.00 L of a 0.400 mol L^{-1} solution. *(2marks)*

26. Calcium carbonate 'fur' on the inside of a kettle used in a hard water area of the country can be removed using a dilute solution of hydrochloric acid. What volume of 0.010 mol l^{-1} hydrochloric acid would be needed to remove 2.00 g of calcium carbonate from the kettle? The equation for the reaction is: *(5 marks)*

$$CaCO_{3(s)} + 2\,HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$$