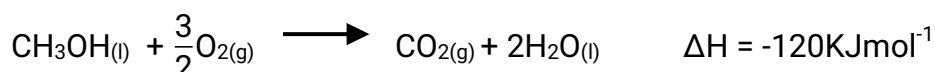


CHEMISTRY QUESTIONS.

DEVINE MERCY SECONDARY SCHOOL

1.
 - a) Define the term Enthalpy of combustion
 - b) Describe using a well labeled diagram how the enthalpy of combustion of methanol can be determined in the laboratory
 - c) Methanol burns in oxygen according to the equation



When a certain mass of methanol was burnt, the heat evolved raised the temperature of 100g of water from 25.3°C to 45.3°C.
(Specific heat capacity of H₂O = 4.2, density of water = 1g/cm³). Calculate the mass of methanol burnt.

d) When 40cm³ of a 2M nitric acid was mixed with 40cm³ of a 2M sodium hydroxide solution at initial temperature of 25.0°C, the temperature of the solution rose to T°C. Determine T (S.H.C of water = 4.2Jg⁻¹K⁻¹, density of water = 1gcm⁻³, and enthalpy of neutralization of nitric acid by sodium hydroxide = 56.5KJmol⁻¹)

e) Explain why enthalpy of neutralization of ethanoic acid is lower than that of hydrochloric acid.

2.
 - a) Define the terms
 - (i) acid
 - (ii) salt
 - b) An aqueous solution of hydrogen chloride formed bubbles of a colorless gas when added to Zinc granules where as a solution of hydrogen chloride in methyl benzene does not. Explain.
 - c) Describe how a pure dry sample of Zinc sulphate – 7- water can be prepared from Zinc oxide in the laboratory.
 - d) State and explain what would be observed when dilute sodium hydroxide solution was added drop-wise until in excess to aqueous solution of Zinc sulphate.
3.
 - a) (i) Without the use of a diagram(s) and equations briefly outline an experiment that can be carried out to show that the rate of reaction between dilute hydrochloric acid and calcium carbonate depends on the surface area of the calcium carbonate.

(ii) Other than surface area, state 2 conditions that can affect the rate of the reaction in

a(i) above.

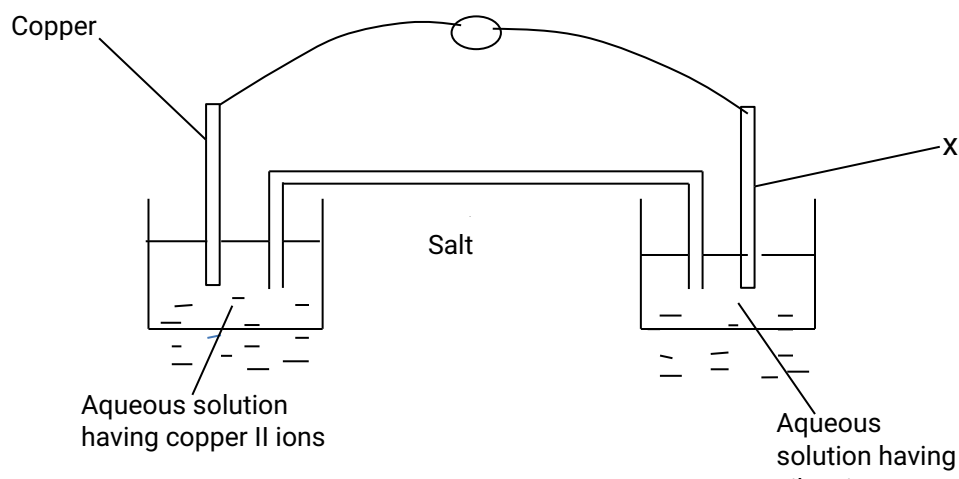
b) A reaction between magnesium ribbon and dilute Sulphuric acid was carried out to study the rate of reaction. The flask in which magnesium and the acid reacted was weighed at time interval of 10 minutes for a total time duration of 50 minutes.

The table of results got is as follows;

Time (Minutes)	0	10	20	30	40	50
Mass of Flask + Contents (g)	95	64.5	39	24.4	15	11.9

- Plot a graph of mass of flask + contents against time.
- Determine the rates of the reaction after 15 minutes and 27.5 minutes respectively and give a comment about your results.

4. Comparison of copper and silver reactivities was made using an electrochemical cell shown in the diagram below:



a) On the diagram, draw an arrow to show the direction of electron flow.

b) (i) Name substance x

(ii) Identify one substance that was used to make the electrolyte containing silver ions.

c) State the purpose of the salt bridge.

d) Write equation for the reaction occurring at;

(i) Copper electrode

(ii) Electrode labeled x

5. a) Write the molecular formula for the following compound.

(i) Calcium hydrogen phosphate.

(ii) Calcium phosphate

b) (i) Write ionic equation leading to formation of calcium phosphate.

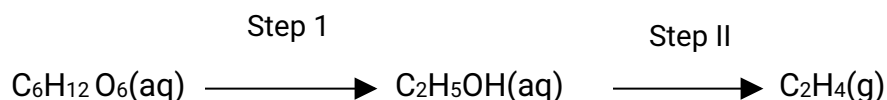
(ii) Calculate the percentage of phosphorous in calcium phosphate

(Ca = 40, P=31, O=16)

a) (i) Compounds in a(i) and a(ii) above can be used as fertilizers. Which one of them is a better fertilizer?

b) (ii) Give reason for your answer in c(i) above.

6. Ethanol obtained from glucose can be converted to ethene as shown below.



a) Name

i) the process that takes place in step 1

ii) the reagent used in step II

b) Ethene can be converted to a polymer J of relative molecular mass 16,800.

i) Write equation for the reactions showing the conversion of ethene to polymer J.

ii) Determine the number of ethene molecules that make up one molecule of J.

iii) Give one disadvantage of continued use of J.

7. Hydrocarbon D whose molecular mass was found to be 42grams contains 85.7% of carbon.

- a) (i) determine the empirical formula of D. (H=1, C=12)
- (ii) Determine the molecular formula for hydro carbon D?
- b) Write the possible structural formula of D.
- c) If a solution of bromine in Tetra Chloromethane is added onto D.
 - (i) State what was observed.
 - (ii) Explain the observation in c(i) above.

8. a) Using copper (II) Sulphate – 5 – water, explain the term “reversible reaction (8marks)

b) In decomposing hydrogen peroxide to prepare oxygen, manganese (IV) oxide is added as a catalyst.

i) Define the term catalyst.

ii) Briefly describe how it can be shown experimentally that manganese (IV) oxide is a catalyst during the decomposition of hydrogen peroxide.

c) State two factors other than manganese (IV) oxide catalyst that can affect the rate of decomposition of hydrogen peroxide, and indicate how each of the factors that you have stated affects the rate of decomposition of hydrogen peroxide.

9. a) The atomic numbers of hydrogen, oxygen, sodium and chlorine are 1, 8, 11 and 17 respectively.

i) Write the electronic configurations of hydrogen, oxygen, sodium and chlorine.

iii) State one difference between the compounds formed in a(ii).

b) Sodium, magnesium, aluminium, phosphorous and sulphur are some of the elements in period 3 of the periodic Table.

State;

i) in each case the class of the oxide of the elements.

ii) the trend in the metallic character of elements of period 3 of the periodic table and explain your statement basing your answer on the oxides whose classes you have stated in b(i).

c)i) Name one reagent that can be used to distinguish Aluminium ions from magnesium ions in solution.

ii) State what would be observed if the reagent you have named in c(i) was treated separately with aluminium and magnesium ions.

10. a) i) State what is meant by the terms “solubility “ and saturated solution”

ii) State two factors that can affect solubility of a substance and in each case, indicate how the factor you have stated can affect solubility.

b) The solubility of some two compounds S and T at various temperatures are shown in the table below.

Temperature ($^{\circ}\text{C}$)	0	20	40	60	100
Grams of S per 100g of water	4.0	6.0	12.0	25.0	52.0
Grams of T per 100g of water	35.7	36.0	36.6	37.3	39.2

i) Plot on the same axes, the solubility of S and T

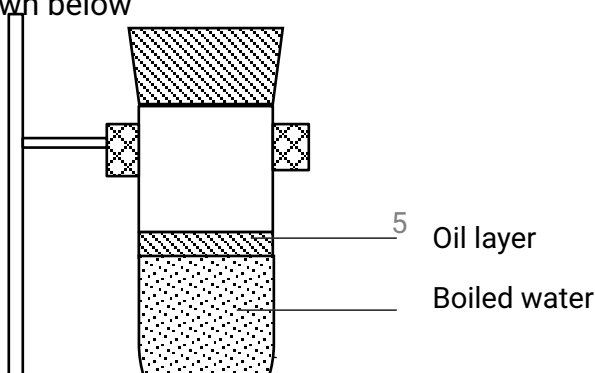
ii) Using the solubility curves you have plotted in b(i), state which one of the two compounds dissolves more rapidly as temperature increases.

iii) If a saturated solution containing both S and T at 100°C was prepared describe how a pure sample of T would be obtained.

iv) Determine the mass of dry crystals that would be collected if a saturated solution of S at 90°C was cooled to 50°C .

11. (a) Name two main gases found in air.

(b) An experiment to investigate one of the conditions under which iron rusts was set up as shown below



- (i) State what was observed after three days .
- (ii) Explain your answer to b (i) above.
- (c) State
 - (i) One disadvantage of rusting .
 - (ii) Two methods of preventing rusting .
- (d) what is an alloy?
- (e) State two reasons why alloys are more useful than pure elements.
- (f) Name the elements used in making each of the following alloys:
 - (i) Brass.
 - (ii) Solder.

12. An element Q has atomic number 20

- (a) Write the electronic configuration of an atom of Q.
- (b) Identify the group and period to which Q belongs in the periodic table.
 - (i) Group
 - (ii) Period
- (c) Atoms of another element R with electronic configuration 2:6 react with Q
 - (i) Write the formula of the compound formed between Q and R.
 - (ii) State three properties of the compound in C (i) above.
- d). 5.6g of iron reacted with 2.4g of oxygen to form an oxide, Y, of formula mass 160.

(i) Determine the Empirical formula of Y and Molecular formula of Y.

(O=16, Fe = 56)

(b) Write the equation for the reaction between the oxide Y and carbon monoxide

13. (a) Name two substances that can be used to prepare soap .

(b) Describe briefly how soap is obtained from the substances named (a) above include an equation for the reaction.

(c) Detergents are commonly used in laundry instead of soap. State one

(i) Advantage of using detergents,

(ii) Disadvantage of using detergents

(d) What is a polymer?

(e) Under suitable conditions ethene molecules $\text{H}_2\text{C} = \text{CH}_2$, react forming a polymer.

(i) Write the equation for the formation of the polymer.

(ii) Give one use of the polymer in b (i) above.

(f) Differentiate between thermoplastic and thermosetting plastics.

(g) State one disadvantage of using plastics.

14. (a) What is the rate of a chemical reaction?

(b) Explain the effect of the increase in each of the following on the rate of reaction.

(i) Concentration

(ii) Temperature.

(c) 10cm^3 of 2M hydrochloric acid was added to sodium thiosulphate solution and time taken for sulphur precipitate to form was noted. The concentration of sodium thiosulphate was varied by adding the volume of water which makes the solution to 60cm^3 in each case. The results are shown in the table below

Volume of thiosulphate (cm^3)	Volume of water (cm^3)	Time (s)	$\frac{1}{\text{time}}$ (s^{-1})

60	0	23	
50	10	27	
40	20	34	
30	30	45	
20	40	73	
10	60	143	

(i) Complete the table by filling in the value of $\frac{1}{\text{time}}$.

(ii) Plot a graph of $\frac{1}{\text{time}}$ against the concentration of thiosulphate

(iii) Deduce from the graph how the rate of the reaction varies with the concentration

15. (a) state one physical difference between fats and oils.

(ii) State any examples of each of the above

(iii) state any one source of oils.

(b) Describe how soap can be manufactured in the laboratory from the source mentioned in a(iii) above.

(c) (i) State any two substances that can be used instead of soap.

(ii) state any two disadvantages of the substance mentioned above.

16. (a) When ammonium chloride is heated, it undergoes sublimation

- (i) State what is meant by the term sublimation
 - (ii) write an equation to show the effect of heat on ammonium chloride.
 - (iii) Name any two substances other than ammonium chloride that undergoes sublimation
 - (b) fractional distillation can be used to separate components of air.
 - (i) State why the components of air can be separated by the above method.
 - (ii) Describe an experiment that can be carried out to separate the components of air.
 - (c) 7.5g of methane was completely burnt in air according to the following equation.
- $$\text{CH}_{4(g)} + 2\text{O}_{2(g)} \longrightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(l)} \quad \Delta = -890\text{kJ}$$
- (i) Calculate the volume of carbon dioxide required to react with methane
 - (ii) The heat evolved on combustion of methane.

17. Giving reasons, State how the following mixtures can be separated.

- (i) cooking oil and water
- (ii) beans and husks
- (iii) components of ink
- (iv) sodium carbonate and sodium hydrogen carbonate.
- (v) Pure water from Dirty water.

18. (a) (i) Differentiate between saturated and Unsaturated hydrocarbons

(ii) State one example of each of the above.

(b) An organic compound Z of molecular mass 60 consists of 60.64% carbon.

13.12% and the rest being oxygen. Determine.

- (i) it's empirical formula
- (ii) it's molecular formula
- (c) Given that Z reacts with hot concentrated Sulphuric acid to produce an alkene R.
- (i) Write the structural formula of Z
- (d) R in (c) above can react to form a polymer E.
- (i) Write equation for the polymerisation of R
- (ii) Determine the number of moles of R molecules that reacted to produce E with

relative atomic mass 14,000

(e) Distinguish between thermosetting and thermo-softening plastics and give an example of each.

19. (a)(i) State what is observed when a piece of sodium is burnt in excess oxygen.

(ii) Write equation for the reaction that took place.

(b) To 5g of the solid product in (a) was added excess water.

(i) State what was observed.

(ii) Calculate the volume of the gaseous product formed. (1 mole of a gas occupies 22.4dm^3 at s.t.p)

(C) Describe how oxygen can be prepared from potassium chlorate. include all the conditions, equations and diagram.

20. Describe how Dry hydrogen can be prepared from action of Zinc and hydrochloric acid. include all the conditions, equations and diagram.

(b) Dry hydrogen gas was passed over 4.0g of copper (ii) oxide,

(i) State what was observed

(ii) write the equation for the reaction.

(iii) calculate the number of moles of the solid product produced.

(c) Give five uses of hydrogen gas.

21. Corn oil can be converted to solid fat as shown in the word equation below.

Corn oil $\xrightarrow{\text{Y}}$ Fat/Margarine.

(a) Name the process shown in the equation.

(b) What is the significance of the process you have named in (a).

(c) Identify Y.

(d) Give two differences between solid fat and Corn oil.

22. Study the list of salts given below and answer the questions that follow.

P. NaHSO_4

Q. $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$

R. CaCl_2

S. $\text{Zn}(\text{OH})\text{Cl}$

T. KH_2PO_4

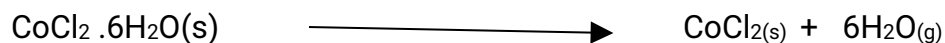
(a) State which of the salts above is:

(i) Acidic

(ii) Normal

(iii) Basic

(b) salt Q undergoes the reaction in the equation below.



(i) Identify the type of reaction undergone by Q in the equation above.

(ii) Suggest one practical application of the solid product from the above reaction.

23. (a) copper (ii) sulphate -5-water was left exposed in air for some days.

(i) State what is observed.

(ii) Give a reason for your answer in a(i) above.

(b) Aqueous sodium hydroxide was added drop-wise until in excess to a solution of copper (ii) Sulphate.

(i) State what was observed.

(ii) Write an ionic equation for the reaction that took place.

(c) (i) Name one reagent other than sodium hydroxide that you could use to distinguish between copper (ii) and aluminium (iii) ions.

(ii) State what is observed in c(i) above.

24. Complete the table below.

Element	Formula	Class	Type
Sulphur			
Aluminium			
Sodium			
Lead			
Hydrogen			
Iron			

Copper			
Zinc			
Nitrogen			

25. (a) An acid and a base react to form salt, water and heat.

(i) Write an ionic equation for a reaction between an acid and a base.

(ii) Name the type of reaction.

(iii) Give one application of the reaction in industry or home.

(b) Sulphuric acid react with sodium hydroxide in the mole ratio 1:2.

(i) Write equation for the reaction

(ii) Calculate the mass of sodium hydroxide required to produce 67g of sodium sulphate.

END.