STANDARD HIGH SCHOOL ZZANA

O LEVEL CHEMISTRY SEMINAR QUESTIONS

Instructions

- **Attempt all questions and forward scanned answers to stahiza2020@gmail.com**

1. Describe the method you would use in the laboratory to prepare a pure sample of

(i) Potassium nitrate.

(ii) Copper (II) carbonate.

b) What is meant by the term solubility of the salt?

c) The table below shows the solubility of potassium nitrate at various temperatures

Temperature/^{O}C	0	10	20	30	40	50	60	70
Solubility/g per 100g of water	13	24	32	46	64	86	110	138

(i) Plot the graph of solubility of potassium nitrate against temperature.

d) From your graph, determine;

(i) The solubility of potassium nitrate at 44 ^{O}C.

(ii) The temperature at which the solubility of potassium nitrate is 100g per 100g of water.

e) Calculate the amount of potassium nitrate which would crystallize out of solution when cooled from 63 ^{O}C to 25 ^{O}C.

2. a) Name two ores from which iron can be extracted.

(b) Briefly how cast iron can be obtained from one of the ores you have named in (a) in a blast furnace using coke and limestone.

c) Iron(II)(III) oxide, Fe_3O_4, can be reduced by hydrogen according to the following equation

$$Fe_3O_4(s) + 4H_2(g) \rightleftharpoons 3Fe(s) + 4H_2O(l)$$

(i) State the conditions under which the reduction takes place.

(ii) Determine mass of iron that would formed when 10.5g of Iron (II) (III) oxide was reduced by hydrogen.

d) State what would be observed and in each case write and equation for the reaction that would be take place when:

(i) Excess dry hydrogen chloride is passed over strongly heated iron wire.

(ii) Excess chlorine is passed over strongly heated iron wire.

e) State two uses of iron.

3. (a) Write the equation to show how ethene can be prepared from ethanol and state the conditions for the reaction.

b) Ethene was bubbled through bromine water.

(i) State what was observed.

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

c) Polyethene is a synthetic polymer which can be manufactured from ethene.

(i) Name the process by which ethene is converted to Polyethene.

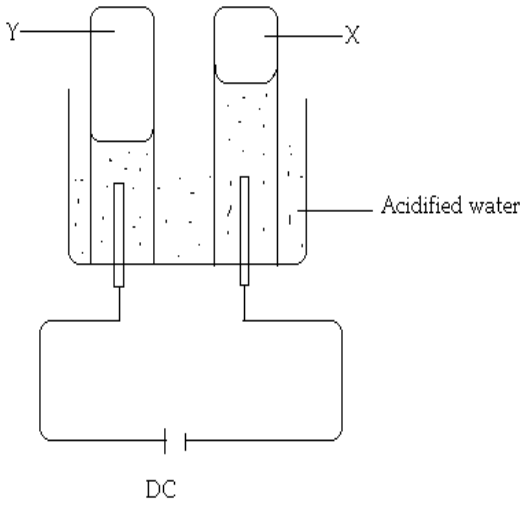
(ii) Write the equation leading to the formation of Polyethene from ethene.

(iii) State one industrial use of Polyethene.

d) Name one natural polymer and state its use.

e) Distinguish between the terms *thermosetting* and *thermosoftening plastics* and give one example of each case.

4. a) The set up below is the voltammeter electrolysis of acidified water using inert electrodes.



(i) Name the suitable pair of electrodes that may be used.

(ii) Identify the major anion and cation present in the solution.

b) Write the ionic equations for the reactions that take place at the electrodes.

c) Explain the reason for the difference in volumes of gases X and Y.

d) A current of 0.65A was passed through dilute sulphuric acid for 1½hour and 20 seconds.

i) State what would be observed and write equations for reactions at the electrodes.

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

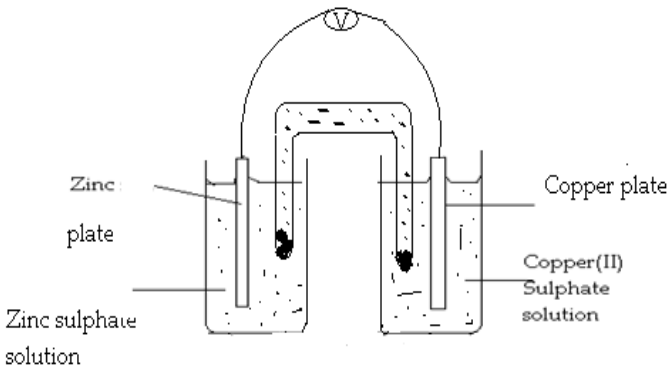
iii) Calculate the mass of substance deposited at the cathode.

e) (i) What is meant by the term electroplating?

(ii) Draw a set up of the apparatus you would use to electroplate an iron spoon with copper.

(i) State two reasons for electroplating.

5. The following diagram is a voltaic cell, which is an electrochemical cell.



a) Write down the equations occurring at each plate.

b) On the diagram,

(i) Mark the negative and positive electrode.

(ii) Show the direction of the flow of electrons

c) State the purpose of the salt bridge.

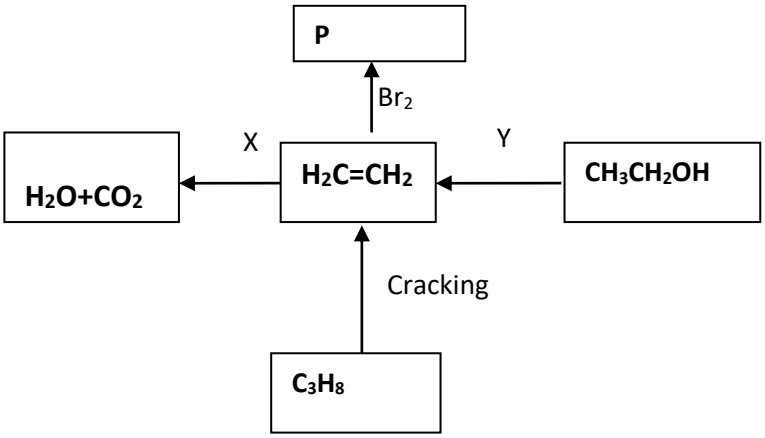
d) Write the overall for the reaction that takes place in the cell.

e) Giving suitable examples explain the three factors that determine the discharge of ions at an electrode.

f) Explain why crystals of copper(II)sulphate does not conduct electricity while aqueous copper(II)sulphate conducts.

g) Copper(II)sulphate solution was electrolysed using copper electrodes. Explain the reactions that take place at each electrode indicating observations and equations.

6. Study the scheme below and answer the questions that follow.



a) Give structure and name of P.

b) (i) State the processes X and Y.

(ii) Write the equation for the process X.

c) State the conditions for process Y to take place.

d) (i) Name the other product of cracking of C_3H_8.

(ii) Briefly state how this product is prepared in the laboratory.

e) Ethene undergoes addition polymerization to form a plastic man uses in everyday life.

(i) Define addition polymerization.

(ii) Name the plastic formed the polymerization of ethene.

(iii) Give one environmental concern of the plastic you have named in (ii) above.

7. With the help of a labeled diagram, describe how a sample of dry hydrogen chloride gas can be prepared in the laboratory.

b) A jar full of Hydrogen Chloride gas was inverted over jar full of ammonia;

(i) State what was observed.

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

c) Describe, with a labelled diagram, an experiment to that ammonia diffuses faster than hydrogen chloride.

d) Explain the following observations:

(i) A white precipitate is formed when aqueous hydrogen chloride is added to Silver nitrate solution.

(ii) A blue litmus paper dipped in jik turns red ant then white.

i) An aqueous solution of hydrogen chloride forms effervescence with sodium carbonate solution whereas solution of hydrogen chloride in methyl benzene shows no observable change.

ii) Anhydrous iron(II)chloride cannot be prepared by direct synthesis using chlorine and iron.

8. a) Describe how soda ash is manufactured.(no diagram is required)

b) State how washing soda crystals are obtained from soda ash.

c) Kasepiki left washing soda crystals, $Na_2CO_3.10H_2O$ on a Petri dish for sometime and they turned into a white powder. He dissolved 1.59g of this powder in distilled water, and the solution was made to 250 cm^3. 25.0 cm^3 of this solution required 25.6 cm^3 of 0.1M hydrochloric acid for complete reaction,

i. Calculate the number of moles of hydrochloric acid used in this experiment.

ii. Calculate the number of moles of sodium carbonate solution in 25.0cm^3

iii. Determine the mass of sodium carbonate in 250cm^3 of solution.

iv. Given that the formula of the powder dissolved is $Na_2CO_3.xH_2O$, determine the value of x (Na =23, C = 12, O = 16, H=1)

9. Dilute sulphuric acid was added to Copper (II) oxide in a beaker until there was no further change.

a) State what observed.

b) To a portion of resultant solution in (a) was added iron filings.

i. State what was observed.

ii. Explain your observation in (b) (i)

iii. Write the equation for the reaction that took place in (b) (i)

c) To the product in (b) was added sodium hydroxide solution dropwise until in excess

(i) State was observed.

(ii) Write the equation for the reaction.

d) A green powder P is insoluble in water but dissolves in dilute sulphuric acid with strong effervescence, forming a blue solution.

(i) Suggest the cation and anion in the powder P.

(ii) Describe the tests that you would carry out to confirm the ions in the powder and state the expected observations.

10. A compound consists of 26.7% carbon and 2.2% hydrogen by mass, the rest being oxygen.

a) Calculate the empirical formula of S. (C =12, H =1, O = 16)

b) An aqueous solution of S turns blue litmus paper red.

i. Suggest how the pH value of a 2M aqueous solution of S would compare with the pH value of a 2M hydrochloric acid. Give the reason for your suggestion.

ii. Predict how S would react with sodium hydrogen carbonate.

iii. Write an ionic equation for the reaction you have predicted in (ii) above

c) 20.0cm^3 of a solution containing 4.5g per dm^3 of the solution required exactly 25.0cm3 of 0.08M sodium hydrogen carbonate for complete reaction. (1 mole of S requires 2 moles of sodium hydrogen carbonate) Calculate

i. The concentration of S in moles per dm^3

ii. Molar mass of S

d) Determine the molecular formula of S.

e) Calculate the volume of carbon dioxide formed when 10 cm^3 of methane is burnt in 40 cm^3 of oxygen at room temperature and pressure.

11. The positions of elements A, B, C, D, E F and G are shown in the Periodic Table below. These letters are not the symbols for these elements.

I	II							III	IV	V	VI	VII
A										H		D
F	B								E		C	
							G					

a) Name the type of bonding that takes place between elements;

(i) B and D.

(ii) E and C.

(iii) F.

b) Which of the following elements

(i) Is the strongest reducing agent

(ii) Is strongest oxidizing agent.

(iii) Forms coloured compounds.

c) Write formula of the compound formed between B and D.

d) Draw the electronic structures of the compounds formed between

i. F and C.

ii. C and H.

e) State 3 differences between covalent and ionic compounds.

12. a) Distinguish between the following

(i) Addition polymerization and condensation polymerization.

(ii) Fats and oils.

(iii) Natural and synthetic.

(iv) Soap and detergent.

b) Describe the process by which soap is made.

(i) State what is observed when soap is added a solution containing calcium hydrogen carbonate and write the equation for the reaction.

(ii) What name is given to the main product above?

(iii) State two chemical ways of reducing hardness in water and write equations for the reaction.

c) Define the term vulcanization.

(i) State three importance of vulcanization.

(ii) State two uses of vulcanized rubber.

d) (i) Define the term fermentation.

(ii) Write an equation for the reaction that takes place during fermentation.

(iii) Describe briefly how in your locality a local alcoholic drink can be prepared.

(iv) State the method by which crude alcohol can be concentrated.

13. (a) Describe how a dry sample of chlorine gas is prepared in a laboratory from Manganese(IV)oxide.

b) State what is observed and write an equation for the reaction when dry chlorine is passed through/over the following.

(i) Burning magnesium.

(ii) Hydrogen sulphide.

(iii) Iron(II)chloride solution.

(iv) Dilute sodium hydroxide solution.

(v) Turpentine.

c) (i) Describe the bleaching action of chlorine.

(ii) State three uses of chlorine.

e) Conc. sulphuric acid was added to solid Y and a colourless gas X was formed which fumed in air. Identify.

(i) Gas X

(ii) Solid Y

(iii) Write the equation leading to the formation of gas Y.

(iv) Name the product formed when gas Y is dissolved in water.

f) Describe how dry sample of iron(iii)chloride can be prepared in the laboratory.
(no diagram is required)

14. a) Describe how a dry sample of ammonia can be prepared in a laboratory.

b) State what is observed and write the equation for the reaction when dry ammonia is passed over heated lead(IV)oxide in a combustion tube

c) Air was passed over heated copper in a combustion tube, then through a bottle containing concentrated sodium hydroxide solution and the remaining gas X was collected over water.

(i) State the role of copper and sodium hydroxide and write the equations for the reactions.

(ii) Identify gas X

(iii) State what is observed and write the equation for the reaction when burning Magnesium is passed through gas X

(iv) The product in (iii) above was dissolved in water. Write the equation for the reaction and state the effect of the solution on phenolphthalein indicator.

c) 6.62g of lead(II)nitrate was heated strongly in a boiling tube.

(i) State what was observed and write the equation for the reaction.

(ii) Calculate the mass of the residue.

d) State what is observed and write the equation for the reaction when lead(II)nitrate solution is added to the following.

(i) Zinc chloride.

(ii) Sodium sulphate and mixture heated.

(iii) Potassium iodide.

e) (i) State what is observed and write the equation for the reaction when conc. nitric acid is added to Copper metal

(ii) The gaseous product in (i) above was dissolved in water. Write the equation for the reaction and state the effect of the solution on litmus paper.

(iii) Write the equation for the reaction between nitric acid and ammonia and state one use of the product formed.

15. a) Describe how sulphur is extracted by use of Frasch process

b) Write equations to show how fuming sulphuric acid can be obtained from sulphur.

c) State what is observed when conc. sulphuric acid is added to:

(i) Hydrated copper(II)sulphate

(ii) Sugar.

d) (i) Using a well labelled describe how a dry sample of sulphur dioxide is prepared in the laboratory.

(ii) Write the equation for the reaction

(iii) Describe a test that can be carried out to confirm the presence of Sulphur dioxide

e) State what is observed when sulphur dioxide is bubbled through:

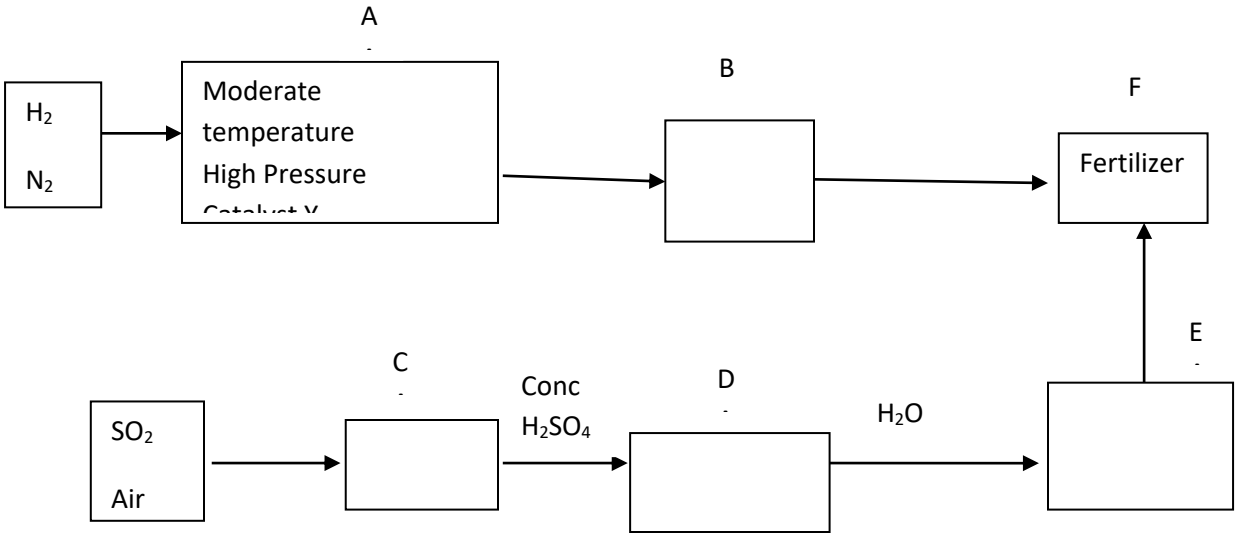
i) Saturated Hydrogen sulphide solution.

ii) Acidified potassium dichromate.

iii) Acidified potassium manganate(VII).

f) The figure below represents a flow chart for the manufacture of a fertilizer.

A, B, C, D, E and F are some of the important parts of the plant.



i) Name catalyst Y

ii) Write an equation to show how the product at B is formed.

iii) State the three conditions for the reaction at C.

iv) Identify the product at C

v) Write an equation to show how the product at D is formed.

vi) Name the product at E

vii) What is the use of water at E?

viii) Write an equation to show the reaction that takes place at F

ix) Name the fertilizer formed at F

x) Calculate the percentage of nitrogen in the fertilizer.

16. a) (i) Define the term enthalpy of combustion.

ii) With the aid of a labelled diagram describe an experiment you would carry out in the laboratory to determine the enthalpy of combustion of propanol

iii) In an experiment to determine the enthalpy of combustion of propanol, 0.54g of propanol were burnt and the heat evolved caused the temperature of 150 cm^3 of water to rise from 30^0C to 51.5^0C. Calculate the enthalpy of combustion of propanol

(Molar mass of propanol = 60, Density of water =$1g/cm^3$,S.H.C of water=$4.2Jg^{-1o}C^{-1}$)

b) (i) Define the term enthalpy of neutralization.

ii) 50.0cm^3 of a 0.2M hydrochloric acid was added to 50.0cm^3 of 0.2M potassium hydroxide in a plastic beaker and the temperature of the resultant solution rose by 13^oc

(iii) Write the ionic equation for the reaction.

(iv) Why was a plastic beaker used?

(v) Calculate the enthalpy of neutralization of hydrochloric acid.

c) The theoretical molar heat of neutralization of hydrochloric acid by sodium hydroxide is 57.3 $kJmol^{-3}$ while that of ethanoic acid by sodium hydroxide is 56.1 kJ mol^-. Explain this difference.

17. a (i) What is meant by the term *Rate of a chemical reaction*.

ii) State and explain any three factors that affect the rate of a chemical reaction.

b) A specific volume of 0.2M sulphuric acid was added to excess magnesium powder, resulting into evolution of 120cm^3 of a gas at room temperature and pressure.

(i) Draw a labelled diagram of the apparatus that can be used to collect the gas and the gas volume used to determine the rate of the reaction.

(ii) Write an equation for the reaction.

d) Calculate the

(i) Mass of the magnesium powder used in the reaction.

(ii) Volume of 0.2M sulphuric acid added in the reaction.

e) (i) Draw a graph of volume of hydrogen against time when excess Magnesium powder to the same volume of 0.2M sulphuric acid and label the graph P.

(ii) On the same axes draw a graph of volume of hydrogen against time when excess magnesium ribbon is added to the same volume of 0.2M sulphuric acid and label the graph Q

(iii) Explain the difference between the two graphs.

f) The results below are obtained during the reaction between excess powder calcium carbonate and dilute hydrochloric acid

volume of CO_2/ cm^3	0	20	35	47	56	64	69	73	77	79	80	80
Time /seconds	0	10	20	30	40	50	60	70	80	90	100	110

(i) Plot a graph of volume of carbon dioxide evolved against time

(ii) Explain the shape of the graph.

(iii) Determine the rate of evolution of CO_2 at 20 and 50 seconds and explain the difference in the two rates.

(iv) How long did it take for 40cm^3 of carbon dioxide to be formed?

(v) What volume of gas was formed after 15 seconds?

18. (a) Carbon can naturally exist as graphite, diamond, soot, coke or charcoal

(i) What name is given to these different forms of carbon?

(ii) State two chemical properties of carbon. Include equations to illustrate your answer.

(iii) Draw a simplified structure of graphite.

(b) Carbon dioxide gas can be prepared by reacting marble chips with dilute hydrochloric acid.

(i) Draw a well-labelled diagram for the set up of apparatus used to prepare a dry sample of carbon dioxide gas.

(ii) Write the ionic equation for that reaction leading to the formation of carbon dioxide.

(c) Explain what would be formed when carbon dioxide is bubbled through aqueous solution of sodium hydroxide.

(d) State two uses of carbon dioxide.

e) In Eastern Uganda, calcium hydrogen carbonate is found in tap water.

(i) Explain how Calcium hydrogen carbonate enters the water.

(ii) This water is found to waste soap during washing, how can this water be treated in order to reduce soap wastage?

19. (a) Describe how the percentage of oxygen by volume in air can be determined.

(b) Explain how oxygen is prepared on a large scale.

(c) State what is observed when the following are separately lowered into a jar of oxygen. Write the equation in each case

(i) Burning sulphur.

(ii) Ignited sodium.

(iii) Hot iron

d) Water is added to the product in c (ii) and the resultant solution it's tested with a litmus paper. State what happens and write the reaction for the reaction that occurs.

e) How and under what conditions does each of the following react with water and write the equation for the reaction in each case.

(i) Sodium.

(ii) Magnesium.

(iii) Carbon.

20. a) i) What is water pollution?

ii) How can water be polluted?

(iii) Describe the major steps in purification of water.

b) i) What is meant by the term *Sewage*?

(ii) Describe how urban sewage is treated?

(iii) One of the products of sewage treatment is sludge; state its use to the society?

c) Explain what is meant by the terms;

(i) Biomass.

(ii) Biogas.

d) State three advantages of using biogas as a fuel instead of charcoal.

e) State three factors you would consider when choosing a good fuel.