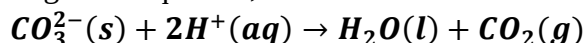


S.3 and S.4 CHEMISTRY REVISION QUESTIONS 2020

1. (a) Sodium is extracted from its ore by electrolysis of the ore. Calcium chloride is added to the ore prior its electrolysis. The ore is then electrolyzed in a cell having an iron gauze cylinder between the anode and cathode.
 - (i) Name the sodium ore; and state the role of the calcium chloride.
 - (ii) State the condition(s) under which the ore is electrolyzed.
 - (iii) Name the substance(s) used as the anode and cathode respectively, for the electrolysis of the sodium ore.
 - (iv) Write equation(s) for the reaction(s) that take place at the cathode and the anode respectively.
 - (v) State the purpose of the iron gauze cylinder
 - (vi) The sodium produced is collected under dry nitrogen gas. Give a reason.
 - (vii) Name the by product during the extraction of sodium
- (b) State the use of;
 - (i) Sodium
 - (ii) The by product
- (c) When sodium is exposed to air, a white solid develops on the surface,
 - (i) State the identity of the white solid
 - (ii) Write equation(s) only, to show the reaction(s) which lead(s) to the development of the white solid.
- (d) Write equation for the reaction that would take place if burning sodium was lowered into a gas jar containing.
 - (i) Oxygen
 - (ii) Hydrogen
2. (a) State what the term ‘Hydrocarbon’ means.
- (b) When a gaseous hydrocarbon, J was burnt in excess oxygen, 6.6g of carbon dioxide and 2.7g of water were produced.
 - (i) Calculate the empirical formula of J (C=12 and O=16)
 - (ii) Determine the molecular formula of J (1 mole of J weighs 42g)
 - (iii) Name J
- (c) Write the structural formula of;
 - (i) J
 - (ii) Ethane
- (d) Name one reagent that can be used to distinguish J from ethane. State what would be observed in each case if J and ethane were treated with the reagent you have named.
- (e) Incomplete combustion of J can cause environmental pollution. Give a brief explanation.
3. (a) Name a gas
 - (i) X which is produced when charcoal is burnt in a limited amount of oxygen
 - (ii) Y which is produced when sodium reacts with water
- (b) Write equations to illustrate the reaction in (a) above.

- (c) State;
- One chemical property, which shows differences between X and Y
 - Two chemical properties which shows similarity between X and Y
- (d) Y can react with Nitrogen gas forming a gas Z on large scale;
- Identify gas Z
 - Write an equation leading to formation of Z on large scale.
4. (a) Fermentation is one of those reactions which increase the concentration of carbon dioxide in the atmosphere. State;
- One difference between fermentation and combustion.
 - Two uses of the non-gaseous product of fermentation.
- (b) Name one process during which concentration of carbon dioxide in the atmosphere decreases.
5. (a) Sodium hydroxide solution forms a white precipitate, when left in an open reagent bottle for some time. Name the white precipitate. State
- The main purpose for which sodium hydroxide is used as a laboratory reagent
 - One commercial use of sodium hydroxide
- (b) Aqueous sodium carbonate solution is a mixture of carbonic acid and sodium hydroxide.
- State whether the PH of the solution would be; below 7, equal to 7 or above 7
 - Give a reason for your answer in (b)(i) above.
6. (a) Write equation for the reaction that takes place when chlorine is bubbled into water.
- (b) A gas tube filled with the solution of chlorine was inverted in a beaker of water and left for some time in bright sun light
- State what was observed
 - Explain your observation in (b)(i).
- (c) Dry chlorine was passed over strongly heated iron wire. State what was observed and write equation for the reaction that took place.
- (d) State the condition(s) in each case and write the equation for the reaction of chlorine with;
- Sulphur
 - Turpentine
- (e) Write an equation for the reaction which can show that chlorine is more reactive than Bromine
7. (a) Lemon juice turns blue litmus paper pink, which means it contains a weak acid.
- Define the term ‘acid’.
 - State what is meant by the term ‘weak acid’
 - Write the name of the acid that is in lemon juice.
- (b) Limestone is an impure calcium carbonate which is often used in the laboratory preparation of carbon dioxide because it readily reacts with acids, forming the gas according to the following ionic equation;



- (i) State the condition(s) under which acids react with limestone
 - (ii) Briefly explain why sulphuric acid is not suitable for preparing carbon dioxide from limestone
 - (iii) Explain how carbon dioxide can be dried and collected during its preparation
- (c) During the preparation of carbon dioxide, excess hydrochloric acid was added to 3.0g of a sample of limestone which yielded 288cm^3 of the gas at room temperature. Calculate the percentage purity of the limestone. (C=12, O=16, Ca=40; 1 mole of a gas occupies 24dm^3 at room temperature)
8. (a) Soot is a form of carbon
- (i) Write an equation for the complete combustion of soot in oxygen.
 - (ii) Calculate the volume of gas produced at room temperature, when 0.6g of soot is burnt in excess oxygen (C=12; 1 mole of gas occupies 24.0dm^3 at room temperature).
 - (iii) Deduce the volume of the gas that would be produced at room temperature if the same mass of graphite was burnt in excess oxygen.
 - (iv) Give a reason for your answer in (a)(iii) above.
- (b) State one industrial use of graphite.
9. (a) Write an equation to the reaction that would take place leading to the formation of Hydrogen if;
- (i) Acidified water was electrolyzed
 - (ii) Potassium was added to water
 - (iii) Zinc granules are dissolved in a dilute acid.
- (b) Dry hydrogen was passed over strongly heated copper(II)oxide.
- (i) State what was observed
 - (ii) Write an equation for the reaction that took place.
 - (iii) Name one non metal substance that would react with copper(II)oxide in the similar way to hydrogen.
10. When excess iron fillings were added to 200cm^3 of 0.5M of copper(II)sulphate solution in a plastic cup, the temperature of the solution rose by 17.9°C .
- (a) Write an ionic equation for the reaction that took place.
 - (b) Suggest a reason why a plastic cup was used instead of a metallic cup.
 - (c) (i) Calculate the enthalpy change for the reaction between iron fillings and copper(II) sulphate solution (O=16, S=32, Fe=56, Cu=64, density of water is 1g/cm^3 and the Specific Heat Capacity of water= 4.2 J/K)
 - (ii) State any assumption(s) you have made in the calculation of (c)(i)
11. The atomic number of elements X, Y and Z are 18, 16 and 19 respectively
- (a) State the;
 - (i) Group in the periodic table to which X belongs
 - (ii) Valency of Y
 - (iii) Period in the periodic table to which Z belongs
 - (b) Write the formula of the compound formed when X reacts with;
 - (i) Y

- (ii) Z
- (c) State one physical property of the compound formed between X and Y in which it differs from the compound between Z and X.
12. (a) A mixture of iron fillings and sulphur was heated strongly. Write equation for the reaction that took place.
- (b) Dilute sulphuric acid was added to the product in (a)
- (i) State what was observed
- (ii) Write equation for the reaction that took place
- (c) One of the substances formed in reaction (b)(ii) pollutes air
- (i) Identify the substance
- (ii) Give one reason why the substance pollutes air
13. A gaseous organic compound J contains 82.76% carbon, the rest being hydrogen.
- (a) To which group of the organic compounds does J belong
- (b) Calculate the empirical formula of J (C=12, H=1)
- (c) 140cm^3 of J weighed 0.363g at s.t.p. Determine the molecular formula of J (1 mole of a gas occupies 22400cm^3) at s.t.p.
14. State what would be observed and write ionic equation for the reaction that would take place if Hydrogen chloride gas was bubbled through aqueous;
- (a) Sodium hydrogen carbonate
- (i) Observation
- (ii) equation
- (b) silver nitrate
- (i) observation
- (ii) equation
15. (a)(i) Name one process by which ethanol can be produced from sugar
- (ii) Write equation for the production of ethanol by the process you have named in (a)(i)
- (b) Ethanol can be converted to ethene by dehydration
- (i) State the conditions under which the reaction takes place.
- (ii) Write the equation for the reaction leading to the formation of ethene from ethanol
- (iii) Name the reagent that can be used to confirm the presence of ethene formed by the above reaction and state what would be observed if the reagent is treated with ethene
- (iv) Write an equation for the reaction in (b)(iii)
16. Name one reagent that can be used to differentiate between the following pairs of ions and in each case state what would be observed when each of the ions is treated separately with the reagent you have named;
- (a) HCO_3^- and CO_3^{2-}
- (i) Reagent
- (ii) Observation
- (b) Pb^{2+} and Zn^{2+}
- (i) Reagent
- (ii) Observation

- (c) SO_4^{2-} and Cl^-
- Reagent
 - Observation
- (d) Fe^{2+} and Fe^{3+}
- Reagent
 - Observation
17. (a) Distinguish between the terms ‘anode’ and ‘cathode’
- (b) Explain why copper(II)chloride in solid form does not conduct electricity whereas in molten form it does.
- (c) Dilute solution of copper(II)chloride was electrolyzed using graphite as electrodes
- State what would be observed at the cathode
 - Write an equation for the reaction in the cathode and anode respectively
- (d) Describe how the product at the anode can be identified
- (e) The electrolysis of dilute copper(II)chloride was repeated for some time using copper instead of graphite as the electrodes
- State what was observed at the anode and cathode respectively
 - Write equation to support your observation at the anode
- (f) State one factor other than change of electrode from graphite to copper that would affect the products of electrolysis of copper(II) chloride solution and indicate how it would affect the process.
18. (a) Describe how a dry sample of hydrogen can be prepared in the laboratory(Diagram is not required)
- (b) Hydrogen burns in air to form a liquid L
- Identify L
 - Name a reagent that can used to test for L and state what would be observed if L was treated with the reagent you have named.
- (c) Write equation to show the reaction of hydrogen with chlorine.
- (d) State the conditions under which hydrogen can react with copper(II)oxide and write the equation for the reaction.
- (e) Hydrogen reacts with iron(II, III) oxide according to the following equation
- $$Fe_3O_4(s) + 4H_2(g) \rightarrow 3Fe(s) + 4H_2O(l)$$
- Calculate the volume of hydrogen measured at room temperature that would be required to produce 3.36g of Iron. (Fe=56, 1mole of a gas occupies 24dm³ at room temperature)
- (f) State one industrial use of hydrogen
19. (a) Aluminium oxide is an amphoteric oxide.
- Define the term amphoteric oxide
 - Write equation to show the reaction of Aluminium oxide with dilute nitric acid.
 - Give two examples of Amphoteric oxide other than Aluminium oxide.
- (b) With the aid of an equation, describe how a pure dry sample of Aluminium sulphate crystals can be prepared in the laboratory, starting from Aluminium oxide.
- (c) Hydrated Aluminium sulphate, $Al_2(SO_4)_3 \cdot nH_2O$ contains 9.7% of Aluminium. Calculate the value of n in the above formula. (Al=27, S=32, O=16, H=1)

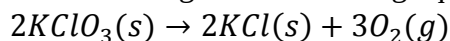
- (d) Ammonia solution was added drop wise until in excess to an aqueous solution of Aluminium chloride.
- State what was observed
 - Write an equation for the reaction that took place
- (e) (i) Name one reagent that can be used to distinguish between Aluminium ions and Lead(II) ions
- State what would be observed and write equation for the reaction that take place if any, when the reagent you have named in (e)(i) is treated separately with Aluminium ions and Lead(II) ions.
20. Haematite is one of the ores from which iron can be extracted
- Write the chemical formula of Haematite
 - During the extraction of Iron, roasted Haematite is mixed with coke and limestone. The mixture is fed into the blast furnace and a blast of hot air blown into the furnace from the bottom;
 - Write equation(s) for the reaction(s) in the blast furnace that lead to the formation of Iron.
 - Explain the role of limestone
 - Write equation for the reaction of iron with
 - Water
 - Hydrochloric acid
 - To the resultant mixture in the reaction in (c)(ii) was added dilute ammonia solution until the alkali was in excess. State what was observed and write the equation for the reaction that took place.
21. 7.5g of methane was completely burnt in air according to the following equation
- $$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l) \quad \Delta H = -890KJ/mol$$
- Calculate the volume of carbon dioxide formed at s.t.p
 - The heat evolved
22. (a) Barium sulphate can be prepared by reacting sodium sulphate and Barium chloride
- State the method of preparation being used
 - Write ionic equation for the reaction that takes place when the two compounds are reacted
- (b) Excess Barium chloride was added to a solution containing 3.55g of Sodium sulphate and the mixture filtered. Calculate the mass of the precipitate formed. (Na=23, S=32, O=16, Ba=137)
23. (a) Using a diagram, describe the laboratory preparation of dry chlorine by oxidation of Potassium manganate(VII).
- Litmus solution was poured into a gas jar of chlorine
 - State what was observed
 - Write a suitable equation, explain your observation in (b)(i) above
 - Chlorine gas was bubbled through water and the resultant solution exposed to bright sunlight in an inverted tin.
 - State what was observed.

- (ii) Write equation for the reaction that took place when the solution was exposed to sunlight
- (d) A gas jar of hydrogen sulphide was inverted over a gas jar of chlorine
 - (i) State what was observed
 - (ii) Write equation for the reaction that took place
- 24. (a) Describe how a pure sample of sodium carbonate can be obtained in the laboratory starting with dilute hydrochloric acid(Your answer should include equation for the reaction)
- (b) Concentrated solution of sodium carbonate was added to water containing calcium ions.
 - (i) State what was observed.
 - (ii) Write equation for the reaction that took place.
- (c) 15.0g of a mixture of sodium carbonate and sodium sulphate was added to distilled water in a volumetric flask and the solution made up to 1000cm^3 with distilled water. 25cm^3 of this solution required 12.5cm^3 of 0.2M sulphuric acid for complete reaction;
 - (i) Write equation for the reaction that took place
 - (ii) Calculate the mass of sodium carbonate in the mixture
 - (iii) Find the percentage of sodium carbonate in the mixture
- 25. (a) What is meant by the term rate of reaction
- (b) Briefly describe an experiment that can be carried out to determine the effect of concentration on the rate of reaction between sodium thiosulphate and dilute hydrochloric acid.
- (c) In order to determine the rate of reaction between magnesium and 0.1M hydrochloric acid, the acid was added to magnesium powder;
 - (i) Sketch the graph of volume of the gas produced against time for the above reaction and label it X.
 - (ii) Using the same axes, sketch a graph of volume against time if magnesium ribbon is used instead of magnesium powder and label it Y.
 - (iii) Explain the difference between the two curves X and Y
- (d) Magnesium ribbon was put in a test tube containing 120cm^3 of 2M nitric acid until the evolution of the gas stopped. Calculate the mass of magnesium that reacted with the acid.
- 26. Explain the following observations
 - (a) A solution of Barium chloride reacts with sodium sulphate to give a white precipitate insoluble in dilute hydrochloric acid, whereas a solution of Barium chloride reacts with sodium sulphite to give a white precipitate that dissolves in dilute hydrochloric acid.
 - (b) At low temperature (100°C), nitrogen does not react with magnesium. However it reacts with burning magnesium to form a white solid which dissolves in water evolving a colourless alkaline gas
 - (c) When sodium hydroxide solution is added to a solution containing zinc sulphate, a white precipitate soluble forming a colourless solution is formed.
 - (d) Dilute sulphuric acid conducts electricity but concentrated sulphuric acid does not.
- 27. Copper(II) oxide and copper can both react separately with sulphuric acid under certain conditions;

- (a) State the conditions for the reaction of sulphuric acid with
- Copper(II) oxide
 - Copper
- (b) State what is observed and in each case write an equation for the reaction when sulphuric acid reacts with;
- Copper(II)oxide
 - Copper
- (c) Write an ionic equation for the reaction when sodium hydroxide is added drop wise until in excess to the product of reaction in (b)(i).
28. Lead (II) nitrate reacts with Barium hydroxide solution according to the following equation.
- $$Pb(NO_3)_2(aq) + Ba(OH)_2(aq) \rightarrow Pb(OH)_2(s) + Ba(NO_3)_2(aq)$$
- 30.0 cm³ of 0.1M lead(II) nitrate solution were added to 20cm³ of 0.1M Barium hydroxide solution. The mixture was stirred, filtered and the residue dried. Calculate;
- The number of moles of Lead(II) ions used.
 - The number of moles of hydroxide ions used.
 - The maximum mass of the dried residue.
29. Oxygen gas can be prepared in the laboratory from the reaction of hydrogen peroxide solution.
- Write an equation of reaction that takes place
 - State how oxygen gas can be identified in the laboratory
 - Briefly describe an experiment that can be carried out to show that the rate at which oxygen is evolved from hydrogen peroxide depends on temperature.
 - State two other factors that can affect the rate of formation of oxygen from hydrogen peroxide.
 - State what would be observed if excess oxygen is passed over;
 - Burning sulphur
 - Heated iron wire.
 - Write an equation for the reaction that took place in (c)(ii)
 - State one;
 - Process that increases the concentration of oxygen in the atmosphere
 - Use of oxygen gas.
30. The atomic numbers of elements M, X and Q are 6,11 and 17 respectively;
- Define the term atomic number
 - Write the electronic structures of M, X, and Q
 - Q and M can each combine with X to form compounds;
 - Use the valence electrons to explain briefly how the atoms Q and X, Q and M combine.
 - Write the formulae of the compounds formed when atom X combines with oxygen. (O= 8)
 - State two properties of the compounds formed between
 - Q and X

(ii) Q and M

31. Potassium chlorate decomposes according to the following equation

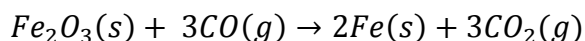


- (a) Name a catalyst for the reaction above
- (b) When potassium chlorate was heated to a constant mass, 1.8dm^3 of oxygen gas, measured at room temperature and pressure was formed;
- (i) Why did the mass become constant
- (ii) Calculate the mass of potassium chlorate that decomposed
32. (a) Draw a labeled diagram for the laboratory preparation of dry ammonia gas
- (b) Dry ammonia gas was passed over heated copper(II) oxide,
- (i) State what was observed
- (ii) Write an equation for the reaction that took place
- (iii) Name another oxide which behaves like copper(II) oxide in this reaction
- (c) (i) Name the process by which ammonia is prepared in a large scale
- (ii) State the optimum conditions for the process in (c)(i) above
- (iii) State two conditions which affect the equilibrium way of ammonia in the process in (c)(i) above.
- (iv) Explain how one of the conditions that you have stated in (c)(iii) above affect the equilibrium yield of ammonia.
- (d) State one use of ammonia prepared on large scale.
33. (a) Starting with sulphur, describe how sulphuric acid is manufactured.
- (b) Write one equation of reaction in each case, in which sulphuric acid behaves as;
- (i) An acid
- (ii) An oxidizing agent
- (iii) A dehydrating agent
- (c) (i) State what was observed when anhydrous iron(II)sulphate is strongly heated in a test tube.
- (ii) Write equation for the reaction in (c)(i) above.
34. (a) When a beaker containing concentrated ammonia was placed on a table for 20 minutes, the smell of ammonia was observed.
- (i) Name the process demonstrated.
- (ii) Give reasons for your answer in (a)(i) above
- (b) A test tube containing concentrated hydrochloric acid was brought near the mouth of the beaker in (a)
- (i) State what was observed
- (ii) Write an equation for the reaction that took place.
35. Figure 1, below shows part of the periodic table

I	II	III	IV	V	VI	VII	VIII
A		D				G	
	B					H	I

- (a)(i) Write down the formula of the oxide of D and state the type of bonding
(ii) Name the class of oxide to which the oxide of D belongs
(b) Identify the element which is the most reactive;
 (i) Non metal
 (ii) Metal
(c) Give a reason why element I is un reactive.

36. (a) Dry carbon dioxide was passed over heated sugar charcoal. Write an equation for the reaction that took place.
(b) 4.20g of heated Iron(III)oxide was treated with the gaseous product in (a)according to the equation.



Calculate the volume of carbon dioxide evolved at r.t.p. (Fe=56, O=16, C=12, 1 mole of a gas at r.t.p occupies 24dm³)

THE END

“This is just the beginning”