



JINJA JOINT EXAMINATIONS BOARD

MOCK EXAMINATIONS JULY/AUGUST 2024

54S/2 CHEMISTRY MARKING GUIDE

ASSESSMENT GRID

| s/n | Basis of assessment | Assessment criteria | scoring |
|--------|--|--|---------|
| a(i) A | Aim of the experiment | An experiment to investigate the effect of temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid | 02 |
| B | Variables of the experiment. | (DV) dependent variable: rate of reaction/time taken for the cross to disappear. (IV) independent variable: temperature of the reaction. (CV) Controlled variable: volume and concentration of sodium thiosulphate. | 03 |
| C | Hypothesis | Increase in temperature produces more sulphur in a specified time. OR More Sulphur is produced at high temperatures. | 02 |
| D | Procedure of the experiment with relevant materials. | a) A cross mark was written on a white sheet of paper using blue or black ink pen. b) 50cm ³ of sodium thiosulphate solution was added into a conical flask and stirred with a thermometer. The initial temperature of the solution was read and recorded. c) 5cm ³ of hydrochloric acid was added and a stop clock immediately started. The conical flask was swirled carefully and placed over the cross on the white sheet of paper. d) The cross was observed by looking down through the solution from above the conical flask. e) The stop clock was stopped when the cross just became no longer visible and the time read and recorded. f) The components of the conical flask were poured away and the conical flask cleaned thoroughly. | 03 |

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| | <p>g) Procedures (b) to (f) were repeated but warming the sodium thiosulphate up to 30°C, 40°C, 50°C and 60°C respectively.</p> <p>h) Values of $1/t$ were computed.</p> | |
| E | <p>Risks and mitigation</p> <p>Risk Use of damaged apparatus that can cause cuts. Mitigation Equipment was inspected before experiment.</p> <p>Risk Acid spills and contact with skin/ body Mitigation Put on lab coat, gloves and closed shoes.</p> <p>Risk Direct inhaling of acid fumes. Mitigation Wearing of a mask.</p> | <p>02</p> <p>04 scores</p> |

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|--|-------------------|-----------|-------|-------|-------|
| Presentation of data | 1 | 2 | 3 | 4 | 5 |
| Experiment number | Rt=24 | 30.0 | 40.0 | 50.0 | 60.0 |
| Temperature of mixture(°C) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| Volume of sodium thiosulphate (cm ³) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Volume of acid (cm ³) | 122.0 | 67.0 | 43.4 | 27.9 | 17.8 |
| Time taken for the cross to disappear (seconds) | 0.008 | 0.015 | 0.023 | 0.036 | 0.056 |
| Rate of reaction ,1/t (per second) | Recording of data | 04 scores | | | |

Data analysis and interpretation

A graph of $1/t$ against temperature is a straight line with a positive gradient. This indicates that rate of reaction increases with increase in temperature.

Conclusion

The higher the temperature of sodium thiosulphate, the higher the rate of reaction and thus the higher the amount of Sulphur produced within a short period of time.

End

BASIS OF ASSESSMENT

| Basis of assessment | Assessment criteria | Scoring |
|---|--|----------------------------------|
| Aim of the experiment | <ul style="list-style-type: none"> • Aim of experiment with both key words • Aim of experiment with one key word • No aim of the experiment | 02 01 00 |
| Variable for the experiment | <ul style="list-style-type: none"> • Independent, dependent and controlled • Independent and dependent or independent and controlled or dependent and controlled variable. • Independent or dependent or controlled • No variable | 03 02 01 00 |
| hypothesis | <ul style="list-style-type: none"> • Hypothesis related to experiment with both key words. • Hypothesis related to experiment with one key words. • No/ wrong hypothesis of the experiment | 02 01 00 |
| Procedure of the experiment | <ul style="list-style-type: none"> • Relevant material, relevant procedure, coherent procedure of the experiment. • Relevant materials and procedure • Either relevant materials or relevant procedure • No relevant material and procedure | 03 02 01 00 |
| Risks and mitigation | <ul style="list-style-type: none"> • Any one risk identified and mitigated • Any one risk identified or mitigated • Any one risk identified or mitigated • No risk identified or mitigated. | 02 01 01 00 |
| Presentation of data | <ul style="list-style-type: none"> • 2/3 of required sets of data appropriately presented. • 1/3 of required sets of data appropriately presented. • Data appropriately presented without required sets. • Data partially appropriately presented without required sets. • No set of data presented. | 04 03 02 01 00 |
| Recording of data | <ul style="list-style-type: none"> • Appropriate recording of data within the error margin. • Partial appropriate recording of data within the error margin • Appropriate recording of data outside the error margin • Partial appropriate recording of data outside error margin. • No data recorded/ data recorded outside error margin | 04 03 02 01 00 |
| Data analysis and interpretation | <p>Method used is:</p> <ul style="list-style-type: none"> • Appropriate accurate • Appropriate and partially accurate • Appropriate and inaccurate • Inappropriate and inaccurate • Conclusion based on data Interpretation • No conclusion | 03 02 01 00 01 00 |
| Conclusion | | |



JINJA JOINT EXAMINATIONS BOARD

Uganda Certificate of Lower Secondary Education

MOCK EXAMINATIONS JULY/AUGUST 2024

MARKING GUIDE 2024

5451 Chemistry paper 1

Item I

| S/N | BASIS OF ASSESSMENT | ASSESSMENT CRITERIA | SCORING |
|-----|---|--|---------|
| a | Category/type | Natural and artificial | 2 |
| b | Functions of the product (how it works) | <p>Preservatives slow down or prevents the growth of microorganisms by retarding their growth and extending food storage life.</p> <p>Or:</p> <p>salt draws waters from the cells of the microorganism and retards their growth.</p> <p>OR:</p> <p>Vinegar lowers PH to inhibit the growth of microorganisms.</p> <p>Flavouring-give/ strengthen taste/smell of a particular foods.</p> <p>Stabilizers, work by stabilizing emulsions through inhibition of reactants between chemicals in food.</p> | 2 |

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| | visual appeal to match customers expectation. Antioxidant prevent fats and oils from oxidation when fats stay for long. | |
| c | Dangers/side effects of the product Preservatives cause -asthma, allergies, carcinogen, increase risks of cardiovascular diseases some antioxidants are carcinogenic. Salt increases blood pressure. Flavours:- causes Headache, allergy, thirsty, nausea, chest pain, increase risks of leukemia. Food colouring causes - Allergy, hyperactivity, carcinogenic Sweeteners: cause Hyperactivity, allergic carcinogen Thickness cause -allergic reaction | 3 |
| D | Evaluation of product Similarities. -both make food delicious. -both can preserve food. -both restore the food colour | Differences -Natural additives are chemical compounds extracted from plants, animals, minerals while synthetic additives are not extracts but are |

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| | | result of chemical or enzymatic reaction i.e (not plant or animal) -Natural food additives are less effective in action than synthetic -Natural additives have fewer side effects than synthetic. |
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Item 2

Item 3

| SECTION B | | | scoring |
|-----------|---------------------|---|---------|
| S/N | Basis of assessment | Assessment criteria | |
| A | Raw materials | Nitrogen, hydrogen | 2 |
| | Process | <p>-Nitrogen from distillation of liquid air is reacted with hydrogen from natural gas in a ratio of 1:3 respectively to form ammonia by labour process. The reaction requires low temp. (450-500°C), high pressure (200atm) and finely divided Iron catalyst.</p> $N_2(g) + H_2(g) \rightleftharpoons 2NH_3(g)$ <p>-Ammonia produced is heated in air (O_2) in the presence of platinum catalyst forming nitrogen monoxide and water.</p> <p>-All these in the tank</p> $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(l)$ <p>-Nitrogen monoxide is further oxidized to nitrogen dioxide.</p> $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$ <p>Nitrogen dioxide is dissolved in water in presence of oxygen in a tank forming nitric acid.</p> <p>Nitric acid is heated with ammonia gas to form ammonium nitrate.</p> $NH_3(g) + HNO_3(g) \rightarrow NH_4NO_3(ag)$ | |

| | | The fertilizer is further concentrated and converted to solid form. |
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| | Side effects and mitigation | -Run off into water bodies increases algae growth, thus oxygen supply is cut off leading to suffocation of aquatic animals. |
| S/N | Basis of assertion | Assessment criteria |
| a) | Category of element or compound | <p>A material is substance or mixture of substances that constitute an object. It can be natural or artificial.</p> <p>Natural material is God-made/ exists in nature and its formation is not influenced by man eg rocks, sand, soil etc.</p> <p>Artificial material is man-made /synthetic manufactured by man eg plastics, glass etc</p> |
| b) | | <p>Materials to be used for making Kitchen utensils have different qualities based on their nature.</p> <p>Home utensil are made using the following</p> <ul style="list-style-type: none"> a) Steel /iron <ul style="list-style-type: none"> -it is very strong -high melting point -has high tensile strength. b) Aluminium <ul style="list-style-type: none"> -low density -good conductor of heat and electricity -high melting point -durable -bright appearance c) plastic <ul style="list-style-type: none"> -flexible and strong -can be molded -good insulators -some plastics do not easily melt d) Glass; <ul style="list-style-type: none"> -water proof -resistant to acids |

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| | | <ul style="list-style-type: none"> -transparent -strong -resistant to fire. | |
| | | <p>The choice of material for home utensils is independent on the purpose it is meant to serve.</p> <p>a) Iron for</p> <ul style="list-style-type: none"> - making sauce pans or boilers- plates -making spoons or forks -making cutting materials -making kettles and dishes <p>b) Aluminium for</p> <ul style="list-style-type: none"> -making sauce pans -making dishes -making kettles, cups, plades <p>c) Plastic used for</p> <ul style="list-style-type: none"> -making cups -making serving dishes -making forks and spoons (disposable) -making buckets, sieves, trays, water jars. <p>c) Glass is used for</p> <ul style="list-style-type: none"> -water glasses -serving dishes -plates and cups | |
| d | Choice of a material | <p>The materials used to make kitchen utensils have impact to the environment.</p> <p>a) Iron</p> <ul style="list-style-type: none"> -Depletes soil fertility when it accumulates. -Being a heavy metal can cause cancer. <p>b) Aluminum</p> | |

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| | <ul style="list-style-type: none"> -Depletes soil fertility when it accumulates. -Non-biodegradable mitigation promote use of recycled aluminum products. <p>c) Plastics;</p> <ul style="list-style-type: none"> -Non-biodegradable -spoils soil fertility when it accumulates in the soil. <p>Mitigation by recycling.</p> <p>d) Glass solid products can harm the environment if not properly managed mitigation is by recycling.</p> | |
| | <p>Mitigation by using organic fertilizers.</p> <ul style="list-style-type: none"> -when dissolve in water forms acid solution that alters soil PH. -hence low crop production. <p>Mitigation application of lime to neutralize the soil.</p> | |
| D | <p>Social benefit</p> <ul style="list-style-type: none"> -Employment opportunities leading to increased income among residents hence improved standards of living. -High levels of nutrients supplied leading to improved crop production hence better standards of living. -Government revenue leading to dev't of infrastructures like roads, hospitals, schools, electric lines. | |

Item 4

| S/N | Basis of assessment | Assessment criteria | scoring |
|-----|---------------------|---|---------|
| a | Raw materials | Sucrose (molasses), yeast | |
| | Process | <p>-calculated amount of water is added to molasses in container then yeast is added and then covered, it is left for 3 days.</p> <p>Sucrase in yeast converts glucose and fructose.</p> <p>Zymase enzyme in yeast catalyses the breakdown of glucose and fructose to crude ethanol and carbon dioxide.</p> $\text{C}_6\text{H}_{12}\text{O}_6 \text{(aq)} + 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2 \text{(g)}$ <p>-crude ethanol is converted to pure ethanol by fractional distillation.</p> | |
| | Side effects | <p>-Hot surface burns from distillation tanks cause;</p> <p>Wounds, hence pain to workers,</p> <p>Mitigation is by proper use of personal protective equipment.</p> <p>-Ethanol spills on the surface leading to falls and accidents.</p> <p>Mitigation is by appropriate use of personal protection equipment's.</p> | |

Item 5

| S/N | Basis of assessment | Assessment criteria | scoring |
|-----|---|---|---------|
| a | Identify category of natural resource, reason and example | Natural resources are categorized as Renewable and non-renewable resource. -renewable natural resource can be replenished eg air, water, dust -non-renewable resource cannot be replenished (get used up) eg fossil fuel, rocks/minerals. | |
| b | Composition of natural resource | Fossil fuels contain carbon, hydrogen -Air, contains Nitrogen, oxygen, carbon dioxide, rare gases -water, contains hydrogen and oxygen -rocks contains, iron, copper, calcium carbonate and other minerals like Gold, cobalt. | |

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| C | <p>impact of natural resources on the environment and how it occurs /chemicals and physical reactions and mitigation</p> <p>Air: some components of air pollute environment and cause global warming and carbon dioxide because it is a greenhouse gas thus traps heat in the atmosphere.</p> $C(s) + O_2(g) \rightarrow CO_2(g)$ <p>Mitigation;</p> <p>Increased afforestation to replace the cut trees which absorbs carbon dioxide from the atmosphere to reduce global warming.</p> <p>-carbon monoxide affects and its production can be reduced by using catalytic converters on exhausted pipes of cars and other fuel engines to reduce the poison in the environment.</p> <p>Water; it contains dissolved gases like oxygen and carbon dioxide. The carbon dioxide in it forms carbonic acid that makes water acidic. The acid rains dissolved or depletes rocks.</p> $CO_2(g) + H_2O(l) \rightleftharpoons H_2CO_3(aq)$ $H_2CO_3(aq) + CaCO_3(s) \rightarrow Ca(HCO_3)_2(aq)$ <p>The dissolved oxygen in water facilitates rusting of iron containing materials according to the following equation.</p> $2Fe(s) + xH_2O(l) + \frac{3}{2}O_2(g) \rightarrow Fe_2O_3 \cdot xH_2O(s)$ <p>Mitigation</p> <p>Reafforestation</p> <p>-Hot water as an effluent from industries when introduced into water bodies, increase the temperature of the water bodies affecting the life of aquatic organisms.</p> <p>Mitigation.</p> <p>-Hot water reservoirs and effluent deposit points from factories to cool exhaust water before introduction into the water bodies, increase the temperature of water bodies affecting the life of aquatic organs.</p> <p>-Hot water reservoirs and influent deposit points from factories to cool the exhaust</p> |
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| | <p>water before introduction into the water bodies.</p> <p>Mitigation for X.</p> <ul style="list-style-type: none"> -Use of alloys, painting, galvanizing to reduce the effect of rusting. -Vehicles and machines burn fossil fuels leading to production of gaseous pollutants into atmosphere. $2C(s) + O_2(g) \rightarrow 2CO(g)$ $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$ $S(s) + O_2(g) \rightarrow SO_2(g)$ $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ |
| D | <p>benefits of the natural resources</p> <p>Mitigation:</p> <ul style="list-style-type: none"> -Use alternative fuel sources like solar, H.E.P from the sun and water respectively to reduce on depletion of fossils and also decrease in gaseous pollutants. <p>-fossil fuels are used as fuels, fossil fuels when burnt produces heat energy used to run engines and machines and for cooking.</p> <p>-Air facilitates respiration during. During respiration carbohydrates combine with oxygen in order to release energy and carbon dioxide used for proper body functioning.</p> <p>-Air facilitates photosynthesis. Explain Water is a habitat for aquatic animals.</p> |

Item 6

| S/N | Basis of assessment | Assessment criteria | scoring |
|-----|--|---|---------|
| A | identify category of natural resource, reason and example. | <p>THEME: (My environment my responsibility)</p> <p>-Resources in our environment which we use to satisfy our needs include air, water, rocks and minerals, fossil fuel.</p> <p>-They are classified as renewable and non-renewable.</p> <p>-Renewable resources can be replenished e.g. air, water, plants. Non-renewable resources can be exhausted and not replaceable e.g. fossil fuel, rocks and minerals.</p> | |
| B | Composition of natural resources | <p>Air; contains nitrogen, oxygen, carbon dioxide, rare gases.</p> <p>-water contains hydrogen and oxygen.</p> <p>-fossil fuels contain carbon, hydrogen.</p> <p>-Rocks contains iron, copper, calcium carbonate and other minerals like gold and cobalt.</p> <p>-Trees and natural vegetation, is made up of carbon, hydrogen, oxygen and magnesium.</p> | |
| C | Impact of natural resources in the environment, how it | <p>Impact:</p> <p>Water: water pollution caused by farming and agriculture.</p> | |

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| | occurs, chemical and physical reactions and mitigation | Farming involves use of fertilizers and manure which pollutes water bodies and makes the water unsafe for use. | Mitigation. Sensitize farmers to use controlled doses of fertilizers and manure in gardens. -Animal husbandry causes water pollution through their excreta. |
| | | | Mitigation People should ensure proper disposal of animal excreta and also convert it into other useful products for example biogas, organic fertilizers and briquettes. -pouring detergents in waterbodies. They have long carbon chains that do not degrade quickly and have harmful effects on plants and animals living in water. -Detergents contain phosphates which act as nutrients for certain algae, resulting in increase in the algae which use up the oxygen in water leading to suffocation of aquatic animals and eventually die. -Use biodegradable detergents like soap detergents. -Avoid wash near water bodies. |
| D | Benefits of natural resources | -Water is a; -Habitat for many aquatic animals and plants, water bodies like lakes, dams, pools contain | |

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| | <p>necessary conditions for survival of aquatic animals.</p> <ul style="list-style-type: none">-Water bodies like rivers can be used to generate electricity, fast moving waters to the rivers drive turbines at waterfalls which produce kinetic energy into electrical energy.-Water from water bodies evaporates and eventually cools and condenses on the clouds, these result into precipitation.-Used in industries to cool hot machines.-Used in body temperature regulation for normal functioning of body cells. |
| | |

END