SCORING GUIDE 2024

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CHEMISTRY PAPER 1
(THEORY)
MOCK 2024
AUGUST
TIME:2 HRS

MEBU EXAMINATIONS CONSULT

Uganda Certificate Of Education

MOCK ASSESSMENTS 2024

CHEMISTRY PAPER 1

(THEORY)

TIME:2HRS

INSTRUCTIONS TO CANDIDATES:

This paper consists of two sections **A** and **B.** It has **six** examination items

Section A has **two compulsory items.**

Section B has two parts **I** and **II.** Answer one item from each part.

Answers to section A must be written in the spaces provided while those of section B must be written on the answer booklets provided.

Any additional items responded to will **not** be scored.

SECTION A

Attempt all items in this Section

1. After working the whole day in their garden. Mary and Annet complained of pain and headache, Mary decided to take tablets of acetaminophen (Panadol) which were available in her drawer. Annet took some juice extract from Aloe barbadensis miller (aloe vera) plant. After a few hours, Mary got relieved from the pain but Annet claimed the pain was still on.

Task;

a) As a chemistry learner,

i. Explain categories of products, used by the two ladies.

Mary used modern medicine which is an analgesic drug while Annet used traditional medicine which is an antibiotic.

Accept –Mary used modern drug which is a pain killer while Annet used a traditional drug which is a bacteria inhibitor/killer.

(ii) Help Annet to understand how the product works.

Panadol works by blocking the chemical messengers in the brain that tell the body that you have pain.

Accept alternatively

(Analgesics Panadol work by interfering with the transmission of pain signals to the brain thereby relieving the pain.)

Antibiotics work by killing bacteria or inhibiting its growth thereby treating bacterial infections.

b) Advise the two ladies on the challenges associated with the use of the products.

Risk of developing dependence and addictions. This can be mitigated by reducing the use of the drug.

Increased risk of adverse effects such as constipation, nausea and drowsiness. This can be mitigated by taking the prescribed dose.

Evaluation

Similarities.

Both are used to treat illnesses

Both have potential side effects

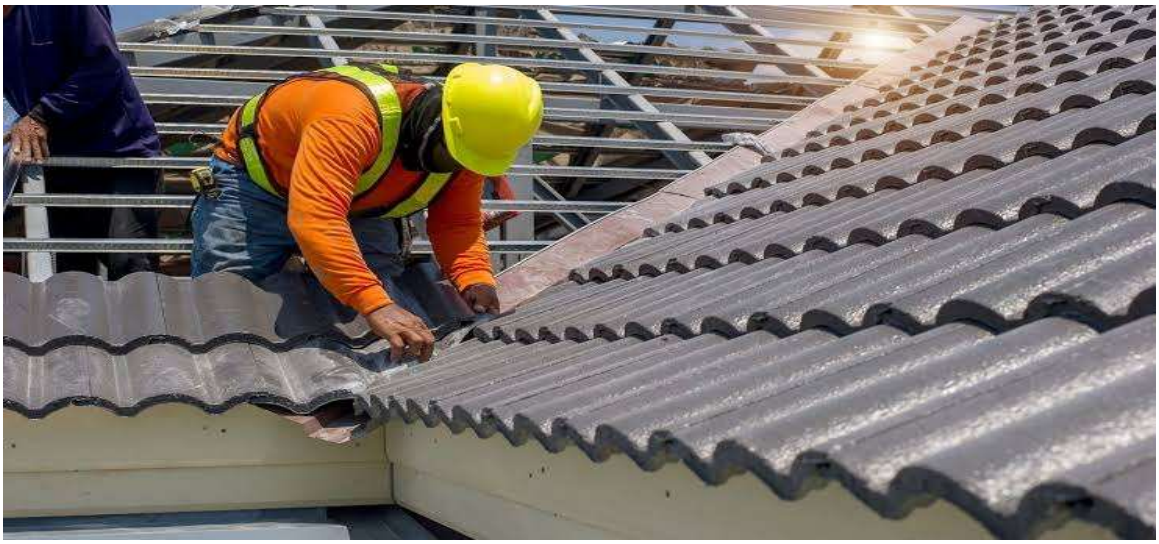
Differences

Analgesics relieve pain while antibiotics treat bacterial infections

2. John, a resident of Wakikoola, a remote village in Buikwe district is disturbed by frequent rains due to a leaking house top. He is willing to work on his house without affecting the environment.

He is aware that there are various materials on the hardware market for roofing his house. He also knows that in order for one to produce good quality roofing materials; he should select the right material with suitable qualities and properties. However, he is still confused with the choice of the materials to use and he has approached you for some advice.

Task;



Use your chemistry knowledge to:

a) Explain

i. The categories of the materials. (1 material required)

Synthetic material: made by man: example Iron Accept also.

Natural material exists in nature (God made) Example wood

ii The suitability of the materials.

- **Strong to withstand compression forces**
- **Bright appearance**
- **Durable and long lasting if well maintained**
- **High heat conductivity**
- **High melting point therefore can resist fires**

(Any three properties)

For wood- readily available so easy to get cheaply

-strong so it can support heavy load

-Light when dry so very good for roofing.

- Easy to smoothen to give nice appearance.

- Can be eaten by termites when not treated.

b) Advise John on the choice of the materials.

The choice of the material for roofing depends on its purpose and its impact on the environment. Iron is used to fix/ join objects like timber and iron sheets.

Iron depletes soil fertility when it accumulates in the soil and this can be mitigated by recycling.

SECTION B

Part I

Attempt one item from this Part.

3. In many industries, sodium hydroxide is used to make wood pulp and paper, textiles, soaps and detergents and as a drain cleaner. To ensure that sodium hydroxide is readily available and at a cheaper cost, one of the managers of a textile industry is planning to set up a sodium hydroxide production plant. Unfortunately, the residents have raised concerns about its environmental effects and their valuable land about to be taken by the investor.

The science club in your school is also wondering how the production process of sodium hydroxide will be carried out.

As a result, the chairperson of the club has appointed you to make a presentation to be published in one of the local newspaper.

Task;

As a chemistry learner, prepare a brief massage that you will use during the presentation.

Proposed response for item three

RAW MATERIALS:

Brine

Graphite and

Mercury.

PROCESS OF SODIUM HYDROXIDE PRODUCTION

- ✓ Brine is electrolyzed in an **electrolytic cell** having graphite anode and mercury cathode
- ✓ During the process, chloride and hydroxide ions migrate to the anode. Chloride ions are preferentially discharged by electron loss to form chlorine gas due to their **high** concentration. The chlorine formed is dried, liquefied and stored in tightly closed tanks
- ✓ $2Cl^-(aq) \longrightarrow Cl_2(g) + 2e$
- ✓
- ✓ Sodium and hydrogen ions move to the cathode.
- ✓ $Na^+(aq) + e \longrightarrow Na(s)$

- ✓ Due to its high concentration, sodium ions are discharged in preference to hydrogen ions by **electron gain** to form sodium metal.
- ✓ The sodium metal dissolves (or combines with) in mercury to form sodium amalgam which is reacted (or dissolved in) with water to form sodium hydroxide solution, hydrogen and mercury. Mercury is fed back into the cell for re-use as the cathode.
- ✓ The sodium hydroxide solution is **evaporated** to dryness to molten sodium hydroxide and cooled to form solid sodium hydroxide.

NEGATIVE EFFECTS OF SODIUM HYDROXIDE PLANT ON THE ENVIRONMENT

- Mercury poisoning. Exposure to inhalation of mercury can result into damage to the nervous system, kidneys, liver and immune system. This may result into cancer and hence death.
- This can be mitigated by posting hazard and warning information in the working area / communicating all information on the health and safety hazards of mercury to potentially exposed persons.
- Air pollution by waste gases/fumes. Waste acidic gases/ fumes can cause acid rain which leads to crumbling of buildings, bridges, lowering the soil pH hence lowering crop productivity/ soil productivity. Etc.
- This can be mitigated by encouraging the production and use of renewable energy instead of fossil fuels, fitting scrubbers in exhaust pipes of machines to neutralize the acidic gases/ fumes, fitting catalytic converters to convert oxides of nitrogen to nitrogen. Etc.
- Land pollution due to oil spillage and other wastes like plastics. This reduces soil fertility and hence, low production / famine results, death of insects and other animals due to suffocation.
- Land pollution also leads to contamination of underground/ surface water. This makes water unsafe for other uses.
- This can be mitigated by enforcing strict laws to protect the community / regular maintenance and monitoring (inspection) of equipment / reduction, recycle and reuse of wastes like plastics.
- Destruction of vegetation/ cutting down trees for construction space and installing of machines. This leads to accumulation of carbon dioxide in the atmosphere hence, global warming/ increasing famine etc. This can be mitigated by planting of trees that grow and mature so fast.
- Global warming due to emission of gases like carbon dioxide, steam, methane, nitrous oxide etc. This results into change in rainfall patterns. This can be mitigated by encouraging the production and use of renewable energy instead of fossil fuels.

SOCIAL BENEFITS

- Employment opportunity; improved income thus better standards of living

- Development of infrastructure e.g. roads which facilitate trade, improved income status thus better standards of living.
- Development of infrastructure e.g. hospitals, access to better and cheaper medical services and therefore better health community.
- Development of infrastructure e.g. schools, access to better and cheaper education and thus better well informed community.

4. Grain Pulse limited is one of Uganda's leading phosphate fertilizer manufacturer. It uses sulphuric acid as the main raw material. In a bid to cut the costs on the high revenue imposed on importing the acid, the management has contracted a production unit to set up a sulphuric acid production plant with minimal environmental concerns. A certain Village in Kasese district has been selected for the plant. However some residents in the region claim that the plant will not benefit them at all.

The science club members in your school would like to know how the production process will be carried out. They are seeking for guidance prior to addressing the school assembly.

Task.

As a chemistry learner, make a write up they will use while addressing the assembly.

PROPOSED RESPONSE FOR ITEM 4

RAW MATERIALS

- **Sulphur or equivalent**
- **Water**
- **Vanadium (V) oxide**
- **Air**

PROCESS OF SULPHURIC ACID PRODUCTION

✓ **The Sulphur is roasted is roasted in air to form Sulphur dioxide in a furnace / Sulphur burner.**

Equation;

✓ $S + O_{2(g)} \longrightarrow SO_{2(g)}$

- ✓ **The Sulphur dioxide formed is mixed with excess air, purified in a purifier, compressed and passed over finely divided vanadium (V) oxide at 400º -500ºC and 1-2 atmospheres in a catalytic chamber/ converter. The gases react to form Sulphur trioxide.**
  Equation; $2SO_{2\,(g)} + O_{2(g)} \longrightarrow 2SO_{3(g)}$

- ✓ **The Sulphur trioxide formed is absorbed in concentrated sulphuric acid in an absorption chamber to form oleum which is then diluted with appropriate amount of water in the dilutor to form sulphuric acid of a desired concentration.**
- ✓ **Equations;**
- ✓ **;** $2SO_{3(g)} + H_2SO_{4(aq)} \longrightarrow H_2S_2O_{7(l)}$
- ✓ $H_2S_2O_{7\,(l)} + H_2O_{(l)} \longrightarrow H_2SO_{4(l)}$
- ✓ **The sulphuric acid is then stored in the storage tanks.**
- ✓

NEGATIVE EFFECTS OF THE SULPHURIC ACID PLANT ON THE ENVIRONMENT:

- **Air pollution by waste gases/ fumes. Waste acidic gases/ fumes can cause acid rains which lead to crumbling of buildings, bridges, lowering of soil pH, low crop production/soil productivity etc.**
- **This can be mitigated by encouraging the production and use of renewable energy instead of fossil fuels, fitting scrubbers in exhaust pipes of machines to neutralize the acidic gases/fumes, fitting catalyst converters to convert oxides of nitrogen to nitrogen. Etc.**
- **Land pollution due to oil spoilage and other wastes like plastics. This reduces soil fertility and hence low productivity/famine results, death of insects and other animals due to suffocation.**
- **Land pollution also leads to contamination of underground / surface water. This makes water unsafe for other uses.**
- **This can be mitigated by enforcing strict rules and laws to protect the community/regular monitoring (inspection) of the equipment / reduction, recycle and re-use of wastes plastics**
- **Destruction of vegetation/ cutting down trees for space for construction and installing of machines. This leads to accumulation of carbon dioxide in the atmosphere and hence global warming/ increased famine.etc. This can be mitigated by planting trees that grow and mature fast.**
- **Global warming due to emissions of gases like carbon dioxide, steam, methane nitrous oxide etc. This results into change of rainfall patterns. This can be mitigated by encouraging the production and use of renewable fuels instead of fossil fuel.**

SOCIAL BENEFITS:

- **Employment opportunity; improved income thus better standards of living.**
- **Development of infrastructures e.g. roads which facilitate trade hence improved income thus better standards of living.**
- **Development of infrastructures e.g. hospitals, access to better and cheaper medical service and thus a better healthy community.**

- **Development of infrastructure e.g. schools, access to better and cheaper education and thus better a well-informed community.**

Part II

Attempt one item from this Part.

5. People of Kigaragara village in Isingiro district can easily cross into Tanzania for charcoal business. Due to increase in population of this district, many natural forests have been cleared to provide charcoal for use as fuel and natural swamps have been reclaimed to create space for settlement. These happenings have left the district officials wondering.

   As a result, the government through the district officials is planning to create awareness to the people in Isingiro District through sensitization workshops organized in different villages.

   Task;

   As a chemistry learner, prepare a short presentation that you will deliver during the workshop when invited.

PROPOSED RESPONSE FOR ITEM 5

CATEGORY OF THE NATURAL RESOURCES

They are classified as:

- **Renewable Natural resources; can be replenished example Air, trees**
- **Non-renewable resources; cannot be replenished example.**

COMPOSITION NATURAL RESOURCE ON THE ENVIRONMENT;

(Select only one from above examples you have stated)

Air; contains Nitrogen gas, Oxygen gas, Carbon dioxide gas, rare gases, water vapour.

IMPACT OF THE NATURAL RESOURCE IN THE ENVIRONMENT;

(Only one explained point with its mitigation is required)

AIR;

- **When carbon dioxide levels in air increase, being a greenhouse gas, it traps heat in the atmosphere leading to global warming.**
- **Mitigation: increased afforestation to replace the cut trees which absorb carbon dioxide from the atmosphere to reduce global warming.**

BENEFITS OF THE NATURAL RESOURCE

(Only one explained point required)

Air;

- **Contains carbon dioxide that facilitates photosynthesis in green plants.**

- **During photosynthesis, carbon dioxide from air combines with water in presence of sunlight trapped by chlorophyll to form glucose, oxygen and energy.**

6. Kagulu village in Buyende district is developing at a faster rate. Many of the recently existing swamps and forests are now filled with buildings. Stone quarrying is the order of the day among most the locals in the village.
   Recently the wells have started drying up and yet the little water available is not fresh. The few residents that practice crop husbandry also say that seasons have changed and this has caused famine in the area.
   All these happenings have left many of the residents wondering.
   A sensitization workshop is to be organized in the district by the government through National Environment Management Authority (**NEMA).**

   Task;
   As chemistry learner, prepare a brief presentation you will deliver upon invitation.

PROPOSE RESPONSE FOR ITEM SIX

As learner of chemistry, present the message you will share when called upon.

CATEGORY OF THE NATURAL RESOURCES

They are classified as:

Renewable Natural resources; cannot replenished example Air, Water, Trees

Non-renewable resources; cannot be replenished example, Fossil fuels, rocks

COMPOSITION OF THE NATURAL RESOURCE.

(Select only one from above examples you have stated)

Air; contains Nitrogen, Oxygen, carbon dioxide, rare gases, water vapour.

Water; contain Hydrogen and oxygen atoms.

Fossil fuels contain carbon, hydrogen, oxygen atoms.

Rocks; contain minerals for example limestone, iron, Gold, Copper, Quarts.

IMPACT OF THE NATURAL RESOURCE ON THE ENVIRONMENT

(Only one explained point with its mitigation is required)

AIR;

- **When carbon dioxide levels in air increase, being a greenhouse gas, it traps heat in the atmosphere leading to global warming.**
- **Mitigation: increase Afforestation to replace the cut trees which absorb carbon dioxide from the atmosphere to reduce global warming.**

WATER;

- **It has dissolved oxygen which facilitates rusting of iron containing materials since water and oxygen are necessary for iron materials to rust;**
- **Mitigation; Use of Alloys, painting, galvanizing to reduce the effect of rusting.**

END

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