

Candidate's Name: **MOST RECENT UCE SCORING GUIDE FOR CHEMISTRY 545/1**

By Joseph Lomoi Rugamoi Tel: +256772194332/+256752194332

Signature: _____



Random No.						Personal No.		

(Do not write your School / Centre Name or Number anywhere on this Booklet)

545/1
CHEMISTRY
Paper 1
Oct./Nov. 2024
 2 hours

TOTAL SCORE = $\frac{X}{57}$



UGANDA NATIONAL EXAMINATIONS BOARD
Uganda Certificate of Education
CHEMISTRY
Paper 1
 2 hours

INNSTRUCTIONS TO CANDIDATES:*The 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.**Answer **four** items in all.**Answer to Section **A must** be written in the spaces provided while those of Section **B must** be written on the answer booklet(s) provided.**Any additional item(s) answered will **not** be scored.**Use where necessary;**Ca = 40; C = 12; O = 16; 1 mole of a gas occupies 22.4 dm³ at s.t.p.*

SECTION A

Answer **both** items from this section in the spaces provided

Item 1.

During the Second World War the cities of Hiroshima and Nagasaki in Japan were bombed using the most lethal weapon of the time, which caused massive destruction as shown in figure 1. However, the energy that was used can be useful in the treatment of cancerous growths in humans. Up to now the impact of the bombing is still being felt in Japan.

**Fig. 1**

<https://www.pennlive.com>

Task:

As a learner of Chemistry;

(a) Identify the type of bomb used

-Nuclear bomb; ;✓ C

ACCp: Atomic bomb; Nuclear energy; Nuclear fission.

Deny score: Nuclear fussion; Radioactive

(b) Suggest any other use of the form of energy that was used in the bomb.

Used in the treatment of cancerous cells;✓ F

Used for the production of electricity to run industrial machines;✓

C + F = T₂ = 06

(c) Explain the other danger associated with the form of energy in the bomb and give its mitigation.

-The energy emitted can cause mutations;✓ Di thus, the emissions can cause sudden change in the arrangement of DNA/the genetic composition of the cells, hence altering characteristics of organisms;✓ De This can be mitigated by wearing protective gears such as lead coats;✓ Dm

-The energy emitted can cause cancer;✓ resulting into death, ;✓ mitigated by wearing protective gears such as lead coats or by posting warning information in the working area;✓ Di + De + Dm = D₃ = 06scores

TOTAL = T₂ + D₃ = 06 + 06 = 12 Scores

ITEM 2

An industry wanted to produce lime for treatment of acidic soils. The production of lime involves heating limestone strongly which results into its decomposition according to the equation;



The industry is also interested to know how much gas is evolved during the process since the gas is useful. Before the production, an experiment was performed where 25g of limestone were heated until there was no further change. You have been contacted for help

Task:

As a learner of chemistry;

a) Explain the categories of the products

*The product is calcium oxide; which is an **ionic compound**; ✓ **Ci** because it is formed by complete transfer of electrons from a metal atom to a non-metal atom or by the Combination of a metal with a non-metal atom; ✓ **Cr***

*[OR], Calcium oxide is a **basic oxide**; ✓ because it reacts with water to form an alkaline solution; ✓ **Ci + Cr = C₂ = 04scores***

*The second product is carbon dioxide an **acidic oxide**; ✓ and covalent compound because it is formed by sharing of electrons between non-metal atoms, Carbon and oxygen, for example sulphur dioxide; ✓*

*It is an **acidic compound** because reacts with water to form carbonic acid*

b) Suggest the properties of the gaseous product that make it useful in daily life

*- Carbon dioxide is colourless and odourless; ✓ **P** thus, ideal for use in food and beverages as a preservative.; ✓ **U₁***

*- It does not support burning; ✓ **P** thus, used in fire extinguishers; ✓*

*- Dissolves in water, this allows it enter plant cells for photosynthesis; ✓ **P***

*- Reacts with light, water, chlorophyll to produce glucose and oxygen; ✓ **P***

c) Calculate the volume of the gaseous product measured at s.t.p. that was formed.



*RFM of CaCO₃ = (40x1) + (12x1) + (16x3) = 40 + 12 + 48 = 100; ✓ **CA***

1 mole of CaCO₃ decomposes to form 1 mole of CO₂ gas

1 mole of CO₂ contains 22.4dm³ at S.T.P

*100g of CaCO₃ decompose to produce 22.4dm³ of CO₂ gas; ✓ **CA***

*1g of CaCO₃ decompose to produce **22.4 dm³** of CO₂ gas*

100

*25g of CaCO₃ decompose to produce **[22.4 x 25] dm³** of CO₂ gas; ✓ **CA***

100

*Therefore, Volume of gaseous product = **5.6dm³**; ✓ **CA***

4P + U + CA = X₂ = 05 scores

d) explain the impact of one the products above on Environment

Impacts:** High levels of Carbon dioxide cause **global warming**; ✓ **Mi

mitigated** by planting trees to absorb carbon dioxide; ✓ **Mm** **Mi+Mm = I₂ = 03Sc

TOTAL = C₂ + X₂ + I₂ = 04 + 05 + 03 = 12 scores

SECTION B**Part I**

Answer **one** item from this part in the answer booklet(s) provided.

Item 3.

In Uganda, copper wires are used mainly for transmitting electric power. To ensure the availability of wires, the government is considering setting up a copper production plant in a certain area. However, the residents of the area need to be sensitized about the industrial processes, social benefits, side effects and how they can be overcome.

Your head teacher has been identified to sensitize the residents.

Task:

As a learner of Chemistry, prepare a write-up that your head teacher will use to sensitize the residents.

The process involves concentration of the ore by froth floatation, roasting in air and purification by electrolysis

*The ore of copper, usually copper pyrite (CuFeS_2) ;✓ **Rm** is crushed;✓ **Pp** into fine powder and added to water with a frothing agent;✓ **Pp** in a concentration tank;✓ **V**, agitated by blowing air;✓ **Pp** The copper is then trapped into the oil on the surface, it is skimmed off ;✓ **Pp** and dried;✓ **Pp** an acid is added to break the froth and the ore is dried;✓ **Pp** and roasted;✓ **Pc** in air;✓ **Rm** to obtain copper (I) Sulphide, iron (II) sulphide and sulphurdioxide.*



*The mixture is heated;✓ **Pc** with silicon dioxide (sand) ;✓ **Rm** to remove iron(II) oxide impurities;✓ **Pr** as iron(II) silicate called slag*

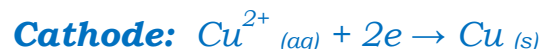
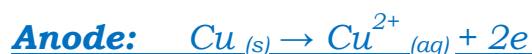


*The slag is separated;✓ **Pp** out and then copper (I) sulphide is heated;✓ **Pc** in limited air;✓ **Rm** supply to form blister copper (impure copper) ;✓ **Pc***



*The blister copper is purified;✓ **Pc** by electrolysis through making it the anode and pure copper strip as cathode and the electrolyte as copper (II) sulphate solution in an electrolytic tank;✓ **V**.*

*The anode dissolves;✓ **Pc** in the electrolyte dropping the impurities, while the copper(II) ions formed migrate to the cathode where they gain electrons and are discharged as pure copper;✓ **Cd** as shown in the equations below;*



*The pure copper is then packed and transported for sell;✓ **Ch***

3Rm+1V+3Pp+3Pc+1Pr+1Cd+1Ch =P3=06 score

Side effects or dangers of the process of extraction of copper

-Release of sulphur dioxide causes air pollution; ✓ **Di** resulting into acid rains that destroy iron roofs, houses, affect plant growth and also causes global warming.; ✓ **De** This can be **mitigated** by treatment of the gas or installing catalytic converters in the exhaust pipes; ✓ **Dm**

Di + De + Dm = S3 = 06 scores

-Exposure to copper fumes or dust; ✓ can cause poisoning, leading to cancer and even death.; ✓ **mitigated** by wearing personal protective equipment; ✓

Social benefits

1. Source of employment opportunities.; ✓ **Sb** hence improved income earnings .; ✓ **Se** and better standards of living; ✓ **Si**

Sb + Se + Si = B3 = 06 scores

2. Increased government revenue through taxes; ✓ hence improvement of infrastructure such as roads, schools, health facilities.; ✓ leading development of the society improving standards of living; ✓

3. Provision of market for goods of the community members. .; ✓ hence generating income, leading; ✓ ng to better lives; ✓

TOTAL = P3 + S3 + B3 = 06 + 06 + 06 = 18 Scores

Item 4.

Cement is one of the most commonly used building materials. In order to meet the high demand of cement in Uganda, many cement factories have been set up across the country, one of which is shown in figure 2.

You are part of the Chemistry class that visited one of the factories and the process of producing cement was explained to the class. You have been invited to a radio talk show to explain how cement is produced. After your presentation one of the callers wants to know whether there is any impact associated with the process you have talked about.



Fig. 2

<http://the.local.ug/wp-content/uploads>

Task:

Make a write-up of the sensitization message up to the end of the talk show.

Process of production of Cement:

The lime stone; ✓ **Rm** obtained from the quarry is mixed with sand/clay; ✓ **Rm** and Aluminium oxide; ✓ **Rm** in the correct proportions and crushed /grounded in to a fine powder; ✓ **Pp**. The powder is then mixed with water and allowed to flow down a **rotating tank (or cylinder or cement kiln)**; ✓ **V** to remove some impurities; ✓ **Pr** the powder is then dried; ✓ **Pp** and strongly heated; ✓ **Pc** at a temperature of about 1500°C a hard solid called clinker; ✓ **Pc** which is a mixture of calcium silicate and calcium aluminate; ✓ **Pc** is formed from the reaction.

Limestone decomposes into calcium oxide and carbon dioxide; ✓ **Cd**



Calcium oxide reacts with sand forming calcium silicate and also reacts with aluminium oxide forming calcium aluminate.; ✓



Calcium silicate and calcium aluminate form a mixture called clinker.

Gypsum; ✓ **Rm** is added to or mixed; ✓ **Pp** with clinker to moderate the setting of the cement and the lumps are then crushed by machine to obtain the fine cement powder; ✓ **Pp**



The fine powder is called ordinary portland cement which is packed into bags and sold; ✓ **Ch**

$$3\text{Rm} + 1\text{V} + 3\text{Pp} + 3\text{Pc} + 1\text{Pr} + 1\text{Cd} + 1\text{Ch} = \text{P3} = 06\text{score}$$

Side effects / dangers of process of production and mitigation

- Inhalation of air contaminated with cement dust emissions ; ✓ **Di** which pollutes air and causes respiratory diseases/irritations ; ✓ **De** **mitigated** by wearing personal protective equipment; ✓ **Dm**
- Effluent discharge; ✓ from the cement plant can contaminate water **bodies**, affecting aquatic life and the quality of water; ✓ This can be **mitigated** by treatment of waste water through sedimentation and filtration before discharge and recycling the water within the plant.; ✓
- **Carbon dioxide emissions** to the atmosphere; ✓ causing **global warming**. ; ✓ This is **mitigated** by recycling of carbon dioxide ; ✓

$$\text{Di} + \text{De} + \text{Dm} = \text{D}_3 = 06 \text{ scores}$$

Social benefits

- Source of employment opportunities; ✓ **Sb** hence improved earnings of income; ✓ **Se** and therefore better standards of living ✓ **Si**
- Increased government revenue through taxes; ✓ hence improvement of infrastructure such as roads, schools, health facilities leading to the development of the society. ✓
- Provision of market for goods of the community members; ✓ hence generating income, leading to better lives ✓ **Sb+Se+Si = B₃ = 06Score**
- Production of cement for use during construction by the community members, hence acquiring better houses ✓ **TOTAL=P3+D3+B3=06+06+06=18**

Part II

Answer **one** item from this part in the answer booklets provided.

Item 5.

Peter, the cattle keeper, grazes his cattle on a community land. During the dry season, he practices bush burning and also takes his cattle to drink water from the community water source. Peter's practices have raised concern in the community. The area chairperson has organized a meeting to create awareness for Peter and the community.

Task:

As a learner of Chemistry make a write-up of the message the chairperson will present to the community.

Categories:

*Bush burning, over grazing, watering cattle in a community water source, affects the vegetation, soil, air and water which are **renewable natural***

resources**; ✓ **Ci** because they can be replenished.; ✓ **R** Vegetation is mainly composed of **Carbon**, ; ✓ **Co** **Hydrogen**; ✓ **Co** and **Oxygen**; ✓ **Co

$$1\text{Ci} + 1\text{R} + 3\text{Co} = \text{N}_2 = 06 \text{ scores}$$

Impacts of natural renewable resource;

*Human activities of bush burning, and overgrazing **exposes soil to***

erosion agents**; ✓ **Mi** as the **land is left bear**; ✓ **Me** after bush burning and overgrazing. This is **mitigated** by enacting tough laws prohibiting individuals from bush burning; ✓ **Mm

$$\text{Mi} + \text{Me} + \text{Mm} = \text{M}_3 = 04 \text{ scores}$$

Benefits of renewable resource;

*Vegetation contributes to the water cycle; ✓ **Bi** through evaporation; ✓ **Be***

$$\text{Bi} + \text{Be} = \text{B}_2 = 05 \text{ scores}$$

$$\text{TOTAL} = \text{N}_2 + \text{M}_3 + \text{B}_2 = 06 + 04 + 05 = 15 \text{ scores}$$

Item 6.

During her School holidays, Eva visited her aunt who works at a stone quarry. She noticed that explosives were being used to blast big rocks to form small stones (aggregates) and there was a lot of dust rising into the air as shown in figures 3 and 4



Fig. 3



Fig. 4

<https://www.google.com/url>

Besides the social benefits, Eva was concerned about what would happen to the site and community if the activity continued over time.

Task:

As a learner of Chemistry, make a write-up to respond to Eva's concern.

Category of the natural resource:

Rocks and minerals are **non-renewable natural resources**;✓ **Ci** because they cannot be replenished / replaced;✓ **R** by natural processes in man's life time. **Or** they get used up.

They are classified as: **Igneous rocks, Sedimentary rocks** and

metamorphic rocks;✓ **Co** $1Ci + 1R + 3Co = N2 = 06 \text{ scores}$

• **Igneous rocks**, comprising of minerals like **Quartz Feldspar**, and **Olivine**;✓ **Co**

• **Sedimentary rocks**, composed of minerals like **Calcite, Quartz, Clay materials, Gypsum**;✓ **Co**

• **Metamorphic rocks**, composed of minerals like **Garnet, Mica(biotite and muscovite), Quartz and Feldspar (Marble or Gneiss)**;✓ **Co**

Impact of the human activities on the natural resource

- Stone quarrying produces **dust particles**;✓ **Mi** which **erode into water bodies**, hence **reducing on its quality**;✓ **Me**

This can be **mitigated** by extracting carefully and use of personal protective equipment from dust;✓ **Mm** $Mi + Me + Mm = M3 = 04 \text{ scores}$

- Stone quarrying and mineral extraction **removes top soil**;✓ and **ditches** which **degrades the soil environment, affecting growth of plants, hence destruction of vegetation cover**;✓ Can be Mitigated, by careful extraction of rocks and minerals. ;✓

- **Mineral extraction** results into **breaking of rocks into smaller stones and gravels** which **depreciates the rocks**;✓

Mitigated by careful extraction of rocks and minerals;✓

Benefits /Importance of the natural resource

-They are useful in formation of soil;✓ **Bi** by a process of weathering;✓ **Be** Hard core, gravel or panels are used as materials for construction of roads, bridges, and houses;✓ **Bi** by breaking Rocks physically into smaller gravels, or panels. **Mitigation** by careful extraction of Rocks;✓ **Be**

$$Bi + Be = B2 = 05 \text{ scores}$$

$$TOTAL = N_2 + M_3 + B_2 = 06 + 04 + 05 = 15 \text{ scores}$$

Jose LO

END