Candidate's Name: 2025-UCE RECENT SCORING GUIDE FOR CHEMISTRY 545/1 __
By Joseph Lomoi (Joselo) Tel: +256772194332/+256752194332

Signature:_ ----------

Random No.						Personal No.		

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

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Total weighted Score	**55**	
Initials		

CHEMISTRY X
Paper 1 55
Oct./Nov. 2025
2 hours

UGANDA NATIONAL EXAMINATIONS BOARD
Uganda Certificate of Education

INNSTRUCTIONS TO STUDENTS:

The paper consists of **two** *Sections;* **A** *and* **B**.
It has **six** *examination items.*
Section **A** *has* **two compulsory** *items*
Responses to section **A must** *be written in the spaces provided.*
Section **B** *has two* **Parts; I** *and* **II.** *Respond to only* **one** *item from* **each** *part.*
Responses to section **B must** *be written in the answer booklet(s) provided.*
Respond to **four** *items in all.*
Responses to each item in Section **B** *should start on a fresh page.*
Any additional item(s) responded to will **not** *be scored.*

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Item No.	Basis code	Weighted Score	Scorer's Initials
1	T	03	
	D	05	
	E	05	
2	C	05	
	X	05	
	I	04	
__(3/4)	P	06	
	S	04	
	B	04	
__(5/6)	N	05	
	M	04	
	Be	05	
Total Weighted Score		**55**	

Turn Over

SECTION A

Respond to **all** *the items in this section in the spaces provided.*

Item 1

When preparing chicken sauce for her family, Jane adds common salt only. However, when she visited a restaurant, Jane noted that the chicken sauce served to her contained onions, tomatoes and curry powder in addition to common salt. Figure **1** shows some of the ingredients used in the preparation of chicken sauce in the restaurant. Jane was highly impressed by the restaurant sauce, which tasted much better than the one she prepares at home. She wanted to know more about the ingredients used in the restaurant and came to a S4 student, who gave her a write up explaining to her about the ingredients, but she did not understand the write up explanation and she came to you for help.

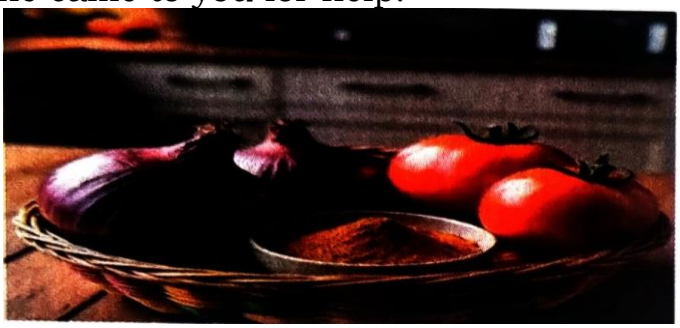

Fig.1. Some of the ingredients used in the restaurant

Task:

As a learner of chemistry, help Jane to;

(a) State the Category of the ingredients and the function of each ingredient.

EITHER: *The category of ingredients used in the restaurant (onions, tomatoes, curry powder and common salt) are categorized as food additives / natural food additives.*✓ ***C***

[OR] ACC: *Common Salt and curry powder are artificial food additives whereas Onions and tomatoes are natural food additives*✓ ***C***

Functions:

All the ingredients add taste/flavour/nutrients/seasonings to souce/food✓ ***4F***

Common salt *is used for seasoning food and as a food preservative by reducing bacterial growth and preventing spoilage*✓ ***F***

Onions *are colourant/thickeners/aroma enhancers and sweeteners that function by adding natural flavour and aroma to food, stimulate appetite and improves taste.*✓ ***F***

Tomatoes*: are colourants/thickeners/moisturizers/improves digestion/ and sweeteners and flavouring agents which add pleasant aroma, taste and contain antioxidants that help slow spoilage of food*✓ ***F***

Curry powder*; is a colourant/aroma enhancer and improves digestion*✓ ***F***

C + 4F = T_2 =03scores

C + 1- 3F = T_1 = 02 scores

[NB]: ***(score 4F for a general function of all ingridients or functions of each of the four ingredients)***

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Basis Code	T
Score	03 scores

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(b) Describe the side effect(s) associated with the ingredients.

All *ingridients can cause allergic reactions for example; vomiting/nausea/ dizness/diarrhea/stomach ache/headache/bloating/skin irritations/itching and discomfort* ✓ ***4Di*** *due to incompatibility;* ✓ ***4De*** *This is* ***mitigated*** *by avoiding/reducing their intake and seeking medical advise* ✓ ***4Dm***

All *can cause heart failure/worsen ulcers* ✓ ***4Di*** *by causing high acidic levels;* ✓ ***4De Mitigated*** *by avoiding/reducing their intake/seeking medical attention* ✓ ***4Dm***

Excessive *consumption/intake can cause organs like kidney and liver failure;* ✓ ***4Di*** *as they are overworked* ✓ ***4De*** *Mitigated by avoiding/reducing their use/intake.* ✓ ***4Dm***

[OR]. *Excessive intake of Common Salt can cause high blood pressure or Hypertension.* ✓ ***Di*** *this increases chances of heart failure hence death* ✓ ***De*** *This can be mitigated by limiting its intake/use it in moderaqtion.* ✓ ***Dm***

[OR] *Excessive intake of Onions and tomatoes can cause ulcers;* ✓ ***Di*** *leading to pain and discomfort in the body* ✓ ***De*** *mitigate by reducing their intake* ✓ ***Dm***

[OR] *Excessive intake of curry powder can cause diarrhea;* ✓ ***Di*** *leading to dehydration and stomach pain;* ✓ ***De*** *mitigated by reducing its intake* ✓ ***Dm***

4Di+4De+4Dm = D_2 = 05scores

4Di/4De+4Dm = D_2 = 05 scores

4Di = Do = 00 (identifying Only)

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Basis Code	D
Score	05 scores

State the;

(i) Similarities of the ingredients.

All the ingredients act as food additives/natural food additives. ✓ ***Es***

All are flavor enhancers/add flavor to food ✓ ***Es***

All are taste enhancers/add taste to food ✓ ***Es***

All have side effects ✓ ***Es***

All are nutrient enhancers/add nutrients ✓ ***Es***

(ii) Differences between the other ingredients and common salt.

Other ingredients (onions, tomatoes, and curry powder) are ***organic*** *in nature while Common Salt is an* ***inorganic*** *ionic compound.* ✓ ***Ed***

Other ingridients add aroma unlike common salt ✓ ***Ed***

Other ingridients are non-preservatives while salt is a preservative ✓ ***Ed***

2Es + 2Ed = E_2 = 05

2Es + 1Ed =Eo = 00

1Es + 2Ed =Eo = 00

1Es + 1Ed =Eo = 00

2Es only / 2Ed only =Eo = 00

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Basis Code	E
Score	*05scores*

TOTAL = T_2 + D_3 + E_2= 03+ 05 +05 = 13 Scores

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Item 2

Mary, a 60-year old, complains of dental caries, joint pains and muscular cramps. During one of her visits to a hospital, the doctor advised her to drink water from a bore hole because it contains a compound that can solve her problems. Mary would like to know more about the compound and has approached you for assistance. Your chemistry teacher told you that the compound is chemically written as $\mathbf{XY_2}$. **(***Where* **X** *and* **Y** *are* **not** *the actual symbols of the elements***).** The teacher further informed you that **X** belongs to group II and period 4, while **Y** belongs to group VII and period 2 of the periodic table. Figure **2** shows a periodic table of the first 20 elements.

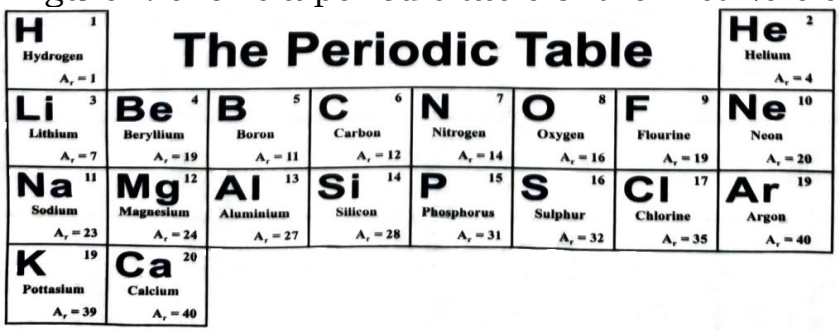


Fig. 2. Periodic table for the first 20 elements

Task:

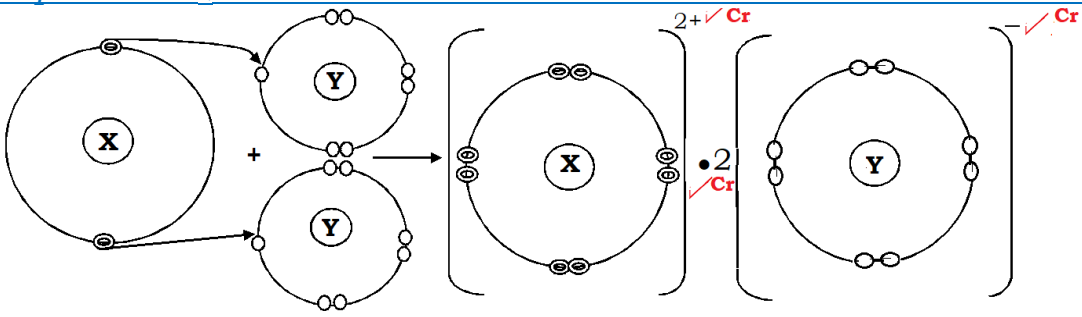
(a) Explain the nature of substances **X** and **Y**, and identify them.

X *is a Calcium* ✓ ***Ci*** *which is a Metal* ✓ ***Ci*** *because it loses two valency electrons to form a cation / positively charged ion* ✓ ***Cr*** ***[OR]*** ***X*** *is calcium which is an alkaline earth metal since it has two valency electrons.*

Y *is fluorine* ✓ ***Ci*** *which is a non-metal* ✓ ***Ci*** *atom since it gains electrons* ✓ ***Cr*** *to form anion/ negatively charged ion.* ***[OR]*** ***Y*** *is fluorine which is a halogen since it has seven valency electrons*

(b) Describe how **X** and **Y** form the compound.

An atom of X(Calcium) loses its two valency electrons to form a cation (calcium ion). ✓ ***Cr*** *The two electrons are transferred to two different atoms of Y(fluorine) which gains the electrons to form anions (fluoride ions).* ✓ ***Cr*** *The electrostatic forces of attraction* ✓ ***Cr*** *between the cation/ Ca^{2+} and the two anions (F^-) constitutes the ionic bond formed between X and Y to form ionic compound XY_2.*



NB: Award correct diagrammatic illustration as 3Cr

4Ci + 5Cr = C_2 = 05scores

4Ci + 1- 4Cr = C_1 = 04scores

4Ci only = C_1 = 04scores

1Ci-3Ci + 1Cr-5Cr = C_o = 00

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Basis Code	C
Score	05scores

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(c) Explain the properties of the compound.

1. *XY_2 being an ionic compound has a high melting and boiling point due to strong electrostatic forces of attraction between particles/ions.* ✓ ***Pe***
2. *Conducts electricity in molten or in aqueous solution state due to the presence of mobile ions/particles.* ✓ ***Pe***
3. *It is slightly soluble in water (polar solvents) since it is polar/ionic.* ✓ ***Pe***
4. *Solid at room temperature due to strong forces of attraction* ✓ ***Pe*** *between ions/particles*
5. *High density due to close packing of ions/particles* ✓ ***Pe***
6. *Typically hard, brittle and crystalline solid* ✓ ***Pe*** *due to the strong ionic Bonds*

d) How does the compound address Mary's complaints?

- *The compound contains Calcium ions, which are essential buildingblocks for strong bones /teeth development/for muscle contraction and relaxation/for nervous transmission., thus addressing joint pains and dental caries.* ✓ ***U***
- *Contains Fluoride ions essential for hardening of teeth/strengthening the teeth enamel,preventing teeth decay (dental cariies)* ✓ ***U*** *by killing the bacteria*

4Pe + 1U = X_2 =05 ***Pe – Property explained***

1Pe-3pe + 1U = X_1 =04 ***P – Property not explained***

1P-4P + 1U = X_1 =04

1P-4P/1U = X_0 =00

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Basis Code	X
Score	05 scores

(e) Write down **one** impact of having a lot of compound **XY_2** in the environment and how it can be mitigated.

Can cause soil or water salinity/raise soilor water pH/cause infertility/water or soil pollution/kill soil or aquatic organisms/excessive intake causes dental or skeletal fluorosis/yellowing of teeth or teethe discolouration especially in children. ✓ ***Mi*** ***Mitigated*** *by application of ammonium fertilizers to soil/proper isposal(in sealed containers).* ✓ ***Mm***

ACC: *Causes water hardness that wastes soap during washing and wastes electricity during heating.* ✓ ***Mi*** *This is* ***mitigated*** *by using methods of softenning permanent hardness of water* ✓ ***Mm***

Mi + Mm =I_2 = 04

Mi =I_0 = 00

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Basis Code	I
Score	04scores

TOTAL = C_2 + X_2 + I_2= 05 + 05 + 04 = 14 Scores

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SECTION B

Part I

Respond to only **one** *item in this part in the answer booklet(s) provided.*

Item 3

Chlorine is one of the disinfectants commonly used to kill micro-organisms that cause diseases. An investor has set up a Chlorine manufacturing industry in an urban Centre in Uganda. Figure **3** shows chlorine manufacturing plant.

Fig. 3. Chlorine manufacturing plant

However, the population in the area has requested to be informed about the process leading to the production of chlorine, the economic and social benefits of the manufacturing plant and how any side effect(s) is/are mitigated. A radio talk show has been organized to address the request by the population and your school has chosen you as their representative.

Task:

Write details of the key issues you will present during the talk show.

RESPONSE:

The primary raw material is Concentrated Brine (aqueous Sodium Chloride. And Water is also required.

Process of Production:

Brine ✓ ***Rm*** *is electrolyzed in an electrolytic cell* ✓ ***V*** *made up of mercury cathode and graphite anode. Brine contains* Na^+, Cl^-, OH^- *and* H^+. ✓ ***Rm***
The ions migrate to oppositely charged electrodes. Sodium ions (Na^+) ✓ ***Rm*** *are discharged at the cathode by electron gain* ✓ ***Pc*** *in presence of hydrogen ions*

At the Cathode reaction; $Na_{(aq)} + e^- \longrightarrow Na_{(s)}$

At the anode chloride ions are discharged, ✓ ***Pc*** *in preference to hydroxide ions, because Chloride ions are in higher concentration than the hydroxyl ions and chlorine gas is liberated / formed.* ✓ ***Cd***

At Anode Reaction; $2Cl_{(aq)} \longrightarrow Cl_{2(g)} + 2e^-$

Chloride ions are oxidized to produce Chlorine gas.
The chlorine formed is collected and stored in tightly closed tanks. ✓ ***Ch***
The chlorine is dried, ✓ ***Pp*** *liquefied* ✓ ***Pp*** *and stored.* ✓ ***Pr***
NB; Another alternative can be the use of rock salt.

All Rm + PP + Pc + Pr + V + Cd + Ch = P_3 = 06
1Rm + V + any two of the rest (Pc, PP, Pr, Cd + Ch) = P_2 = 05
1Rm + V = P_1 = 04

Side effects:

Chlorine gas is highly toxic and poses a severe health hazard, ✓ ***Di*** *causing respiratory irritation, suffocation, and damage to vegetation if leaked.*✓ ***De*** ***Mitigated by*** *installation of gas scrubbing systems to neutralize any fugitive chlorine gas emissions.*✓ ***Dm*** *Strict safety protocols for handling and storage, and workers must wear appropriate personal protective equipment.*

Di + De + Dm = D_2 = 04

Di / De + Dm = D_2 = 04

Di + De = D_2 = 03

Di = D_2 = 00

Social benefit:

The production of Chlorine provides employment opportunities to people in the community,✓ ***Sb*** *increasing on their income*✓ ***Si*** *thus improving on peoples' standards of living.*✓ ***Se***

[OR]: *Chlorine gas is essential for water disinfection, ensuring clean drinking water and preventing waterborne diseases thus improving community Health*

Sb + Se +Si = B_2 = 04

Sb / Se +Si = B_2 = 04

Sb + Se = B_1 = 03

Sb = B_0 = 00

TOTAL = P_3 + D_2 + B_2 = 06 +04 + 04 =14 scores

Item 4

Nitrogen is an essential nutrient for crops. Nitrates are one of the sources of nitrogen. A maize farmers' group in an area experienced poor yields in the past season, which was due to very low levels of nitrogen in the soil.

In response, government has authorized an investor to set up an ammonium nitrate manufacturing plant in the area as a source of nitrates.

Aware of the merits and demerits of such a factory, your School Science Club wishes to write a sensitization article in a daily newspaper. The article is to highlight production process of ammonium nitrate, the social and economic benefits of the plant to the community and how any side effect(s) is/are to be mitigated. You have been asked to prepare the article.

Task:

Make a write up of the article.

Nitrogen✓ ***Rm*** *from distillation of liquid air is reacted with hydrogen*✓ ***Rm*** *from natural gas in a ratio of 1:3 respectively to form ammonia by Habour process at a temperature of* 450℃ − 500℃ *and a pressure of 200atm and a catalyst offinely divided iron*✓ ***Rm*** $N_{2\,(g)} + 3H_{2\,(g)} \rightleftharpoons 2NH_{3\,(g)}$

Ammonia produced is heated✓ ***Pc*** *in air*✓ ***Rm*** *in presence of platinum catalyst*✓ ***Rm*** *forming nitrogen monoxide and water.*

$4NH_{3\,(g)} + 5O_{2\,(g)} \xrightarrow{\text{Platinum}} 4NO_{(g)} + 6H_2O_{(l)}$

Nitrogen monoxide is further oxidized✓ ***Pc*** *to nitrogen dioxide.*

$N_{2\,(g)} + 2O_{2\,(g)} \longrightarrow 2NO_{2\,(g)}$

Nitrogen dioxide is dissolved✓ ***PP*** *in water in the presence of oxygen in a tank*✓ ***V*** *forming nitric acid. Nitric acid is heated*✓ ***Pc*** *with ammonia gas to form ammonium nitrate.*✓ ***Cd*** $NH_{3\,(g)} + HNO_{3\,(g)} \longrightarrow NH_4NO_{3\,(aq)}$

The fertilizer is further concentrated✓ ***Pc*** *and converted to solid form.*

Add All the Rm + PP + Pc + Pr + V + Cd + Ch = P_3 = 06 scores

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Side Effect: *Production of Nitrogen Oxides during the production of nitric acid,* ✓ ***Di*** *which are toxic, corrosive, and cause acid rain. Ammonium Nitrate is also a potential explosive.* ✓ ***De*** *This is* ***Mitigated by*** *employing an air scrubber/catalytic converter to capture and neutralize emissions before release out.* ✓ ***Dm***
Strict security and storage protocols must be enforced to prevent accidental explosion. ***Di + De + Dm = D_2 =04***

Social Benefits:
Creates employment for the local community ✓ ***Sb*** *which increases their income* ✓ ***Se*** *thus improving on peoples' standards of living.* ✓ ***Si***
Ammonium nitrate is a vital nitrogenous fertilizer which ensures improved crop yields (maize), which significantly boosts farmers' incomes and contributes to national food security. ***Sb + Se + Si = B_2 = 04***

TOTAL = P_3 + D_2 + B_2 = 06 + 04 + 05 =14 Scores

Item 5

A youth group has a washing bay along the river. As they wash vehicles, the waste water drains into the river. When senior one student from a nearby School went for a chemistry study tour to river, they found the youth busy with their routine work. One of the students noticed that the water-body around the washing bay looked abnormal. The student expressed worry about the safety of the people around the river and drew the attention of the area local authority. In response, the local authority has called for a meeting with the youth. You have been selected to give a sensitization talk.

Task:

Write details of the key issues you will address during the sensitization talk.

River water or Fresh water is a Renewable natural resource, ✓ ***Ci*** *because it is continuously replenished/replaced naturally through the water cycle in mans' life time.* ✓ ***R*** ***Water is composed*** *mainly of* ***Hydrogen*** ✓ ***Co*** *and dissolved* ***Oxygen***. ✓ ***Co*** *Others components are; dissolved mineral salts, aquatic plants and large animals as. well as micro-organisms.* ✓ ***Co***

Ci + R + 3Co =N_2 =05 scores
Ci + 1Co =N_1 =04 scores
Ci + R /3Co =N_0 =00

Impacts of Human Activity *such as Discharge of* ***untreated waste water*** *from vehicle washing (containing detergents, oils, and grease) into the river causes Water Pollution.* ✓ ***Mi*** *Detergents contain phosphate ions that lead to eutrophication (excessive algal bloom), reducing dissolved oxygen and suffocate aquatic life leading to their death. .* ✓ ***Me***

Mitigation: *Installation of sediment and grease traps or a simple waste water settling system to treat the water before releasing it and also use of biodegradable, phosphate-free detergents.* ✓ ***Mm*** *put strict laws preventing people from dumping wastes into water bodies* ***Mi + Me + Mm = M_2 = 04***
Mi /Me + Mm = M_2 = 04
Mi + Me = M_1 = 03
Mi = M_0 = 00

Benefit:

The river is a source of water for the youth ✓ ***Bi*** *group's business which provides a service and a source of employment to the community by increasing their income thus improving their standard of living.* ✓ ***Be*** *Water bodies are very useful in rain formation which is useful for proper plant growth*

Bi + Eb = Be = 05 scores

Bi only = B_{e0} = 00

TOTAL = N_2 + M_3 + B_2 = 06 + 04 + 05 =14 Scores

Item 6

Air is an important natural resource that should be conserved. There is improper waste management in some homes and schools involving open dumping and burning of garbage. These activities release toxic fumes into the atmosphere hence affecting the air quality. A head teacher has tasked the School Science Club to organize a sensitization campaign aimed at mitigating the challenge. The theme of the campaign is **Be an air quality Champion.**

You have been chosen to speak to the rest of the students regarding the theme. Figure **4** shows rubbish being burnt in a residential area.

Fig. 4. Rusbbish burning

Task:

Make a write-up of the message you will present.

Air is a Renewable natural resource. ✓ ***C*** *Reason is because air can be continuously replenished and restored* ✓ ***R*** *through natural processes such as photosynthesis and atmospheric circulation at a rate faster than it is consumed by humans.* ***Air is composed*** *of nitrogen gas,* ✓ ***Co*** *and oxygen gas,* ✓ ***Co*** *carbon dioxide,* ✓ ***Co*** *rare gases* ✓ ***Co*** *water vapour* ✓ ***Co*** *and dust*

Ci + R + 3Co =N_2 =05

Ci + 1Co =N_1 =04

Ci + R /3Co =N_0 =00

Human activities of rubbish burning, leads to incomplete combustion of waste (Rubbish)--especially plastics) releases toxic fumes like Carbon Monoxide,Dioxins, Particulate Matter) which causes Air Pollution, ✓ ***Mi*** *leading tosevere respiratory illnesses (asthma, lung cancer).* ✓ ***Me*** *This is* ***Mitigated*** *by promotion of waste segregation by separating organics from plastics and recycling of used materials.* ✓ ***Mm*** ***Mi + Me + Mm=M_2 =04scors***

Complete combustion of Rubbish waste produces green house gases like carbondioxide, sulphurdioxide which may cause global warming and cause acid rains that may damage the iorn roofs. This can be ***mitigated*** *by planting fast growing trees to absorb carbondioxide*

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Benefit:

- *Air provides Oxygen✓* ***Bi*** *which is essential for respiration in all living things thus improving health by sustaining life✓* ***Be*** *and supporting essential functions across various biological and ecological systems.*
- *Air contains carbondioxide that can be extracted✓* ***Bi*** *for use in fire extinguishers✓* ***Be***

Bi + Eb = Be = 05

Bi only = Be_0 = 00

TOTAL = N_2 + M_3 + B_2 = 06 + 04 + 05 =14 Scores

END

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