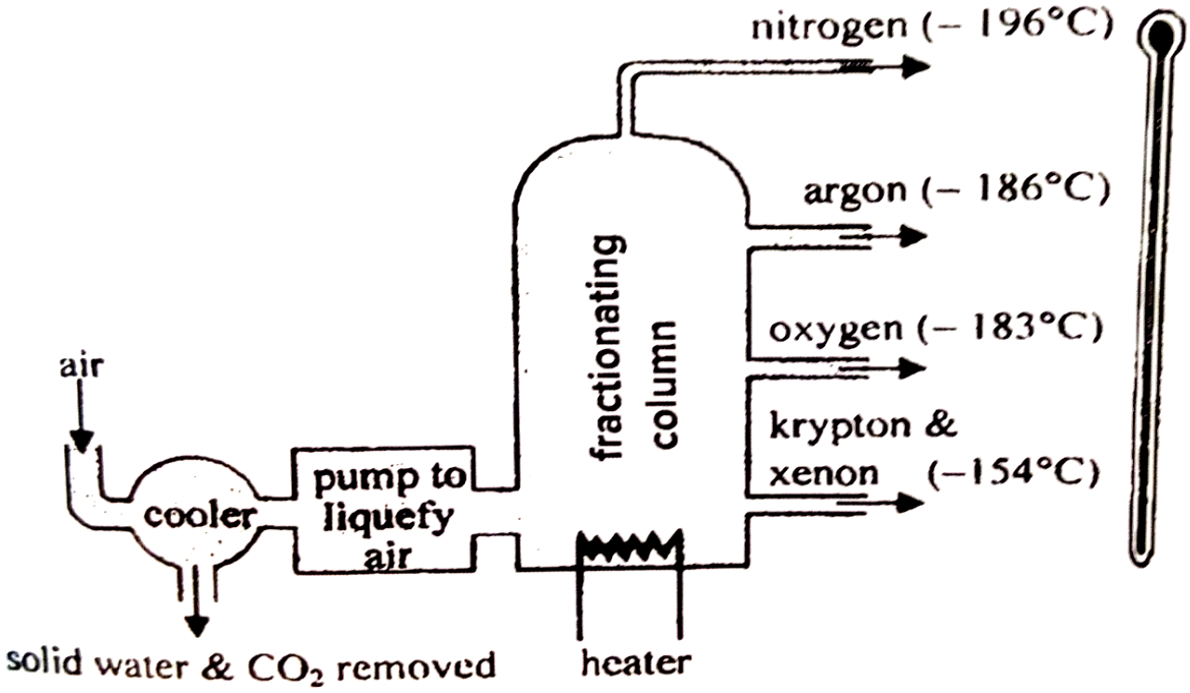
PREPARED BY JOSEPH LOMOI RUGAMOI (JOSELO)

MANUFACTIURE OF OXYGEN



PROCESS OF PRODUCTION

RAW MATERIALS; Air, Concentrated sodium hydroxide and silica

Air is passed through air filter to remove dust and smoke particles.

Air is passed through concentrated sodium hydroxide solution to remove carbon dioxide.

Air is then passed through silica jet to absorb water vapour.

Carbon dioxide and water vapour are removed from air before it is liquefied because they solidify and block the apparatus.

The remaining components of air are repeatedly compressed at 200 atmospheres and allowed to cool at about – 200 ^{0}C to obtain liquid air

The liquid air is fractionally distilled using a fractionating column.

Nitrogen boils off first because it has a lower boiling point (-196^{0}C) leaving behind oxygen with a higher boiling point (-183^{0}C). Pure oxygen is then stored under pressure in steel cylinders.

SIDE EFFECTS AND MITIGATION

Explosion of oxygen cylinders due to high pressure**;** This can cause other materials to catch fire causing injury to people; **Mitigation** can be done by regular maintenance and monitoring of cylinders.

SOCIAL BENEFITS

Employment opportunity**;** improved income**;** thus **better standards of living;**

TRIAL ITEMS WITH THEIR RESPONSES

ITEM 3 and 4 (vi) (Manufacture of oxygen)

During the Covid 19 Pandemic, there was a high demand of oxygen in referral hospitals in Uganda. An investor was contacted by the Ugandan government to set up an oxygen manufacturing plant in one of the swamps near Kampala city authority in order to increase oxygen production. However, the residents seem not to understand how the process was to occur plus its consequences and were resisting the project. As a **senior two** candidate with the knowledge of chemistry, you are required to create awareness to the members and provide the necessary information.

TASK: Write a presentation you will use upon meeting them.

RESPONSES TO ITEM 3 and 4(Vi) (Manufacture of Oxygen)

Process of production;(PP):

Air;✓ ***Rm*** *is passed through* ***air filters*** *to remove dust and smoke particles.;✓* ***Pr*** *It i s then passed through concentrated sodium hydroxide;✓* ***Rm*** *solution to remove carbon dioxide;✓* ***Pr***

$2NaOH_{(aq)} + CO_{2\,(g)} \rightarrow Na_2CO_{3(\,aq)} + H_2O_{(l)}$.

Air free from carbon dioxide is now passed through Silicon (IV) oxide;✓ ***Rm*** *to absorb water vapour.;✓* ***Pr*** *Carbon dioxide and water vapour are removed from air before it is liquefied because they would solidify and block the apparatus. The air is then compressed at 200 atmospheres;✓* ***Pc*** *and allowed to cool;✓* ***Pp*** *by making it escape into a large space through a jet. The process of cooling is repeated several times to obtain liquid air at about –200^{o}C. The liquid air is* ***fractionally distilled;✓*** ***Pc*** *using a* ***fractionating column / tower;✓*** ***V*** ***Nitrogen boils;✓*** ***Pc*** *off first because it has a lower boiling point (–196^{o}C) leaving behind oxygen with a higher boiling point of (-183^{o}C). Pure oxygen;✓* ***Cd*** *is then stored under pressure in steel cylinders.;✓* ***Ch***

3Rm+1V+3Pp+3Pc+1Pr+1Cd+1Ch =P$_3$=06score

Side effects/Dangers of the process of production

- ***Explosion of oxygen cylinders*** *due to high pressure;✓* ***Di causing injuries and fire outbreaks*** *also* ***resulting into damage to equipment,.;✓*** ***De mitigated*** *by the following;* ***first****, regular maintenance and monitoring of cylinders;* ***secondly****, keeping cylinders in cool areas to avoid exposure to heat.;✓* ***Dm*** ***Di + De + Dm = S$_3$ = 06scores***
- ***Exposure to liquid oxygen;✓*** *can* ***cause severe skin and eye irritations and burns, loss of vision and cancer****, ;✓* ***mitigated by****:*

** Posting hazard and warning information in the working area.;✓*

** Communicating all information on the health and safety hazards of oxygen to potentially exposed workers; for example; submerging the affected body parts in warm water.;✓*

Social benefits

- *Source of **employment** opportunities,;✓ **Sb** thus improved income;✓ **Se** and therefore **better standards of living;**✓ **Si***
- ***Increased government revenue** from taxes;✓ hence **improvement of infrastructure** such as roads, schools, health facilities;✓ leading to the **development of the society**.;✓*
- ***Development of small scale businesses**, hence **generating income**, leading to **better life;**✓ **Sb+Se+Si = B_3 =06Scores***
- ***Availability of oxygen for patients**, hence **saving lives of the people in the area** and living a **better health***

TOTAL = P_3 + S_3 + B_3 = 06 + 06 + 06 = 18 Scores

ROCKS AND MINERAL S

ITEM 5/6 (ii) (Rocks and minerals)

The Ugandan Geological scientists have researched that, there are many mineral reserves and rocks in Uganda. However, due to the rapid population growth, their exploitation is causing proportional environmental degradation. The government through media houses wants to make public awareness on the matter. Your school has been chosen to lead the environmental conservation campaign in your district. You have been chosen to present on one of the radio talk shows trusting your chemistry knowledge on natural resources.

TASK:

Write down the information that you can convey to the public on radio.

PROPOSED RESPONSES TO ITEM 5 /6 (II) *(ROCKS AND MINERALS)*

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 categorized as:

- ***Igneous rocks**, ;✓ **Co** composed of minerals like Quartz Feldspar, and the Olivine.;✓ **Co***
- ***Sedimentary rocks**, composed of minerals like Calcite, Quartz, Clay materials, and Gypsum.;✓ **Co***
- ***Metamorphic rocks**,;✓ **Co** composed of minerals like Garnet, Mica(biotite and muscovite), Quartz and Feldspar (Marble or Gneiss) ;✓ **Co***

1Ci + 1R + 3Co = N_2 = 06 scores

Impact of the human activities on the natural resource

- Stone quarrying produces dust particles. which ***erode into water bodies, ;✓ Mi hence reducing on water quality.;✓ Me Mitigation*** *is by extracting carefully and use of personal protective equipment.;✓* ***Mm***

- Stone quarrying and mineral extraction ***removes top soil and creates ditches*** *which* ***degrades the soil environment****, .;✓* ***Mi*** *hence affecting growth of plants, leading to* ***destruction of vegetation cover;✓ Me***

- Mineral extraction results into breaking of rocks into smaller stones and gravels .;✓ ***Mi*** *which* ***depreciates the rocks.;✓ Me*** *This is* ***mitigated*** *by, careful extraction.;✓* ***Mm*** *of Rocks.*

Mi + Me + Mm = M_3 = 04 Scores

Benefits / Importance of the natural resource

Rocks are ***broken*** *into hard core, gravel or panels.;✓* ***Bi*** *used as materials for construction of roads, bridges, and houses.;✓* ***Be*** *They are usefully in formation of soil.;✓* ***Bi*** *by a process of weathering.;✓* ***Be***

Bi + Be = B_2 = 05 scores

TOTAL = N_2 + M_3 + B_2 = 06 + 04 + 05 =15 Scores

END

JOSELO +256772194332/+25675194332