

SECTION Item 1

(a) Calcium is a metal because it forms an ion by loss of electrons in the outer most energy level / shell

$$C = G + R + E$$

$$C = 3$$

If learner gives

$G + R$, or $G + E$ or

$R + E$, then $C = 2$

If learner gives

only G or R or E

then $C = 1$

$C = 0$, if G, R, E not given

b, and c are combined

to make X

$X = 3$ for

$H + 1u$

$X = 2$ for

$1-3p$ and $1u$ or

$3p$ and $0u$

$X = 1$ for $2p$ and $0u$

or $1p$ and $0u$ or

$0p$ and $1u$

$X = 0$ for no p and

no u

b Malleable

Ductile

Good conductor of electricity

Lustrous

(OR EQUIVALENT)

c It strengthens bones and teeth.
(OR EQUIVALENT)

d Dissolved calcium in water causes hardness which ~~make~~ wastes soap.

Mitigation

Soften the water before using or use soft water like rain water

(OR EQUIVALENT)

$$I = D + M$$

$$I = 2$$

Learner scores

$I = 1$ if only D or

only M

$I = 0$ for no D

and no M

Item 2

- a. They can use plastic which is a synthetic material because it is made by man (OR EQUIVALENT) ✓^F

$$C = C_1 + R + E$$

(Refer to item 1 for details)

$$C = 3$$

b.

- ~~It is~~ Plastics are light ✓^P
- Plastics can be moulded in to different bottle shapes ✓^P
 - Some plastics are transparent for easy identification of the juice packed inside ✓^P
 - Plastics don't rust ✓^P
- (OR EQUIVALENT)

(Refer to item one for details)

$$X = H + I + U$$

$$X = 3$$

- c. Making of plastic chairs ✓^u
- (OR EQUIVALENT)

- d. Plastics are non biodegradable and thus when thrown in the soil they prevent water percolation and air aeration reducing the soil fertility mitigation ✓^{Di}
- Recycle the plastic materials ✓^M

$$I = D_1 + M$$

$$I = 2$$

(Refer to item one for details)

item 3

Raw materials

Air

concentrated sodium hydroxide solution

Silica gel

RM - raw materials

V - vessel

Pi - physical / chemical process

cd - conversion to desired product

ch - coherence

cp - complete process

Pr - Purification

 $CP = 3Pr + Pr$

Process of production

Atmospheric air is first pumped into tanks where it is filtered using air filters to remove dust particles.

Air is then passed through silica gel to remove water vapour.

The remaining air components are passed through beds of charcoal to remove air pollutants like nitrogen dioxide and, sulphur dioxide.

It is then passed through concentrated sodium hydroxide solution to remove carbon dioxide gas.

Air is repeatedly compressed at a pressure of 200 atmospheres and it becomes warm. Heat is removed by a network of pipes carrying liquid nitrogen.

The cold compressed air is allowed to expand rapidly, thus cooling even further to the point where most air is liquefied.

The liquefied air is then fractionally distilled where nitrogen with the lowest boiling point (-196°C) comes off first and later on warming, oxygen is collected at -183°C and stored in cylinders.

$P=3$ if learner gives all RM and V, cp, cd, ch

$P=2$ if learner gives 1 RM and any three of V, cp, cd, ch

$P=1$ if learner gives 1 RM and any 1 of V, cp, cd, ch

$P=0$ for no RM and no V, cp, cd, ch

✓ ch

side effects. ✓ ^{DE}

Noise pollution from compressors cause damage to the ear drum of the workers ✓ ^F

Mitigation

Fitting the containers with sound proof materials ✓ ^M

(OR EQUIVALENT)

$$S = D + E + M$$

$$S = 3$$

social benefit ✓ ^{BE}

source of employment opportunities, hence increased income and better standards of living ✓ ^F

(OR EQUIVALENT)

$$B = B_1 + E + I$$

$$B = 3$$

Item 4

Raw materials

sodium hydroxide ✓ AM

hydrochloric acid ✓ AM

Phenolphthalein ✓ AM

Process of production

20cm³ of sodium hydroxide solution is measured using a pipette and put in a conical flask ✓ PC

2 drops of phenolphthalein is added ✓ PC
is fixed on a retort stand and
A burette is filled to the zero mark with
dilute hydrochloric acid to the mark. ✓ PC

A white tile is put on the retort stand and a conical flask containing ~~saturated~~ sodium hydroxide is put on it

The burette is opened ✓ PC and the acid is run into the base until the colour just changes
~~This endpoint is noted and the experiment is repeated using same volumes of acid and base without the indicator~~

The experiment is repeated twice to minimize errors and the average volume noted.
The experiment is repeated using same volumes of base and acid without the indicator

The solution is placed on an evaporating dish and heated to up to a point when crystals begin to form ✓ CD

Cool the solutions and crystals will be formed, filter and wash the crystals with a few drops of water. ✓ CH

P=3

for all RM, and
all of V, CP, CD, CH

P=2

for 1 RM and
any three of
V, CP, CD, CH

P=1

for 1 RM and
1 of V, CP, CD, CH

P=0

for No RM,
No V, CP, CD, CH

side effect ✓_E

Acid spills cause burns on the skin and can result in to cancer

Mitigation

Wear personal protective gears ✓_M
S=9 (OR EQUIVALENT)

$$D = A_i + E + M$$

$$D = 3$$

social benefit

People acquire knowledge on preparation of salts such as ~~so~~ which can be used to cure diseases ✓_I for example iron sulphate hence improved health conditions ✓_E

$$B = B_i + E + I$$

$$B = 3$$

Item 5 $\checkmark$

Rocks are non renewable natural resources because it can not be replaced. $\checkmark$

composition: limestone, calcium, Feldspar, Quartz, mica

Rock quarrying / breaking rocks in to small pieces produces dust particles which are inhaled causing respiratory diseases. $\checkmark$

Mitigation

Wear face mask (OR EQUIVALENT)

Rocks weather and form fertile soils which are used for agriculture (OR EQUIVALENT) $\checkmark$

a) $N=3$ if learner has C, RE + ~~both~~ ^{any} three components

$N=2$ if learner has either $C+R$ or $C+E$ or $R+E$ and 1 component

$N=1$ if learner has either C or E or R and 1 component

$N=0$ if learner has no C, RE , no component or has C, RE but no component

b) $M = H + I + M$

$M = 3$

$M=2$ if learner has $H+I$ or $H+M$ or $I+M$

$M=1$ if learner has only H or I or M

$M=0$ for no HIM

c) $B_c = B_c + E$

$B_c = 2$

$B_c = \text{Benefit}$

$E = \text{Explanation}$

side effect ✓_E

Acid spills cause burns on the skin and can result in cancer mitigation

$$D = A + E + M$$

$$D = 3$$

mitigation

Wear personal protective gears (OR EQUIVALENT) ✓_M

social benefit

People acquire knowledge on preparation of salts such as ~~so~~ which can be used to cure diseases for example iron sulphate hence improved health conditions ✓_I

$$B = B + E + I$$

$$B = 3$$

Item 6 ✓
Air is a renewable natural resource because
it can be replaced ✓
composition: oxygen, nitrogen, carbon dioxide ✓

(check item 5 for details of scoring)

$$N = G + R + 3$$

components

$$N = 3$$

Factories produce pollutant gas such as
carbon dioxide which is a green house gas
causing global warming ✓

$$M = H + I + M$$

$$M = 3$$

Mitigation: Do reafforestation to absorb
carbon dioxide
or Use carbon based absorbers ✓
(OR EQUIVALENT)

Air contains carbon dioxide which is used
by plants to make their food during
photosynthesis hence increased rain from
trees ✓

$$B = B + E$$

$$B = 2$$