

MARKING GUIDE CHEMISTRY SET 3

Item 1

(a) Category /type

Tooth paste is alkaline material as opposed to water which is neutral

(b) Functions of the products

- Tooth paste being alkaline neutralizes the acids produced by bacteria that feed on the sugary foods that remain trapped between the teeth. By neutralization reaction the acids secreted by the bacteria are rendered not harmful. The enamel of the teeth will not decay
- Water on the other hand is a very good solvent capable of washing away the food remains but not fulcy acids produced by bacteria. This makes the teeth subject to decay.

(c) dangers of products

Tooth paste can lead to demineralization of teeth and weakening of enamel.

Mitigation

- can be done by using herbal toothpaste and washing with a lot of water after brushing.
- Avoid eating sugary foods to minimize the effect of bacterial secretions on the teeth therefore lowering the frequency of using tooth paste.

(d) evaluation of products and processes

Tooth paste cleans teeth better by neutralizing the acids secreted by bacteria whereas water only cleans but does not neutralise the acids subjecting teeth to attack by acids secreted by bacterial causing dental decay.

Item 2

(a) category of material or substance with reason

- (i) he construction materials can be grouped into natural or synthetic. Natural are God made such as timber while **synthetic** are man-made eg iron materials and polythene.

Alternative

Materials can be classified as **metals** because they have exceptional hard and durable qualities like aluminium copper and iron whereas **non-metals** which are relatively soft and can be easily broken such as wood, poles, plastics, glass etc

(ii) properties or predictions of properties of materials

- The material used to serve a specific purpose depends on its nature and properties. The rich man has to make a choice of materials to use basing on their properties.
- Iron alloy of steel is good for the support of water tank
- Iron is hard, strong and lasts long/non-biodegradable
- If it is an alloy of carbon i.e steel It is resistant to harsh environmental conditions and does not easily rust
- It can be easily welded in case of any breakage.
- Steel does not require painting so easy to maintain.

Aluminium

- Is light and strong can be used to form the water tanks to reduce weight on the stands
- Does not rust hence can withstand harsh weather conditions

- Easy to weld in case of breakage
- Can be painted hence appears attractive
- Has a high melting point thus stable

concrete

Water tank stand can be made of concrete with reinforced iron bars to add strength

Concrete is a mixture of stones, sand, water and cement. It may be reinforced with iron rods to make it more strong after setting.

Concrete is;

- Very hard and non-flexible to support heavy weight
- Resistant to harsh weather conditions hence can last for a long duration.
- Can take any shape before setting hence good for design which adds beauty
- Can be covered with ceramics or tiles to appear attractive and stronger.

Use of materials

- Iron is used for making water tank stand due to its strength to support heavy weight of water
- Water tank can be made of aluminium (plastics) due its low density
- Concrete is used to make pillars to support the water tank and the base on which the tank sits due its strength and resistance to weather conditions

Item 3

(a) Raw materials

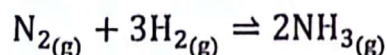
Ammonium nitrate fertilizer is manufactured from ammonia and nitric acid with nitrogen and hydrogen as the starting materials.

(b) process of production

Ammonia is manufactured in the haber process by direct synthesis of nitrogen and hydrogen

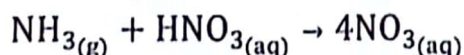
The nitrogen is obtained by fractional distillation of liquid air whereas hydrogen is from steam reforming hydro carbons

Nitrogen is mixed with hydrogen in the volume ratios of 1:3 respectively and passed over finely divided iron catalyst heated at a temperature of about 450°C and at a high pressure to form ammonia.



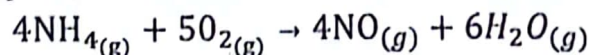
About **10-15** % of the gases combine and the rest is recycled form more ammonia

The ammonia produced is liquefied by refrigeration and used to form ammonium nitrate fertilizers by reaction with nitric acid.

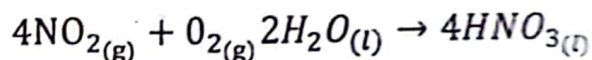
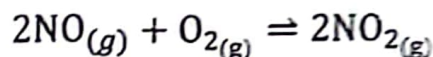


The nitric acid is produced by catalytic oxidation of ammonia.

Ammonia and excess air are passed over a heated platinum rhodium catalyst at a temperature of about 700°C to form nitrogen monoxide.



The gases are cooled so that nitrogen monoxide reacts with oxygen to form nitrogen dioxide that is dissolved in hot water at a high pressure to form nitric acid.



c) side effects of the process of production and mitigation

- Nitric acid fumes are very corrosive and may cause harmful effects on life and property such as corroding iron sheets
- Nitrogen gases are likewise harmful and can cause cancer if continuously exposed to humans

Mitigation

- Wear protective gears to avoid acid burns
- Put on masks to avoid inhaling nitrogen dioxide gas
- Introduce catalytic converters in exhaust fumes of machines to convert the pollutant nitrogen dioxide to safe nitrogen.

(d)

social benefits

Development of infrastructure like roads, schools, hospitals, electric lines thus a better standard of living as diseases, illiteracy are eliminated. Employment opportunities improved income and better standards of living.

Item 4

(a) Raw materials

Ripe bananas, sorghum and millet

(b) process of production

- Ripe bananas are peeled and put in a boat/canoe things squeezed into juice using spear grass
- The juice is filtered out, mixed with little water and roasted sorghum
- It is put in an air tight container such as a pot in a hole dug underground.
- Germinated millet flour/ yeast is added to the mixture before it is covered and buried for a period of 24- 48 hours for it to fully ferment
- Crude alcohol is formed
- The alcohol is removed and distilled to obtain ethanol solution which can be refined better through fractional distillation
- The pure ethanol is an antibiotic as it kills most bacteria hence used as a sanitizer to disinfect surfaces

(c) side effects of the production process and mitigation

- Ethanol is highly inflammable and can cause fires
- Pollutant emissions of machines that can cause greenhouse effect like global warming.
- Irritant smell of gases

mitigation

installation of fire extinguishers to put out fires

Implement protective measures to avoid causes of fire like no smoking

Plant trees and vegetation to remove carbondioxide for photosynthesis in order to reduce the greenhouse effect

(d) social benefits

Employment opportunities earn income and improve standards of living
Improve infrastructural development therefore better services and standards of living

Item 5

(a) identity/category of natural resource, reason and example

Lwera is a wetland which is having both renewable and non-renewable resources.

The renewable natural resources include water, air and vegetable which can be sustained while sand is non-renewable natural resource because it gets used up

(b) Composition of natural resources

Air has various gases such as oxygen carbondioxide nitrogen and pollutants from vehicles.

Vegetation and trees have carbon, hydrogen and oxygen as the major elements that constitutes their tissues.

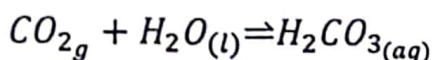
Water chemically has oxygen and hydrogen but also consists of living organisms, dissolved solutes and wastes.

(c) impact of natural resource on the environment

Air contains oxygen for respiration of organisms carbondioxide for photosynthesis.

How it occurs (chemical and physical reactions) and mitigation

And if above normal levels cause greenhouse effect such as global warming.



Mitigation for greenhouse gas

For greenhouse gas emissions plant trees

Water is habitat for many organisms

Oil spillage in water denies organisms oxygen for their respiration

Human waste released into water cause contamination making it unsafe for human use including other resources like fish. Such water can cause diseases like cholera and typhoid

Chemicals from detergents and fertilizers cause eutrophication and a rise in biological oxygen demand by other aquatic organisms like fish with low oxygen levels resulting in their death.

Mitigation of water

Avoid release of untreated sewage into water in order to avoid contamination

Strict laws to prevent the use of artificial fertilizer in farmland near swamps or a water body to prevent eutrophication.

Enforce strict laws to conserve wetlands

Limit human activities in wetland to preserve aquatic life

Prevent sand mining near lake shores as it destroys breeding places for fish.

(d) benefits

- Air facilitates respiration during which foods are oxidized in body cells to release energy. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$

Or

- Water has dissolved oxygen for respiration of aquatic organisms
- Water and plants play an important role in evaporation of water to form clouds that precipitate into rain.
- Swamps act as sponges that purify water to the rivers or lakes ensuring transparency of water and other physical properties
- The wet land is a water reservoir to main water body ensuring water is available at all time.
- Swamps are homes to species of organism like the crested cranes that can live both on land and water

Item 6

(a)

Category of natural resources reason and example

The activities of urban dwellers affect both renewable and non- renewable natural resources.

The renewable natural resources can be sustainable such as water, air and vegetation

Non-renewable natural resources cannot be replenished once they have got used up e.g fossil fuels, rocks and mineral ores.

(b)

Composition of natural resources

Water is chemically composed of oxygen and hydrogen

Air is composed of gases like oxygen, Nitrogen, carbondioxide, inert gases, water vapour and pollutants

Land consists of soil with varying chemical components like iron, oxygen, nitrogen, potassium, phosphorus, sulphur etc

(c)

Impact of natural resource to the environment, how it occurs and mitigation

Impact to the environment

- Air has oxygen for respiration of organisms to obtain energy for their survival
- Carbondioxide in air is essential for photosynthesis; too much levels of carbondioxide in air as a result of pollution cause global warming and acidic rain.
- High concertration of pollutants in air from exhaust fumes of vehicles and manufacturing industries spoilt the qualities of air which may cause respiratory infections/ acidic rain/global warming
- Soil pollution result in crop failure due to infertility of degradation.
- Water contamination by wastes affect exports of fish as it will be rejected in the internal market for not meeting the acceptable safety standards.
- Water physical properties change, smelly water will be rejected and declared unsafe for human consumption

- Oil spillage in water lowers oxygen levels rising the biological oxygen demand which can lead to death of other aquatic organisms like fish
- Hot waters rise temperatures in the water body causing migration of some species like fish to areas with low temperatures
- Chemicals can change the PH of water rendering it unsuitable for certain activities such as cleaning

Mitigation

- Plant trees maintain the balance between carbondioxide and oxygen levels.
- Use catalytic converters in exhaust pipes of vehicles and machines to reduce the effect of pollutants by converting them into non harmful products like sulphur dioxide to sulphur nitrogen dioxide gas to nitrogen.
- Safe disposal of polythene and plastic materials in landfills or recycle them
- Pollution

Mitigation for soil pollution is by adding calcium oxide to rise the PH, add rightful amounts of appropriate fertilizers and sensitization of the urban communities on safe waste disposal.

Mitigation for air pollution is to implement strict laws prohibiting burning of garbage

Mitigation for hot water is to strictly prohibit waste disposal from industries directly into water body

(d)

Benefit / importance of natural resource

Air is for respiration during which foods like glucose are broken down to release energy

Air is required by plants for both respiration and photosynthesis. Plants take in carbondioxide from air and fix it into carbohydrates.

Water is for drinking and forms the medium in which most body reactions take place

Water is a habitat for a number of aquatic organism which depend on its physical and chemical properties for survival such as availability of oxygen.

Soils support plant growth through provision of minerals and water.

END