Natural resources; Item 5/6

a) Category (Ci + R + 3Co)

- Renewable Natural resources (Can be replenished / Replaced)
  - Water; composed of Hydrogen, oxygen and some mineral salts like Iron, Magnesium, Calcium.
  - Trees; composed of Carbon, Hydrogen, Magnesium
  - Air; composed of oxygen, Carbon dioxide, Nitrogen
- Non-Renewable Natural resources (Can't be replenished / Replaced)
  - Rocks; composed of Quartz, mica, Iron, Magnesium
  - Fossil fuels (Carbon, Hydrogen, Nitrogen, Sulphur, oxygen)
    - Natural gas is composed of alkanes (Methane, Ethane, Propane, Butane)
    - Crude oil (carbon, Hydrogen, Nitrogen, Sulphur)
    - Coal (Carbon, Hydrogen, Nitrogen, oxygen)

Ci + R + 3Co = N = 06

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b) Human activity + Impact of human activity + Mitigation = $M_1 + Me + Mm = 04$

c) Benefit + Explanation = $Bi + Be = B_3 = 05$.

i) - Water; used to cool (Bi) machines in industries due to its high heat of vaporisation (Be).

ii) - Trees; - Air purification (Bi) by adding oxygen to (Be) and removing carbon dioxide from the atmosphere.

- Control global warming by removing carbon dioxide gas which is a green house gas from the atmosphere.
- Control of soil erosion by reducing the speed of water run off.

(iii) - Air; Air ~~pollutants~~ facilitates (Bi) photosynthesis. Carbon dioxide from air combines with water in the presence of sunlight.

- Air facilitates respiration. Oxygen from air oxidises carbohydrates to release energy and carbon dioxide

(iv) - Rocks; - Source of raw materials (Bi) for making cement. Limestone from rocks is mixed with other ingredients to make cement.

- Useful in the formation of soil through the process of weathering

v) - Fossil fuels / Crude oil; used as fuel. Fossil fuels / Crude oil when burnt produces heat energy used to run engines and machines

Industrial processes; item 3/4

a) Social benefits of any industrial process; SB + SE + SI = B_3 = 06

✓ People get employed, raising their incomes / increasing their incomes thus better/ improved standards of living

✓ Development of infrastructure like roads which facilitate trade hence improved incomes thus better standards of living.

b) Dangers of the production process;

✓ Extraction of copper, Aluminium, Iron, Cement, Crude oil, Ethanol, Ammonium nitrate fertilizer, Chlorine, Sodium hydroxide, sulphuric acid, Detergents, Oxygen, Biogas, Lime } ✓Di Water pollution due to discharge of ✓De industrial wastes into water bodies. Mitigated by ✓Dm treating the industrial wastes before discharging them into water bodies.

✓ Production of Biogas, Iron, Aluminium, Cement, Lime, Crude oil, Ethanol } ✓Di Air pollution due to release of waste acidic gases such as carbon dioxide into the atmosphere which accumulates lowering the air quality. Mitigated by ✓Dm planting fast growing trees to absorb the carbon dioxide from the atmosphere

OR

✓ Global warming due to release of waste gases such as carbon dioxide which is a ✓ green house gas which on accumulation in the atmosphere causes climate change. Mitigated by ✓ Planting fast growing trees to absorb Carbon dioxide gas from the atmosphere

Di + De + Dm = 06

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Di + De + Dm = 06

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c) Production process; ✓ All Rm + V + PP + Pc + Pr + Cd + Ch = B3 = 06

i) Biogas production

Organic (Rm) wastes are collected and mixed (PP) with water (Rm) to form a liquid mixture (Rm) which is then fed (PP) into the digester tank which is covered to prevent aerial oxidation (Pc). The tank and its contents are maintained at a temperature of 25°C to 35°C for about 2 weeks. Fermentation (Pc) takes place where Anaerobic bacteria decompose (PP) the organic wastes to produce Biogas (Cd) which is purified by removing impurities (Pr) such as carbondioxide. Biogas can now be channelled via pipes ✓ for direct use or stored in gas cylinders ✓ under pressure ✓ Ch

ii) Production of Ammonia gas

Nitrogen gas (Rm) and Hydrogen gas (Rm) are purified (Pr), dried (PP) and mixed in a reactor vessel ✓ in the ratio of 1:3 respectively. The mixtured is heated (PP) at about a temperature of 450°C to 500°C and pressure of 200 atmospheres in the presence of finely divided Iron catalyst (Rm) in a catalystic chamber ✓ V. Nitrogen reacts (Pc) with Hydrogen to form Ammonia gas ✓ Cd which is cooled (PP) to form Liquid Ammonia which is purified by Methanation (Pr) process and stored ✓ Ch

iii) Production of Lime:

Limestone (Rm) is extracted (PP) from the quarry. Rocks having a high percentage of limestone are separated (Pr) from those with a low percentage of limestone. They are crushed (PP) using grinders (V) and fed (Pr) into a kiln (V) from the side tubes. Limestone is heated (PP) to about 900°c and it decomposes (Pc) to form Quick lime (cd) which is cooled (PP) before water is added to it to form slaked lime. The slaked lime is passed through purifiers (V) to remove (Pr) any impurities and then packed for use. (ch).

iv) Extraction of Iron:

Haematite (Rm) ore, coke (Rm) and limestone (Rm) are fed (PP) into a blast (V) furnace (V) from the top. Hot compressed air (Rm) is blown into the furnace from the bottom. Coke is oxidised (Pc) by the hot air to form carbon dioxide. Carbon dioxide formed is then reduced (Pc) by unreacted coke to form carbon monoxide which reduces (Pc) Haematite to molten Iron and carbon dioxide gas is given off. Limestone decomposes (Pc) to calcium oxide and carbon dioxide. Calcium oxide reacts (Pc) with silicon dioxide to form calcium silicate which is tapped off (Pr). Air is passed through molten Iron to remove (Pr) the non-metallic impurities so as to obtain pure Iron (cd) which is collected and stored as Iron bars after cooling. (ch)

Chemicals for consumers Item 1

1. Medicines; a) category — Traditional medicine C=02 ✓; Modern medicine C=02 ✓

b) Function (i) Antibiotic; kills bacteria ✓F / Treat bacterial infections by inhibiting multiplication ✓F and growth of bacteria

(ii) Analgesic; Relieves ✓F pain by blocking ✓F pain impulses to the brain.

(iii) Stimulant; Increases ✓F alertness by increasing ✓F the activity of the sympathetic nervous system.

(iv) Antidepressant; used to manage symptoms of depression by affecting the behaviour of neurotransmitters

OR Affects moods and emotions by affecting the behaviour of neurotransmitters

v) Antipsychotic; used to manage dis-organised thinking / controls thinking ✓F, mood and perception by regulating the function of the brain. ✓Di

c) Dangers; – Liver damage ✓; medicine contain chemicals that harm liver cells. Mitigated by taking medicine as prescribed ✓Dm by the medical personnel / Taking the right dose as prescribed by the medical personnel.

directed /

– Allergic reactions; such as vomiting / stomach upsets which change the normal physiological function of the body. Mitigated by avoiding self medication / seeking advice from a medical personnel.

d) Evaluation; Both traditional and modern medicines contain chemicals that have side effects ✓ to man. However, modern medicines have more side effects ✓ than traditional medicine

OR Both traditional medicines and modern medicines contain chemicals that have side effects to man But modern medicines have clear dosage / prescription while traditional medicines have no clear dosage / Prescription

2. Food additives; a) category — Natural food additives; Synthetic food additives

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b) Function (i) preservative; Extends shelf life by preventing food ✓F
in and microbial growth.

(ii) Anti oxidant; prevents oxidation ✓F of food by neutralising ✓F
the free radicals in the food

(iii) Food flavouring agent; Improves ✓F on taste of food by stimulating ✓F
the taste buds.

(iv) Food colourant; Enhances the appearance of food by absorbing and reflecting certain wave lengths of light from food.

v) Food stabilizers | thickeners; Produce a uniform ✓F texture of food
by absorbing excess liquid from food. ✓F

c) Dangers; – Cancer ✓ risks; some food additives contain ✓ chemicals (like those added to canned foods) that cause cancer. Mitigated by checking on the ingredients' labels as indicated on the package.
– Liver damage; Food additives contain chemicals that harm the liver cells. Mitigated by limiting their use.

d) Evaluation; – Both Natural and synthetic food additives make the food delicious. ✓
But synthetic food additives have more ✓ side effects than Natural food additives. OR Both Natural and synthetic food additives contain chemicals that have side effects to Mom. However, Natural food additives have less side effects them the synthetic food additives.

3. Beverages; a) Category — Non-Alcoholic beverages
Alcoholic beverages

b) Function (i) Alcoholic beverages; ✓F Depressants which
work by slowing down ✓F brain activity

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b) Non-Alcoholic beverages — water; Quenches thirsty by hydrating the body.

— Soda; provide flavours and refreshment.

— Energy drinks; provide mental and physical stimulation

c) Dangers; (i) water; — Bloating. Excessive water consumption can cause stomach discomfort. Mitigated by regulating the amount of water taken

(ii) Soda; — Weight gain due to high sugar content in the soda. Mitigated by regulating the amount of soda taken

(iii) Energy drinks; — Heart failure. Energy drinks contain chemicals that increase heart rate and pressure. Mitigated by regulating the amount of energy drinks taken.

d) Evaluation; — Both Alcoholic and non-Alcoholic beverages contain chemicals that have side effects to Man. But Alcoholic beverages have more side effects than non-Alcoholic beverages

4. Nuclear processes; a) category — Nuclear fission, Nuclear fusion

b) How does the process work?

i) Nuclear fission; Uranium — 235 is bombarded with a neutron. Its atomic mass increases and the nucleus becomes unstable. This makes it to split into two lighter nuclei with release of energy and more neutrons. The neutrons formed cause more atoms of uranium-235 to split. This process continues in a chain reaction with production of more energy. This energy is used to boil water to steam which drives turbines to generate electricity.

(ii) Nuclear fusion; Two lighter nuclei such as Hydrogen and Deuterium/Tritium combine under very high temperature and pressure to form Helium and neutrons with release of energy. The energy released is absorbed by solar pannels to generate Direct current which is converted to alternating current by an inverter making it usuable for domestic and industrial purposes

c) Dangers;- Causes cancer. Direct exposure to excess radi emitted can cause uncontrolled cell division. Mitigat by wearing Lead coats / protective suits.

- Causes mutations. Direct exposure to radiations affect the arrangement of the genes within the cells Mitigated by wearing Lead coats/ protective suits.

Di + De + Dm = D_3 = 06

d) - Evaluation; - Both nuclear processes release alot of energy

- Both nuclear processes use high level of technology
- Both nuclear processes use expensive equipment

However,- Nuclear fission produces more energy than nuclear fusion

- Nuclear fission can take place at ordinary temperatures while nuclear fusion takes place at very high temperatures

5. Detergents; a) Category
   - Soapy detergent C=02
   - Soapless detergent C=02

b) Function of the product / Working of the product;

A soapy / soapless detergent contains two parts; Hydrophilic head and Hydrophobic tail.

During washing soapless / soapy detergent lowers the surface tension between water and dirt.

The hydrophilic head dissolves in water while the hydrophobic tail attaches itself onto the dirt. With constant agitation, dirt is removed from the cloth, rinsed and dried

e) Dangers / side effects

(i) Soapy detergent; - Eye redness leading to pain and loss of vision because of the chemicals contained in the soapy detergent. Mitigated by washing thoroughly the affected area (eyes) with plenty of clean water

- Skin burns / skin irritations leading to pain due to the chemicals contained in the soapy detergent. Mitigated by use of gloves

(ii) Soapless detergent; - water pollution; as soapless detergents contains phosphates so when discharged into water bodies causes an algal bloom which leads to suffocation and death of aquatic life. Mitigated by proper disposal of the soapy (less) detergent

d) Evaluation; - Both soapy and soapless detergents are salts of organic acids of long carbon chain

- Both soapy and soapless detergents are effective cleansing agents in soft water

However; - soapy detergent forms scum with hard water while a soapless detergent does not form scum with any form of water.

- soapy detergent is biodegradable while a soapless detergent is Non-biodegradable.

C+F = T_2 = 06

Item 2

a) Category; (Ci + Cr + Ce) = 04

i) Materials / Plastics / polymers / Alloys ;
- Synthetic material; Man made material (Ci, Cr)
- Natural material; God made material (Ci, Cr)

ii) Elements;
- Non-metal (Ci); gains electron(s) to its outer most shell to form a negative ion
- Metal; it loses its outer most electron(s) to form a positive ion

iii) Compound
- Ionic compound (Ci); Formed by combination of a metal (Cr) and non-metal.
- Covalent compound; Formed by combination of non-metal (Cr) atoms.

iv) Oxide
- Basic oxide (Ci); dissolves in water to form an alkaline solution (Cr)
- Acidic oxide (Ci); dissolves in water to form an acidic solution (Cr)
- Neutral oxide (Ci); dissolves in water to form a neutral solution (Cr)

v) Mixture; Method of separation + principle behind separation.

vi) structures;
- Giant Ionic structure (Ci); ions held together by strong Ionic bonds (Cr)
- Giant metallic structure; atoms held together by strong metallic bonds
- Giant covalent structure (Cr); Atoms held together by strong covalent bonds
- Simple molecular structure; Molecules held together by weak Vander waals forces of attraction

b) Suitability; 4Ps + 1 use = 05

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Item 2

a) Category; (Ci + Cr + Ce) = 04

i) Materials / plastics / polymers / Alloys ;
- Synthetic material; Man made material (Ci, Cr)
- Natural material; God made material (Ci, Cr)

ii) Elements;
- Non-metal; gains electron(s) to its outer most shell to form a negative ion (Ci)
- Metal; it loses its outer most electron(s) to form a positive ion

iii) Compund
- Ionic compound; Formed by combination of a metal and non-metal. (Ci, Cr)
- Covalent compund; Formed by combination of non-metal atoms. (Cr)

iv) Oxide
- Basic oxide; dissolves in water to form an alkaline solution (Ci, Cr)
- Acidic oxide; dissolves in water to form an acidic solution (Ci, Cr)
- Neutral oxide; dissolves in water to form a neutral solution (Ci, Cr)

v) Mixture; Method of separation + principle behind separation.

vi) structures;
- Giant Ionic structure; ions held together by strong Ionic bonds (Ci, Cr)
- Giant metallic structure; atoms held together by strong metallic bonds
- Giant covalent structure; Atoms held together by strong covalent bonds (Cr)
- Simple molecular structure; Molecules held together by weak vander waals' forces of attraction

b) Suitability; 4Ps + 1 use = 05

c) Danger / side effect (DitDetDm) = 03

✓ Nylon / Glass / Plastics / Polyethene / Polyester / Alloys / ~~Ores~~ } – Non-biodegradable (Di) so accumulates (De) in the environment polluting soil / water. Mitigated by recycling (Dm)

✓ Ceramics – – – – – – – – – – } – Non-biodegradable (Di) so accumulate (De) in the environment when poorly disposed polluting the soil. Mitigated by proper (De) disposal of ceramic wastes

✓ Iron bars / Aluminium bars / sheets / Synthetic rubber } – Deplete soil fertility (Di) on accumulation in the soil leading to low crop yields. Mitigated by recycling. (Dm)

✓ Paper / coton / sisal / wood / wool } – Global warming; when burnt ---- releases carbon dioxide which is a green-house gas. Mitigated by planting fast growing trees to absorb carbon dioxide.
– Air pollution; when burnt, ---- release pollutant gases such as carbon dioxide into the atmosphere which accumulates lowering the air quality. Mitigated by planting fast growing trees to absorb carbondioxide from the atmosphere.

✓ Concrete / mortar } – Take long to decompose spoiling the soil. Mitigated by recycling concrete / mortar wastes.

✓ Salts } – Soil salinity; when poorly disposed, accumulate in the soil leading to low crop yields. Mitigated by proper disposal
– Water pollution when poorly disposed, it accumulates in water bodies. Mitigated by proper disposal