

545/1 Chemistry paper 1 Marking Guide, 2024

BASIS	CRITERIA FOR ASSESSMENT	SCORING
CATEGORY OF PRODUCT	Modern medicine i.e. Analgesics e.g. paracetamol	02
Function of the product	Works by relieving mild to moderate pain like headache, muscle & joint pains, backache & period pains	01
Dangers	Can cause skin rashes, blood disorders and acute inflammation of the pancreas if used on regular basis for a long time Overdose can cause liver damage	03
Evaluation	Similarities Both traditional herbs and modern medicines aim at treating symptoms of the disease. Differences Natural medicines lack scientific evidence for variable efficacy while modern medicines are scientifically evidenced.	02

N0.2

BASIS	CRITERIA	SCORE
CATEGORY (REASON AND EXAMPLE)	A material is a substance or a mixture of substances that constitute an object. It can be Natural or Artificial. Natural material is God made / exists in nature and its formation is not influenced by man e.g. rocks, sand, wood, water, soil etc. Artificial material is man-made / synthetic manufactured by man e.g. iron bars, plastics, paint, composites	02
PROPERTIES OF MATERIALS	Materials to be used for constructing a roof strong house have different qualities based on their nature. (a) Iron; - Very strong (can support heavy load.) - has high tensile strength (resists breakage). - its ductile and malleable (easy to mould.) - has high melting point (resists fires.)	03

	<ul style="list-style-type: none"> - Galvanised iron resists rusting. - steel has improved properties, making it suitable for many users. <p>(b) Aluminium;</p> <ul style="list-style-type: none"> - low density (used on top of buildings). - strong, not easy to break / durable. - has high melting points (resists fires). - has bright appearance (used for doors, roofing, window frames.) - high electrical/ heat conductivity (making utensils.) <p>03 5 (c) Wood;</p> <ul style="list-style-type: none"> - Readily available so easy to get cheaply. - Strong, so it can support heavy load. - Light when dry so good for roofing. - Easy to smoothen to give nice appearance. - can rot or be eaten by termites when not treated. (Cushioning to spread the vertical load e direction so good for windows (visual security.) 	
USES OF MATERIALS	<p>Iron;</p> <ul style="list-style-type: none"> - Irons used to fix / join objects like timber, iron sheets. - Used for plumbing. <p>Wood;</p> <ul style="list-style-type: none"> - Making struts and ties during roofing. - Making poles, pillars and beam 	01
IMPACT OF SUBSTANCE TO THE ENVIRONMENT	<p>Iron;</p> <ul style="list-style-type: none"> - Depletes soil fertility when it accumulates. - Being a heavy metal can cause cancer. - Non-biodegradable <p>Wood</p> <ul style="list-style-type: none"> • Cutting trees to get wood leads to deforestation. 	02

SECTION B

BASIS	CRITERIA	SCORE
Raw materials	Fats or oils Sodium hydroxide Salt	01
Process of production	The process of making soap using an alkali and fat/oil (ester) is known as saponification.	03

	<p>Boil vegetable oil (from coconut, ground nuts, cotton etc.) or animal fat (from cattle or sheep) with concentrated sodium hydroxide solution in a metallic can until a uniform solution is obtained. Allow the solution to cool.</p> <p>Concentrated solution of sodium chloride (brine) is added to precipitate the soap which floats on the surface.</p> <p>The process of precipitating the soap is known as salting out.</p> <p>The soap is then removed and treated further to produce pure soap.</p> <p>Perfumes may, dyes and disinfectants may be added to make toilet soap e.g. Geisha</p> <p>General equation</p> $\text{RCOOR}_1 + \text{NaOH} \rightarrow \text{RCOONa} + \text{ROH}$ <p>Fat/oil + Alkali Soap + Glycerol</p>	
Social benefits	<p>The process leads to production of soap which can facilitates cleaning hence improving on people's hygiene leading to improved health</p> <p>Alternative</p> <p>Employment opportunities leading to improved standards of living as a result of income earned hence development.</p> <p>Increased revenue as a result of taxes that are got from the companies which is used to develop other sectors</p>	02
Impacts and mitigation	<p>Soap produced can lead to water pollution as a result of wastes being washed into water bodies, this in the end affects aquatic animals leading to their death. Additionally, it can also create a threat to human health as a result of consumption of unclean water.</p> <p>Mitigation</p> <p>Proper disposal of wastes from soap after the cleaning process.</p>	03

NO.4

BASIS	CRITERIA	SCORE
RAW MATERIALS	The principle/chief ores of iron are: Haematite, Fe_2O_3 ; Magnetite, Fe_3O_4 ; Iron pyrite, FeS_2 ;	02

	Siderite or Spathic iron ore (FeCO_3); Limonite ($\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$).	
PROCESS OF PRODUCTION	<p>The iron ore is crushed and roasted in air to remove water and other non-metallic impurities especially sulphur and phosphorus which are oxidized away as gaseous oxides.</p> <p>The roasted ore is now mainly Fe_3O_4.</p> <p>When an ore is roasted in air and Fe_3O_4 is the main product, it is known as sintering.</p> <p>The roasted ore is mixed with coke (carbon) and limestone (calcium carbonate) and introduced into the blast furnace where the reduction of the ore takes place.</p> <p>Very hot air is introduced from low down into the blast furnace.</p> <p>As the hot air passes through the mixture of roasted ore, coke and limestone, the coke burns to form carbon dioxide (is oxidized) in an exothermic process.</p> $\text{C(s)} + \text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)}$ <p>As the carbon dioxide produced rises through the furnace, it is reduced by the excess hot coke to produce carbon monoxide.</p> $\text{CO}_2\text{(g)} + \text{C(s)} \rightarrow 2\text{CO(g)}$ <p>The carbon monoxide formed reduces the iron ore at a high temperature (about 1000°C) to form iron metal.</p> $4\text{CO(g)} + \text{Fe}_3\text{O}_4\text{(s)} \rightarrow 3\text{Fe(s)} + 4\text{CO}_2\text{(g)}$ <p>The molten iron formed sinks to the bottom of the blast furnace where it is tapped and solidified into blocks of pig iron.</p> <p>The pig iron is purified by electrolysis.</p> <p>Steel is an alloy of mainly iron with carbon and other elements like manganese, chromium, silicon, cobalt and some time tungsten.</p> <p>The quality of steel depends on the amount of carbon present and this in turn determines its intended use.</p>	03
SOCIAL BENEFITS	The steel produced can be used for construction of bridges hence leading to	03

	<p>development of transport system.</p> <p>Employment opportunities leading to improvement income sources hence improved standards of living.</p>
SIDE EFFECTS	<p>The production process can lead to air pollution due to emissions from the engine like carbon dioxide which is a byproduct leading to greenhouse effect hence global warming.</p> <p>Mitigation</p> <ul style="list-style-type: none"> - fitting catalytic converters in exhaust pipes of machines to convert oxides of nitrogen like nitrogen and carbon monoxide to carbon dioxide <p>Alternative</p> <p>Depletion of soil as a result of extraction process. This can lead to soil erosion and degradation.</p>

N.O.5

BASIS	CRITERIA	SCORE
IDENTIFY (CATEGORY OF NATURAL RESOURCE)	<p>Renewable resource because it exists on its own and can be replaced after consumption. e.g. air, forests.</p> <p>Non-renewable resources: Resources that cannot be replaced once consumed e.g. fossil fuels</p>	03
COMPOSITION OF NATURAL RESOURCES	<p>Air contains Nitrogen, Oxygen Carbon dioxide, rare gases, water contains; Hydrogen and oxygen.</p> <p>Forests are composed of trees which contain carbon element.</p>	02
IMPACT OF THE NATURAL RESOURCE	<p>Cutting down of trees can lead to loss of habitat of wild animals which in turn puts human being at risk of being attacked by dangerous animals.</p> <p>Mitigation</p> <p>Re afforestation</p> <p>Cutting of trees leads to increased accumulation of carbon dioxide in the atmosphere since the trees that would absorb them are cut down. This can later lead</p>	03

	<p>to greenhouse effect hence global warming. And also, can lead to formation of acidic rain that can lead to death of aquatic animals</p> <p>Mitigation</p> <p>Planting trees to absorb the excess carbon dioxide.</p> <p>Charcoal burning.</p> <p>Leads to increased amount of carbon dioxide in the atmosphere which contributes to climate change and global warming.</p> <p>Mitigation</p> <p>Use charcoal briquettes made from waste organic materials.</p>	
BENEFITS	<p>Air is used for photosynthesis. During this process, carbon dioxide from air combines with water in presence of sunlight trapped by chlorophyll to form glucose and oxygen.</p> <p>Air is used for respiration. During respiration carbohydrate combine with oxygen in air to release energy and carbon dioxide used for proper body functioning</p> <p>Trees act as sources of building materials like timber which is used for construction of the roof. They also contribute to the rain cycle as they release vapor which condenses in the atmosphere to form rainfall.</p>	03

No .6

BASIS	CRITERIA	SCORE
IDENTIFY (CATEGORY OF NATURAL RESOURCE)	Renewable resource because it exists on its own and can be replaced e.g. air, Non-renewable resources because it can get used up e.g. rocks and minerals	03
COMPOSITION OF NATURAL RESOURCES	Air contains Nitrogen, Oxygen Carbon dioxide, rare gases, water contains; Hydrogen and oxygen.	02

	Rocks contain minerals like limestone in metamorphic rocks	
IMPACT OF THE NATURAL RESOURCE	Limestone quarrying leads to release of harmful gases in the atmosphere this can later lead to air pollution which causes respiratory related illness like bronchitis Mitigation Catalytic converters	03
BENEFITS	Air is used for photosynthesis. During this process, carbon dioxide from air combines with water in presence of sunlight trapped by chlorophyll to form glucose and oxygen. Air is used for respiration. During respiration carbohydrate combine with oxygen in air to release energy and carbon dioxide used for proper body functioning Rocks contain minerals like limestone which is used in the production of cement. it is done by converting the raw materials to finished product.	03

06

END