Classroom 42

Triple Science, Higher Tier

C10 Using Materials Revision Checklist

Topic	Content	✓
Using the Earth's Resources and Sustainable Development	• Using the Earth's Resources - Describe how humans use the Earth's resources for warmth, shelter, food, and transport, state examples of natural products supplemented or replaced by agricultural and synthetic products, distinguish between finite and renewable resources.	
	• Sustainable Development - Define sustainable development as meeting the needs of the present without compromising future generations, explain the role of chemistry in improving agricultural and industrial processes to promote sustainability.	
Portable Water and Waste Water Treatment	• Potable Water - Define potable water and explain why it is not chemically pure, describe the process of producing potable water from fresh water sources (filtration and sterilisation), explain desalination methods (distillation and reverse osmosis) and why they require large amounts of energy.	
	• Required Practical 8: Analysis and Purification of Water - Test the pH of water samples, determine dissolved solids, and purify water using distillation	
	• Compare methods for obtaining potable water from different sources.	
	• Waste Water Treatment - Explain the process of treating urban and industrial waste water, describe key stages: screening, sedimentation, anaerobic digestion of sewage sludge, and aerobic biological treatment of effluent, compare the ease of obtaining potable water from waste, ground, and salt water.	
Alternative Methods of Extracting Metals	• Phytomining and Bioleaching - Explain how phytomining uses plants to absorb metal compounds and bioleaching uses bacteria to produce leachate solutions containing metal ions, describe how metals can be obtained from these compounds using displacement or electrolysis, evaluate the environmental benefits of these methods over traditional mining.	
Lifecycle Assessment	• Life Cycle Assessment (LCA) - Describe the four stages of an LCA: raw material extraction, manufacturing and packaging, product use, disposal and transportation, explain how LCAs assess environmental impact but involve value judgments, compare LCAs of different products, such as plastic and paper bags.	
	• Reducing Resource Use - Explain how reducing, reusing, and recycling materials conserves resources and reduces environmental impact, describe how glass, metals, and plastics can be reused or recycled, discuss the role of energy use in material processing and recycling.	

Triple Science, Higher Tier

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Using Materials	• Corrosion and Its Prevention – Define corrosion and explain how rusting requires both air and water, describe methods to prevent corrosion, including barriers (painting, greasing, electroplating) and sacrificial protection (galvanising).	
	• Alloys as Useful Materials – Recall common alloys and their uses: bronze (copper and tin), brass (copper and zinc), steels (high carbon, low carbon, stainless steel), aluminium alloys (low density), explain how alloying changes material properties.	
	• Ceramics, Polymers, and Composites – Describe how different materials are made: soda-lime and borosilicate glass, clay ceramics, polymers (thermosoftening and thermosetting), and composites, compare the properties and uses of ceramics, polymers, composites, and metals.	
The Haber Process and Use of NPF Fertiliser	• The Haber Process – Explain how ammonia is produced by reacting nitrogen with hydrogen using an iron catalyst at 450°C and 200 atmospheres, describe how the reaction is reversible, explain that ammonia is removed by cooling and the unreacted gases are recycled.	
	• Sources of Raw Materials – Recall that nitrogen is obtained from the air and hydrogen is produced from natural gas or by electrolysis of water.	
	• Equilibrium Considerations – Apply Le Chatelier's principle to the Haber process, explain the trade-off between rate, yield, and cost, interpret graphs of reaction conditions versus rate and yield, describe how catalysts and temperature affect reaction equilibrium.	
	• NPK Fertilisers – Explain how nitrogen, phosphorus, and potassium compounds are used in fertilisers to improve agricultural productivity, describe how ammonia is used to make ammonium salts and nitric acid.	
	• Production of Fertilisers – Compare the industrial production of fertilisers (large-scale continuous processes) with laboratory preparation (batch processes), explain how phosphate rock is treated with nitric acid, sulfuric acid, or phosphoric acid to make soluble fertilisers.	
	• Preparing a Fertiliser – Describe how to prepare an ammonium salt.	

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Triple Science, Foundation Tier

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Portable Water and Waste Water Treatment	• Potable Water - Define potable water and explain why it is not chemically pure, describe the process of producing potable water from fresh water sources (filtration and sterilisation), explain desalination methods (distillation and reverse osmosis) and why they require large amounts of energy.	
	• Required Practical 8: Analysis and Purification of Water - Test the pH of water samples, determine dissolved solids, and purify water using distillation	
	• Compare methods for obtaining potable water from different sources.	
	• Waste Water Treatment - Explain the process of treating urban and industrial waste water, describe key stages: screening, sedimentation, anaerobic digestion of sewage sludge, and aerobic biological treatment of effluent, compare the ease of obtaining potable water from waste, ground, and salt water.	
Lifecycle Assessment	• Life Cycle Assessment (LCA) - Describe the four stages of an LCA: raw material extraction, manufacturing and packaging, product use, disposal and transportation, explain how LCAs assess environmental impact but involve value judgments, compare LCAs of different products, such as plastic and paper bags.	
	• Reducing Resource Use - Explain how reducing, reusing, and recycling materials conserves resources and reduces environmental impact, describe how glass, metals, and plastics can be reused or recycled, discuss the role of energy use in material processing and recycling.	

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The Haber Process and Use of NPF Fertiliser	• The Haber Process – Explain how ammonia is produced by reacting nitrogen with hydrogen using an iron catalyst at 450°C and 200 atmospheres, describe how the reaction is reversible, explain that ammonia is removed by cooling and the unreacted gases are recycled.	
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Classroom 42

Double Science, Higher Tier

C10 Using Materials Revision Checklist

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Portable Water and Waste Water Treatment	• Potable Water – Define potable water and explain why it is not chemically pure, describe the process of producing potable water from fresh water sources (filtration and sterilisation), explain desalination methods (distillation and reverse osmosis) and why they require large amounts of energy.	
	• Required Practical 6: Analysis and Purification of Water – Test the pH of water samples, determine dissolved solids, and purify water using distillation	
	• Compare methods for obtaining potable water from different sources.	
	• Waste Water Treatment – Explain the process of treating urban and industrial waste water, describe key stages: screening, sedimentation, anaerobic digestion of sewage sludge, and aerobic biological treatment of effluent, compare the ease of obtaining potable water from waste, ground, and salt water.	
Alternative Methods of Extracting Metals	• Phytomining and Bioleaching – Explain how phytomining uses plants to absorb metal compounds and bioleaching uses bacteria to produce leachate solutions containing metal ions, describe how metals can be obtained from these compounds using displacement or electrolysis, evaluate the environmental benefits of these methods over traditional mining.	
Lifecycle Assessment	• Life Cycle Assessment (LCA) – Describe the four stages of an LCA: raw material extraction, manufacturing and packaging, product use, disposal and transportation, explain how LCAs assess environmental impact but involve value judgments, compare LCAs of different products, such as plastic and paper bags.	
	• Reducing Resource Use – Explain how reducing, reusing, and recycling materials conserves resources and reduces environmental impact, describe how glass, metals, and plastics can be reused or recycled, discuss the role of energy use in material processing and recycling.	

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Double Science, Foundation Tier

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