a

Natural resources form by themselves.

Name the three places they come from.

1. _____

2. _____

3. _____

b

Why is recycling metals better than mining and extracting new metals?

_____

_____

_____

_____

How can metals be recycled?

_____

_____

_____

c

What are the '3 Rs' connected with recycling?

1. _____

2. _____

3. _____

Why is this easy to do with glass?

_____

_____

_____

d

Life Cycle Assessments

This looks at every stage of a product's life and checks the effect on the environment. Add three points under each heading explaining what it means.

1. Getting the Raw Material

_____

_____

_____

_____

2. Manufacturing and Packaging

_____

_____

_____

_____

3. Using the Product

_____

_____

_____

_____

4. Product Disposal

_____

_____

_____

_____

What are the problems with Life Cycle Assessments?

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

e

Compare the life cycle of a plastic bag vs a paper bag.

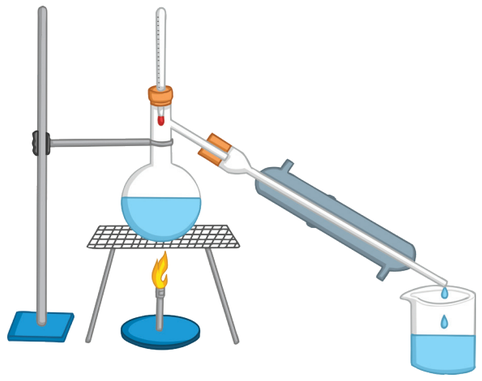
Compare them for the following factors:
raw material, manufacturing, packaging, using the product, product disposal.

Plastic Bag	Paper Bag

f

Desalination

Describe this process.



_____

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_____

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_____

_____

_____

g

Renewable Resources vs Finite (Non-Renewable)

Complete the table with the following keywords: nuclear fuels, timber, fossil fuels, minerals, metals, fresh water, food.

Renewable	Finite

h

Potable water is water you can drink.

For water to be safe to drink, it must...

1. not have high levels of _____ _____ ;

2. a pH between _____ and _____ ;

3. not have any _____.

a

Where does surface water collect?

_____

_____

Where does ground water collect?

_____

_____

b

Where does waste water come from? Give four examples.

1. _____
2. _____
3. _____
4. _____

c

Sewage treatment occurs in several stages (as shown below).

Number the statements in the correct order.

- Anaerobic digestion of sewage sludge.
- Screening and grit removal.
- Aerobic biological treatment of effluent.
- Sedimentation to produce sewage sludge and effluent.

d

Why is it important to use sustainable resources?

1. _____

_____

2. _____

_____

3. _____

_____

e

Evaluate the pros and cons of using coal compared to a renewable energy.

	Pros	Cons
coal		
renewable energy		

f

What are the two processes involved in water treatment?

Name them and describe the process.

1. _____

_____

_____

_____

2. _____

_____

_____

_____

g

List the positives of extracting resources.

1. _____

_____

2. _____

_____

3. _____

_____

h

List the negatives of extracting resources.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

i

Choose the correct answer to complete the sentence below:

Phytomining is the use of _____ to extract copper.

1. bacteria
2. plants
3. animals
4. fungi

Explain how this process occurs.

_____

_____

_____

_____

_____

_____

_____

_____

j

Bioleaching is the use of _____ to obtain copper.

Explain how this process occurs.

_____

_____

_____

_____

_____

_____

_____

_____

a

Describe the conditions necessary for iron to rust.

_____

Give **two** ways to prevent corrosion.

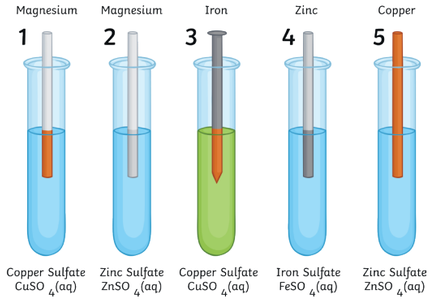
_____

_____

Explain how zinc can be used as a sacrificial protection for iron.

_____

_____



b

What is an alloy?

_____

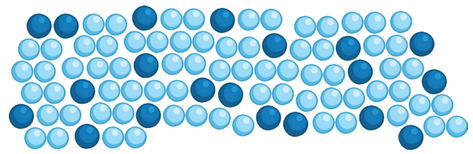
d

The table below shows the tensile strength of some metals. Brass is an alloy of copper and zinc.

Metal/Alloy	Tensile Strength (MPa)
copper	220
zinc	139
brass	350

Use the information in the table to describe how the strength of the metal is changed when an alloy is formed.

_____



Use the diagram above to explain why the alloy is more difficult to bend.

_____

_____

_____

f

What is the difference between a thermosoftening polymer and a thermosetting polymer?

_____

_____

g

A _____ material is made up of two or more different materials to create a material with an improved combination of the materials' properties. They usually have two parts – the _____ and the _____.

Name two examples of these materials.

_____

h

Complete the balanced equation to show the product of the Haber process.

N_2 + ____ H_2 ⟶ ____

Why doesn't the process have a 100% yield of the product?

_____

Complete the sentences by filling in the gaps or crossing out an answer from the **bold** choices.

The conditions of the Haber process are kept at

_____ atmospheres pressure and _____ °C and

uses an _____ catalyst.

Increasing the pressure would **increase/decrease** the yield.

Increasing the temperature would **increase/decrease** the yield.

c

Gold jewellery is usually made from an alloy of different metals, including gold. 18 carat gold contains 75% gold.

Complete the table to show the metals which make up 18 carat gold.

Metal	Proportion (%)
gold	75
silver	18.1
copper	_____
zinc	2.7

e

Low density poly(ethene), LDPE, is flexible, unreactive and can be made into films.

High density poly(ethene), HDPE, is strong, flexible, shatterproof and chemical resistant.

State **two** uses of LDPE.

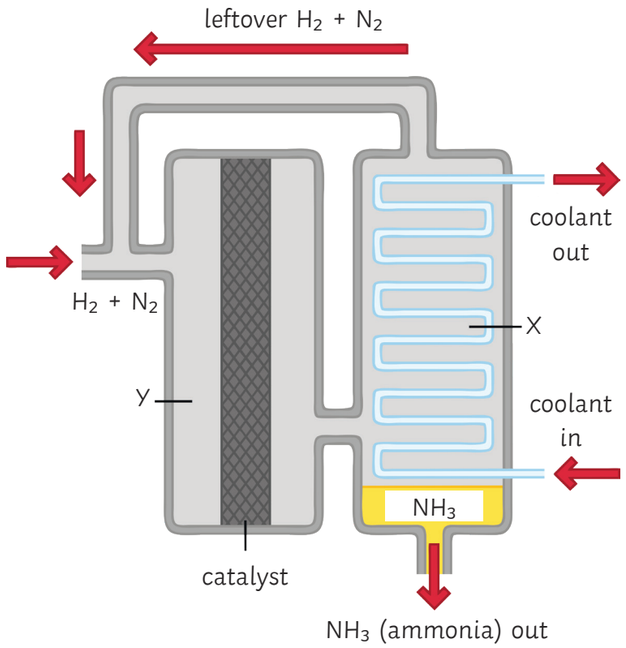
_____

State **two** uses of HDPE.

_____

a

The diagram below shows how the Haber process is carried out industrially.



What are the parts labelled...

X? _____

Y? _____

In what state of matter is the H_2 and N_2 when it is added to the process?

_____

In what state of matter is the NH_3 when it is removed from the process?

_____

What happens to the leftover nitrogen and hydrogen gases?

_____

b

Which **three** essential elements are a main component of NPK fertilisers?

_____

How do plants absorb the elements contained in fertilisers?

_____

c

Complete the table showing the essential elements provided by each of the fertilisers.

Fertiliser Name	Chemical Formula	Essential Element(s)
potassium _____	KNO_3	potassium, nitrogen
ammonium _____	NH_4NO_3	nitrogen
ammonium _____	$(NH_4)_3PO_4$	nitrogen, phosphorus
ammonium _____	$(NH_4)_2SO_4$	nitrogen

d

Complete the equations below by naming the salts produced when phosphate rock is treated with the different types of acid.

phosphate rock + nitric acid → _____ + phosphoric acid

phosphate rock + sulfuric acid → _____ + calcium phosphate

phosphate rock + phosphoric acid → _____

a

Natural resources form by themselves.

Name the three places they come from.

1. earth

2. sea

3. air

b

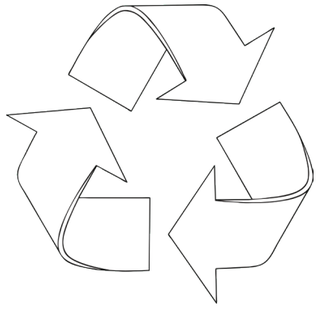
Why is recycling metals better than mining and extracting new metals?

Mining and extraction of metals uses a lot of energy. Recycling uses a lot less energy and it saves the earth's metals.

It also cuts down on landfill waste.

How can metals be recycled?

Metals can be recycled by melting them down and then re-shaping them.



c

What are the '3 Rs' connected with recycling?

1. **reduce**
2. **reuse**
3. **recycle**

Why is this easy to do with glass?

Glass can be reused without reshaping. Some has to be recycled - it is crushed, melted and re-shaped.

d

Life Cycle Assessments

This looks at every stage of a product's life and checks the effect on the environment.

Add three points under each heading explaining what it means.

1. Getting the Raw Material

Extraction damages the environment and uses a lot of energy. Results in pollution and some things need processing to turn them into useful materials.

2. Manufacturing and Packaging

Making packaging can cause pollution. Chemical reactions are sometimes used and they make waste products that have to be disposed of.

3. Using the Product

Using the product can damage the environment.

For example, fossil fuels produce greenhouse gases and fertilisers can get into streams and rivers.

4. Product Disposal

Products thrown away in landfill sites take up space and pollute the earth. Energy is also needed to take the product to the landfill. They may also be incinerated which will cause air pollution.

What are the problems with Life Cycle Assessments?

1. **Sometimes it is hard to give a numerical value.**
2. **They can be biased (depends on the person carrying them out).**
3. **They can be selective to provide a company with positive advertising.**

e

Compare the life cycle of a plastic bag vs a paper bag.

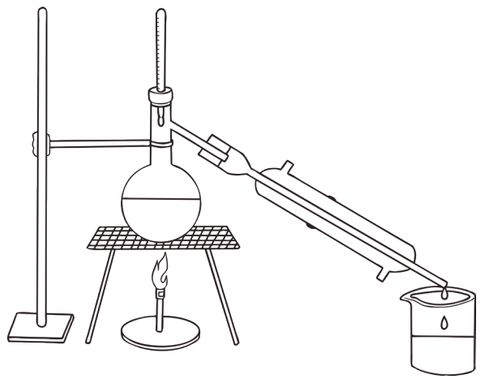
Compare them for the following factors:
raw material, manufacturing, packaging, using the product, product disposal.

Plastic Bag	Paper Bag
from crude oil	**from wood**
Manufactured by fractional distillation, cracking, and polymerisation.	**Made from pulped wood – lots of energy is needed.**
Reused, most are non-biodegradable, take up space in landfill.	**Usually only used once, recycled, biodegradable.**

f

Desalination

Describe this process.



Neutralise the water first by adding either acid or alkali depending on the pH.

Salt water is heated and the water reaches boiling point. When it does, it is evaporated. The vapour goes into the condenser and cools down, forming pure water.
Salt crystals are left behind in the flask.

g

Renewable Resources vs Finite (Non-Renewable)

Complete the table with the following keywords: nuclear fuels, timber, fossil fuels, minerals, metals, fresh water, food.

Renewable	Finite
timber	**nuclear**
fresh water	**fossil fuel**
food	**minerals**
	metals

h

Potable water is water you can drink.

For water to be safe to drink, it must...

1. not have high levels of **dissolved salts** ;
2. a pH between **6.5** and **8.5** ;
3. not have any **bacteria**.

a

Where does surface water collect?

lakes, rivers and reservoirs

Where does ground water collect?

Collects in rocks trapped underground.

b

Where does waste water come from? Give four examples.

1. **bath/toilet/shower**
2. **washing-up**
3. **farming**
4. **industrial processes**

c

Sewage treatment occurs in several stages (as shown below).

Number the statements in the correct order.

1. **Screening and grit removal.**
2. **Sedimentation to produce sewage sludge and effluent.**
3. **Anaerobic digestion of sewage sludge.**
4. **Aerobic biological treatment of effluent.**

d

Why is it important to use sustainable resources?

1. **To preserve the environment.**
2. **Resources are needed for future generations.**
3. **To allow ourselves to live comfortably.**

e

Evaluate the pros and cons of using coal compared to a renewable energy.

	Pros	Cons
coal	**cheaper**	**Non-renewable and takes a long time to form/ pollutes the environment/ produces many greenhouse gases/ leads to global warming and climate change.**
renewable energy	**less of an impact on the environment/ can be re-used**	**Can be dependent on factors such as the weather or the environment.**

f

What are the two processes involved in water treatment?

Name them and describe the process.

1. **Filtration**

   Water is passed through a wire mesh and filter beds to filter out any solid parts.

2. **Sterilisation**

   Water is sterilised to kill bacteria or microbes by bubbling chlorine gas through it and using UV or ozone gas.

g

List the positives of extracting resources.

1. **Useful products made/collected.**
2. **Jobs for the local area.**
3. **Brings money to the area.**

h

List the negatives of extracting resources.

1. **Bad for the environment.**
2. **Uses lots of energy.**
3. **Produces waste.**
4. **Destroys habitats.**

i

Choose the correct answer to complete the sentence below:

Phytomining is the use of **plants** to extract copper.

1. bacteria
2. **plants**
3. animals
4. fungi

Explain how this process occurs.

The copper builds up in the leaves of the plants. The leaves are picked, burnt and the ash is collected. The ash contains the copper.

j

Bioleaching is the use of **bacteria** to obtain copper.

Explain how this process occurs.

Bacteria convert copper compounds found in the ore into soluble copper. The solution produced by the process can be extracted by electrolysis.

a

Describe the conditions necessary for iron to rust.

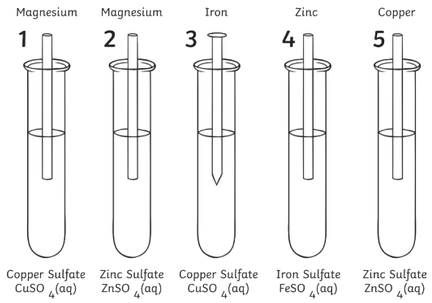
air and water

Give **two** ways to prevent corrosion.

Coatings applied: greasing, painting, electroplating or sacrificial protection.

Explain how zinc can be used as a sacrificial protection for iron.

On the reactivity series, zinc is more reactive than iron and so will react and corrode instead of the iron, protecting the iron from corrosion.



b

What is an alloy?

A mixture of two or more metals.

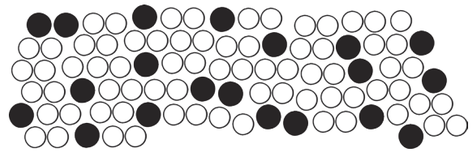
d

The table below shows the tensile strength of some metals. Brass is an alloy of copper and zinc.

Metal/Alloy	Tensile Strength (MPa)
copper	220
zinc	139
brass	350

Use the information in the table to describe how the strength of the metal is changed when an alloy is formed.

The alloy is stronger than the individual metals.



Use the diagram above to explain why the alloy is more difficult to bend.

The layers of atoms/regular lattice structure have been disrupted by the larger atoms of the other metal element. This means that the layers of atoms cannot slide over one another easily and the material is stronger and more difficult to bend.

f

What is the difference between a thermosoftening polymer and a thermosetting polymer?

A thermosoftening polymer will melt when heated. A thermosetting polymer will not melt when heated because of the cross-linking.

g

A **composite** material is made up of two or more different materials to create a material with an improved combination of the materials properties. They usually have two parts – the **matrix** and the **reinforcement**.

Name two examples of these materials.

Reinforced steel, chipboard, fibreglass, carbon fibre reinforced polymers.

c

Gold jewellery is usually made from an alloy of different metals, including gold. 18 carat gold contains 75% gold.

Complete the table to show the metals which make up 18 carat gold.

Metal	Proportion (%)
gold	75
silver	18.1
copper	**4.2**
zinc	2.7

e

Low density poly(ethene), LDPE, is flexible, unreactive and can be made into films.

High density poly(ethene), HDPE, is strong, flexible, shatterproof and chemical resistant.

State **two** uses of LDPE.

carrier bags, bubble wrap, food film

State **two** uses of HDPE.

guttering or water pipes, buckets, toys, drinks bottles

h

Complete the balanced equation to show the product of the Haber process.

$N_2 + 3H_2 \longrightarrow \mathbf{2NH_3}$

Why doesn't the process have a 100% yield of the product?

It is a reversible reaction.

Complete the sentences by filling in the gaps or crossing out an answer from the **bold** choices.

The conditions of the Haber process are kept at

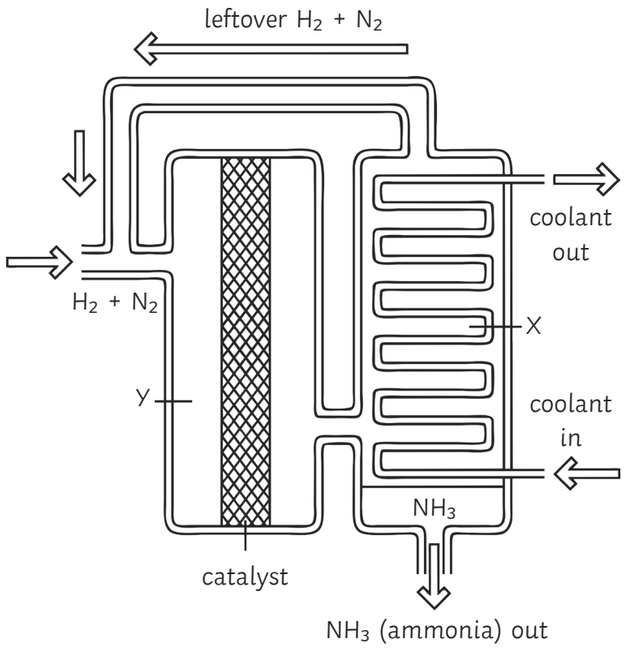
200 atmospheres pressure, **450**°C and uses an **iron** catalyst.

Increasing the pressure would **increase/~~decrease~~** the yield.

Increasing the temperature would **~~increase~~/decrease** the yield.

a

The diagram below shows how the Haber process is carried out industrially.



What are the parts labelled...

X? **condenser**

Y? **reactor**

In what state of matter is the H_2 and N_2 when it is added to the process?
gas

In what state of matter is the NH_3 when it is removed from the process?
liquid

What happens to the leftover nitrogen and hydrogen gases?
They are recycled back into the reactor.

b

Which **three** essential elements are a main component of NPK fertilisers?
N (nitrogen), P (phosphorus), K (potassium)

How do plants absorb the elements contained in fertilisers?
Dissolved in water and through the root hair cells.

c

Complete the table showing the essential elements provided by each of the fertilisers.

Fertiliser Name	Chemical Formula	Essential Element(s)
potassium **nitrate**	KNO_3	potassium, nitrogen
ammonium **nitrate**	NH_4NO_3	nitrogen
ammonium **phosphate**	$(NH_4)_3PO_4$	nitrogen, phosphorus
ammonium **sulfate**	$(NH_4)_2SO_4$	nitrogen

d

Complete the equations below by naming the salts produced when phosphate rock is treated with the different types of acid.

phosphate rock + nitric acid ⟶ **calcium nitrate** + phosphoric acid

phosphate rock + sulfuric acid ⟶ **calcium sulfate** + calcium phosphate

phosphate rock + phosphoric acid ⟶ **calcium phosphate**