

(Finite and renewable resources)

Q1. (2018)

Most methane is obtained from natural gas, which is a fossil fuel.

Methane can also be produced renewably.

Which **two** are renewable sources of methane?

[2 marks]

Tick (✓) **two** boxes.

Animal waste

☐

Food in landfill

☐

Nitrogen in the air

☐

Non-biodegradable plastics

☐

Scrap iron

☐

Q2.(2019)

What type of material is the coating of the surfboard?

[1 mark]

Tick (✓) **one** box.

Alloy

☐

Ceramic

☐

Composite

☐

Nanotube

☐

Q3.(2019)

Complete the sentence.

Choose answers from the box.

[2 marks]

air	ammonia	copper
	limestone	sand

The materials used to make the soda-lime glass fibres are sodium carbonate,

_____ and _____.

Q4.(2019)

Suggest **two** reasons why surfboards are coated.

[2 marks]

1 _____

2 _____

Q5.a)(2019)

Some surfboards are made from wood.

Table 3 contains information about the materials in an addition polymer surfboard and a wooden surfboard.

Table 3

	Addition polymer surfboard	Wooden surfboard
Relative strength	14	38
Cost (£ per m ³)	140	390
Density (kg/m ³)	50	150
Disposal at end of life	Difficult to recycle	Can be used as fuel

Suggest **two** advantages and **two** disadvantages of using addition polymers rather than wood to make surfboards.

Use **Table 3**.

[4 marks]

Advantages of addition polymers _____

Disadvantages of addition polymers _____

Q5.b)(2019)

Calculate the volume of wood in a wooden surfboard of mass 5.25 kg

Use **Table 3** and the equation:

$$\text{Density in kg/m}^3 = \frac{\text{Mass in kg}}{\text{Volume in m}^3}$$

[3 marks]

Volume = _____ m³

Q6.(2020)

This question is about alloys.

Bronze and brass are both alloys which contain copper.

Bronze is an alloy of copper and one other metal.

What is the other metal in bronze?

[1 mark]

Tick (✓) **one** box.

Aluminium

☐

Tin

☐

Zinc

☐

Q7.(2020)

Give **one** use of brass.**[1 mark]**

Q8.a)(2020)

Alloys of gold are used to make jewellery.

The proportion of gold in an alloy is measured in carats:

- pure gold is 24 carat
- 50% gold is 12 carat.

Table 3 shows information about two gold rings, **A** and **B**.**A** and **B** contain only gold and silver.Complete **Table 3**.**[2 marks]****Table 3**

Gold ring	Carat	Mass of metal in grams	
		gold	silver
A		7	7
B	18	9	

Q8.b)(2020)

Suggest **two** reasons why alloys of gold are used instead of pure gold to make jewellery.**[2 marks]**

1

2

Q9.(2020)

Steels are alloys of iron.

Spoons are made of stainless steel.

Spoons:

- are washed after use
- must not wear away quickly.

Suggest **one** reason why stainless steel is suitable for making spoons.

[1 mark]

Q10.(2020)

Steel horseshoes are shaped to fit the feet of horses.

Which type of steel is most easily shaped into horseshoes?

[1 mark]

Tick (✓) **one** box.

High carbon steel

☐

Low carbon steel

☐

Stainless steel

☐

Q11.(2020)

Which **two** processes are used to make ceramic plates?

[2 marks]

Tick (✓) **two** boxes.

Forming a composite

☐

Galvanising with zinc

☐

Heating in a furnace

☐

Melting sand and boron trioxide

☐

Shaping wet clay

☐

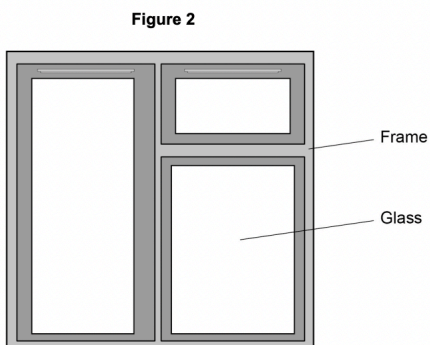
Q12.a)(2021)

Using Resources

<http://www.pcfgstudy.com>

This question is about substances used to make windows and window frames.

Figure 2 shows a window.



Glass is made by heating sand with **two** other materials.

Which **two** other materials are used to make glass?

[2 marks]

Tick (✓) **two** boxes.

Clay

☐

Graphite

☐

Limestone

☐

Sodium carbonate

☐

Sodium hydroxide

☐

Q12.b)(2021)

Window frames need to be:

- easy to install
- resistant to damage.

The polymers poly(chloroethene) and HDPE are used to make window frames.

Table 3 shows information about poly(chloroethene) and HDPE.

Table 3

Property	Poly(chloroethene)	HDPE
Density in g/cm ³	1.4	0.92
Relative strength	72	25

Suggest **one** advantage of using poly(chloroethene) compared with HDPE to make window frames.

Give **one** reason for your answer.

Use **Table 3**.

[2 marks]

Advantage _____

Reason _____

Q12.c)(2021)

Suggest **one** advantage of using HDPE compared with poly(chloroethene) to make window frames.

Give **one** reason for your answer.

Use **Table 3**.

[2 marks]

Advantage _____

Reason _____

Q12.d)(2021)

Wood can be used instead of polymers to make window frames.

- Polymers are unreactive.
- Polymers are produced from crude oil.
- Wood breaks down in wet conditions.
- Wood is produced from trees.

Suggest **one** advantage of using polymers and **one** advantage of using wood to make window frames.

[2 marks]

Advantage of polymers _____

Advantage of wood _____

Q12.e)(2021)

Window frames can also be made from an alloy of aluminium.

6.00 kg of the alloy is used to make a window frame.

Table 4 shows the mass of each element in 6.00 kg of the alloy.

Table 4

Element	Mass in kg
Aluminium	5.94
Magnesium	0.04
Silicon	0.02

Calculate the percentage of aluminium in 6.00 kg of the alloy.

[2 marks]

Percentage of aluminium = _____ %

Q12.f)(2021)

Why is an alloy used instead of pure aluminium to make window frames?

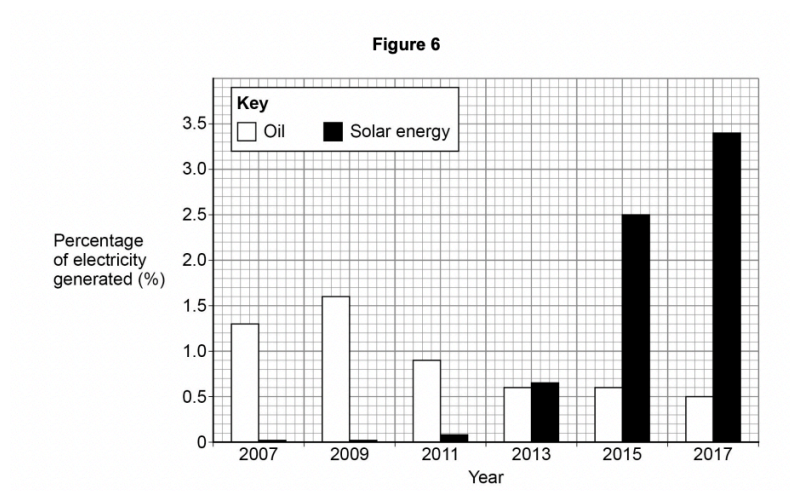
[1 mark]

Q13.a)(2021)

This question is about fuels and energy.

Figure 6 shows the percentage of electricity generated in the UK between 2007 and 2017 using:

- oil
- solar energy.



Describe the changes in the percentage of electricity generated in the UK between 2007 and 2017 using:

- oil
- solar energy.

Use data from **Figure 6** in your answer.

[3 marks]

Q13.b)(2021)

Oil contains carbon and some sulfur.

When oil is burned, the products of combustion may be released into the atmosphere.

Explain the environmental effects of releasing these products of combustion into the atmosphere.

[6 marks]

Q13.c)(2021)

Suggest **one** reason why using solar energy is a more sustainable way of generating electricity than burning oil.

[1 mark]

Q13.d)(2021)

Solar energy may **not** be able to replace the generation of electricity from fossil fuels completely.

Suggest **two** reasons why.

[2 marks]

1

2

Q14.a)(2022)

E5 and E10 are types of fuel used in cars.

These fuels contain ethanol and petrol.

Table 6 shows information about E5 and E10.

Table 6

Fuel	Percentage (%) by mass of ethanol	Percentage (%) by mass of petrol
E5	5	95
E10	10	90

Calculate the mass of ethanol in 4.4 kg of E5.

Give your answer in grams.

Use **Table 6**.

[3 marks]

Mass = _____ g

Q14.b)(2022)

The ethanol in E5 and E10 is produced from sugar.

Sugar is produced from plants.

Explain why the production of E10 removes more carbon dioxide from the atmosphere than the production of E5.

Use **Table 6**.

[3 marks]

Q14.c)(2022)

Table 7 shows the energy content of ethanol and petrol.

Table 7	
	Energy content in MJ (megajoules) per kg
Ethanol	30.0
Petrol	46.4

Suggest **one** disadvantage of using E10 instead of E5.

Complete the sentence.

[1 mark]

A disadvantage of using E10 is that _____

Q15.a)(2023)

This question is about glass and polymers.

Beakers can be made from borosilicate glass or poly(propene).

Table 1 shows information about materials used to make beakers.

Table 1

	Material used to make beakers	
	borosilicate glass	poly(propene)
Temperature at which melting begins in °C	850	160
Flammability	does not burn	burns
Resistance to impact	shatters	tough
Cost of 100 cm ³ beaker in £	1.50	2.00

Suggest **two** reasons why a Bunsen burner should **not** be used to heat a liquid in a poly(propene) beaker.

Use **Table 1**.

[2 marks]

1 _____

2 _____

Q15.b)(2023)

Poly(propene) beakers are more expensive than borosilicate glass beakers.

Suggest **one** reason why using poly(propene) beakers instead of borosilicate glass beakers could save money.

Use **Table 1**.

[1 mark]

Q15.c)(2023)

Which is a raw material used to make borosilicate glass?

[1 mark]

Tick (✓) **one** box.

Boron trioxide

☐

Clay

☐

Limestone

☐

Q16.a)(2023)

This question is about fuels.

The energy produced by burning fuels is used to generate electricity in power stations.

Table 5 shows information about three fuels used to generate electricity.

	Table 5		
	Fuel		
	Coal	Oil	Natural gas
State of fuel at room temperature	solid	liquid	gas
Transportation of fuel to power station	train	pipeline	pipeline
Percentage by mass of sulfur in fuel (%)	5	1	0.001
Relative quantity of solid particles produced when fuel is burned	high	medium	low

Explain why coal is usually transported to power stations by train and **not** by pipeline.

Use **Table 5**.

[2 marks]

Q16.b)(2023)

Sulfur dioxide and particulates are atmospheric pollutants produced when fuels are burned.

1 kg of each fuel in **Table 5** is burned.

Which fuel produces the **most** sulfur dioxide?

Give **one** reason for your choice.

[2 marks]

Fuel _____

Reason _____

Q16.c)(2023)

Give **one** problem caused by sulfur dioxide.

[1 mark]

Q16.d)(2023)

Particulates are formed from solid particles.

1 kg of each fuel in **Table 5** is burned.

Which fuel produces the **least** particulates?

Give **one** reason for your choice.

[2 marks]

Fuel _____

Reason _____

Q16.e)(2023)

Give **one** problem caused by particulates.

[1 mark]

Q16.f)(2023)

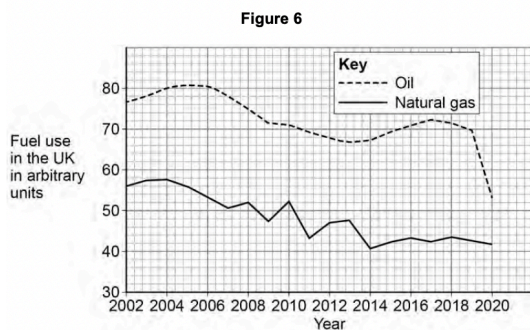
Complete the sentence.

[1 mark]

Solid particles are formed when fuels undergo incomplete _____.

Q17.(2023)

Figure 6 shows how the use of oil and of natural gas as fuels changed in the UK between 2002 and 2020.



Describe the trends shown in **Figure 6**.

[3 marks]

Q18.(2023)

This question is about alloys.

Steels are alloys of iron.

Which non-metal element is in all steels?

[1 mark]

Tick (✓) **one** box.

Carbon	☐
Iodine	☐
Sulfur	☐

Q19.(2023)

Which **two** elements other than iron are in stainless steels?

[2 marks]

Tick (✓) **two** boxes.

Chromium	☐
Gold	☐
Magnesium	☐
Nickel	☐
Zinc	☐

Q20.(2023)

Give **two** properties of stainless steels.

Choose answers from the box.

[2 marks]

brittle	hard	low density
resistant to corrosion	soluble in water	

Property 1 _____

Property 2 _____

Q21.(2024)

Using Resources

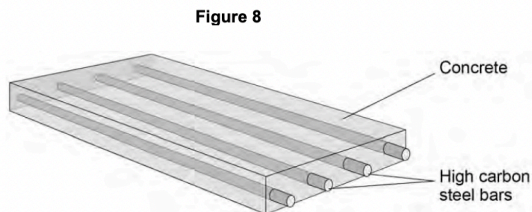
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This question is about materials.

Pre-stressed concrete is a composite material.

The concrete is strengthened using high carbon steel bars.

Figure 8 shows the structure of a piece of pre-stressed concrete.



Which **two** words describe the high carbon steel bars?

[2 marks]

Tick (✓) **two** boxes.

Alloy

☐

Binder

☐

Matrix

☐

Ore

☐

Reinforcement

☐

Q22.(2024)

Table 4 gives some information about plain concrete and pre-stressed concrete.

Table 4

	Plain concrete	Pre-stressed concrete
Cost in £ per m ³	75	225
Density in kg per m ³	2300	2500
Strength in arbitrary units	600	3000

Explain why pre-stressed concrete rather than plain concrete is used to make bridges that carry heavy lorries.

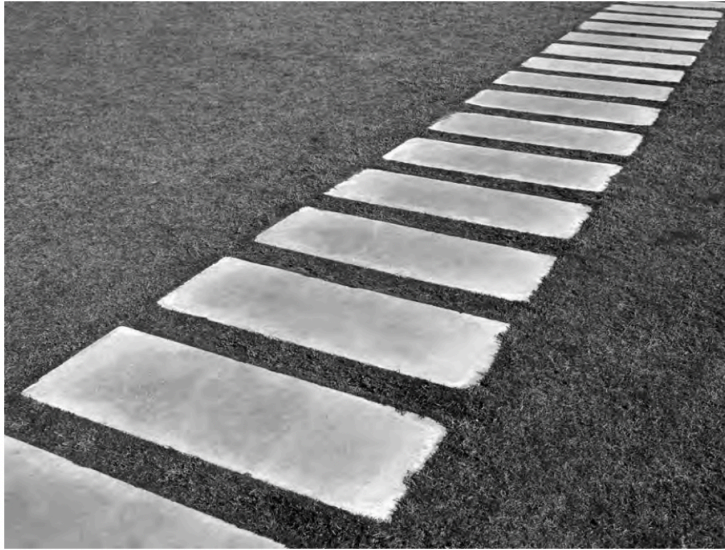
Use **Table 4**.

[2 marks]

Q23.(2024)

Figure 9 shows a garden path made of plain concrete slabs.

Figure 9



Suggest **two** reasons why plain concrete rather than pre-stressed concrete is used to make slabs for garden paths.

Use **Table 4**.

[2 marks]

1 _____

2 _____