

C12 The Earth's Atmosphere Homework task 2

Q1.

Industries use the Earth's resources to produce useful products.

Copper is produced from copper ore and from recycling waste copper.

- (a) The energy needed to produce 1 kg of copper from copper ore is 70 MJ.

The energy needed to produce 1 kg of recycled copper is 27 MJ.

Calculate the energy saved if 100 kg of copper is produced from recycled copper and **not** from copper ore.

Energy saved = _____ MJ

(3)

- (b) Producing copper from recycling waste copper reduces emissions of sulfur dioxide.

Why is reducing emissions of sulfur dioxide important?

(1)

- (c) Copper is used to make coins.

A coin of mass 8 g contains 75% copper.

Calculate the mass of copper in the coin.

Mass of copper = _____ g

(2)

(d) Iron and glass are both produced from the Earth's resources.

Some processes can reduce the use of limited resources.

Draw **one** line from the description of the process to the name of the process.

Description of process	Name of process
	Extraction
Scrap steel is added to iron from a blast furnace	Quarrying
	Reacting
A glass bottle is refilled	Recycling
	Reusing

(2)

(e) Life cycle assessments are used to assess the environmental impact of producing iron nails and glass bottles.

There are four stages, **A**, **B**, **C** and **D**, in a life cycle assessment. The stages are **not** in the correct order.

Stage **A** Disposal

Stage **B** Extracting and processing raw materials

Stage **C** Manufacturing and packaging

Stage **D** Use and operation

What is the correct order of stages **A**, **B**, **C**, and **D**?

Tick (✓) **one** box.

C, D, B, A

D, B, C, A

B, C, D, A

(1)

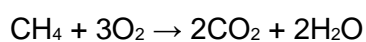
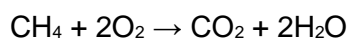
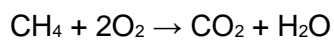
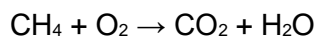
(Total 9 marks)

Q2.

- (a) Methane is burned in a plentiful supply of oxygen.

Which is the correct balanced chemical equation?

Tick **one** box.



(1)

- (b) Burning fuels causes atmospheric pollution.

Write **one** effect for each pollutant in **Table 1**.

Table 1

Pollutant	Effect
Carbon monoxide	
Sulfur dioxide	
Particulates	

(3)

HIGHER TIER QUESTIONS

Q3.

This question is about atmospheric pollutants from fuels.

- (a) Fuel burns in a car engine.

Describe how oxides of nitrogen are produced in a car engine.

(2)

- (b) The table shows the carbon footprint during the manufacture and use of three cars.

Car	Mass of CO ₂ produced during manufacture in kg	Mass of CO ₂ produced when driving in kg per km	Total mass of CO ₂ produced from manufacture and 40 000 km driving in kg	Total mass of CO ₂ produced from manufacture and 100 000 km driving in kg
Car A	14 000	0.123	18 920	26 300
Car B	20 000	0.085	23 400	28 500
Car C	23 000	0.044	24 760	27 400

Evaluate the carbon footprint of the cars.

Use information from the table above.

(6)

(Total 8 marks)

Q4.

This question is about pollutants.

- (a) Waste water has harmful substances removed before being released into the environment.

Complete the sentences.

Agricultural waste water requires the removal of harmful _____.

Industrial waste water may require the removal of harmful _____.

(2)

- (b) How is sewage sludge treated before being released into the environment?

Tick (✓) **one** box.

Aerobic biological treatment

Anaerobic digestion

Grit removal

Screening

(1)

- (c) Hydrocarbons are used to make polymers. Polymers are used to make plastic bags.

In one year 8.0 billion plastic bags were used.

The next year there was a charge for plastic bags and only 1.3 billion plastic bags were used.

Calculate the percentage decrease in the number of plastic bags used.

Percentage decrease = _____ %

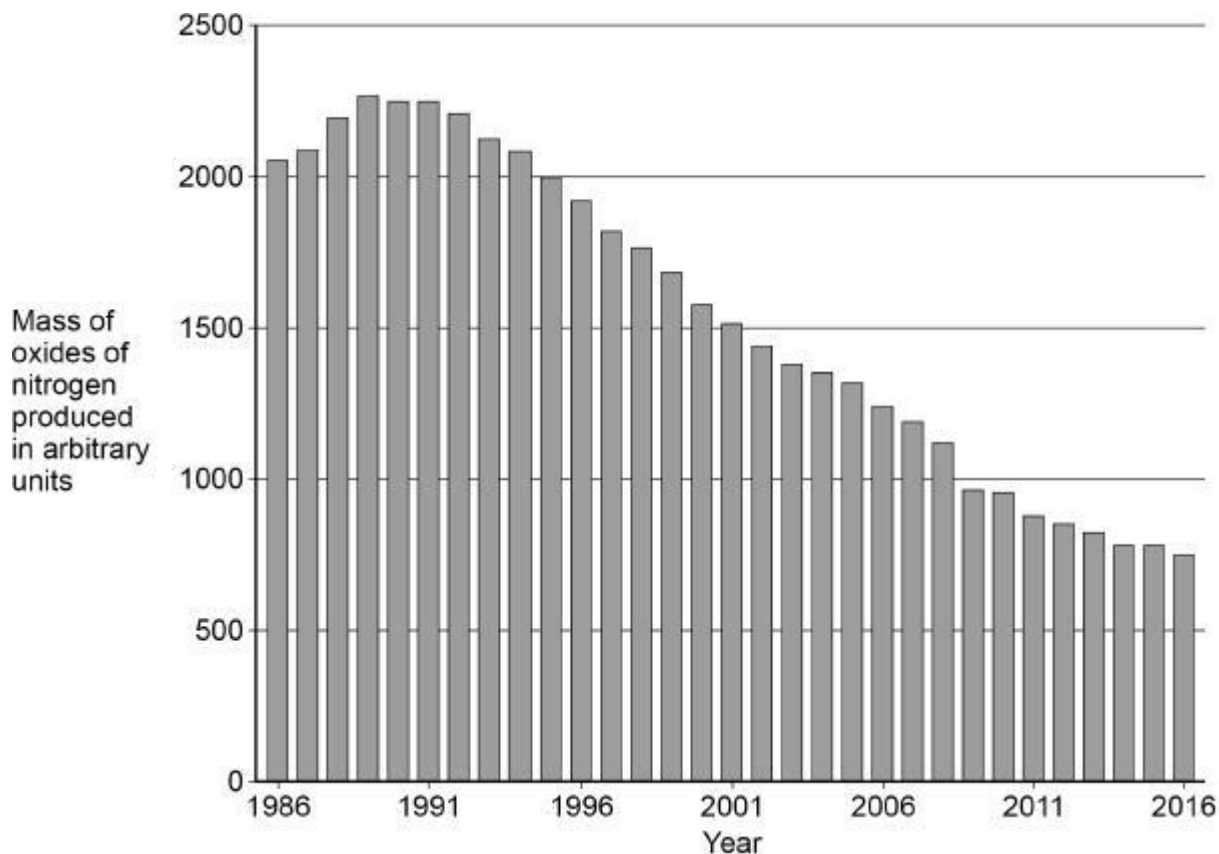
(3)

Oxides of nitrogen are pollutants formed in car engines.

(d) Give **one** problem oxides of nitrogen cause.

(1)

(e) The graph below shows the mass of oxides of nitrogen produced from car engines from 1986 to 2016.



Suggest why the mass of oxides of nitrogen produced from car engines increased and then decreased.

Increased _____

Decreased _____

(2)

(Total 9 marks)

Mark schemes

Q1.

(a) (copper ore)
(70 × 100 =) 7000

1

(recycled copper)
(27×100 =) 2700

1

(7000 – 2700 =) 4300 (MJ)

allow correct use of incorrectly determined values for MP1 (copper ore) and/or MP2 (recycled copper)

1

(b) any **one** from:

- reduces acid rain

allow sulfur dioxide causes acid rain

- reduces respiratory problems (in humans)

allow sulfur dioxide causes respiratory problems (in humans)

1

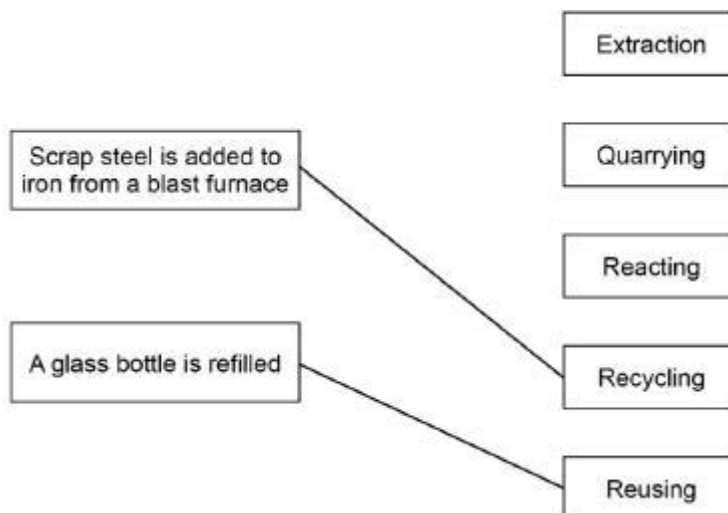
(c) $\frac{75}{100} \times 8$

1

= 6 (g)

1

(d)



do **not** accept more than one line from a box on the left

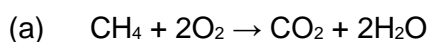
1

1

(e) **B, C, D, A**

1

Q2.



1

(b) toxic

accept causes death

1

acid rain

or

respiratory problems

accept respiratory problems / asthma

1

global dimming

1

(c)

Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5-6
Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3-4
Level 1: Relevant points are made. They are not logically linked.	1-2
No relevant content	0
<p>Indicative content</p> <ul style="list-style-type: none"> methane is the best fuel because it gives more energy per gram than coal, and gives less carbon dioxide per kJ of energy produced petrol is best because it being a liquid is easier to handle than gas or coal - although the energy content is lower than the others, it gives out less carbon dioxide than coal methane has more energy per gram than coal coal produces most carbon dioxide coal can produce sulfur dioxide 	

6

[10]

Q3.

(a) high temperatures (in the engine)

	1
enable oxygen and nitrogen (from air) to react <i>allow combine / bond for react</i>	1
(b) Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given	5-6
Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3-4
Level 1: Relevant points are made. They are not logically linked.	1-2
No relevant content	0

Indicative content

Examples of relevant points might include:

- car **C** produces the most CO₂ during manufacture
- car **A** produces the most CO₂ per km when driving
- car **C** produces the most CO₂ from manufacture and 40,000 km when driving
- car **B** produces the most CO₂ from manufacture and 100,000 km when driving

Examples of linked statements might include:

- car **A** produces least CO₂ during manufacture, but most CO₂ per km
- car **C** produces most CO₂ during manufacture, but least CO₂ per km
- car **A** produces least CO₂ during manufacture, but car **C** produces the least CO₂ per km

Examples of judgements might include:

- overall car **A** has the smallest carbon footprint as it has the smallest CO₂ production during manufacture, the smallest mass of CO₂ after 40,000 km of driving and the smallest mass of CO₂ produced after 100,000 km of driving.
- car **A** eventually (after 157,895 km) will have the largest carbon footprint because the mass of carbon dioxide produced per km is highest.

[8]

Q4.

(a) microbes <i>allow bacteria / pathogens</i>	1
chemicals	1
(b) anaerobic digestion	

1

- (c) (decrease =)
6.7 (billion)

1

(% decrease =)

$$\frac{6.7}{8.0} \times 100$$

allow correct use of an incorrect value for decrease in plastic bag use

1

= 84 (%)

allow 83.75 / 83.8 (%)

1

alternative approach:

(% now used =)

$$\frac{1.3}{8.0} \times 100 (1)$$

= 16.25 (1)

(% decrease =)
84 (%) (1)

allow 83.75 / 83.8 (%)

- (d) respiratory problems

*allow named respiratory conditions eg asthma
allow breathing problems*

or

acid rain

allow consequences of acid rain eg kills aquatic life

or

damages limestone buildings

allow smog

1

- (e) (increased)
more traffic

allow more cars

1

(decreased)
improved efficiency of car engines

allow use of catalytic converters

allow more electric / hybrid cars

allow lower temperature of car engines

allow more use of public transport

allow more people walk / cycle

ignore better designed engines

