

Using Resources 4

Name: _____

Class: _____

Date: _____

Time: **63 minutes**

Marks: **58 marks**

Comments:

1. Crude oil contains a large number of hydrocarbons.

(a) Crude oil is a finite resource.

What is a finite resource?

Tick (✓) **one** box.

A limited resource

A renewable resource

A sustainable resource

(1)

(b) What is crude oil formed from?

Tick (✓) **one** box.

Plankton

Volcanoes

Water

(1)

(c) What type of substance is crude oil?

Tick (✓) **one** box.

Compound

Element

Mixture

(1)

(d) The hydrocarbons in crude oil are separated into fractions using fractional distillation.

Complete the sentences.

Choose answers from the box.

condense	evaporate	freeze	melt
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In fractional distillation the crude oil is heated so

the hydrocarbons _____.

The fractions collect as the hydrocarbons cool and _____.

(2)

Hydrocarbons can be cracked to produce more useful molecules.

(e) Complete the sentence.

Choose the answer from the box.

alloys	fertilisers	fuels
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Some products of cracking are useful as _____.

(1)

(f) Hydrogen gas is a product of cracking.

What is used in the test for hydrogen gas?

Tick (✓) **one** box.

Burning splint

Glowing splint

Limewater

(1)

(g) 5.20 kg of crude oil contains 1.53 kg of LPG (Liquefied Petroleum Gas).

Calculate the percentage (%) of LPG in 5.20 kg of crude oil.

Give your answer to 3 significant figures.

Percentage (3 significant figures) = _____ %

(3)

(Total 10 marks)

2.

The Earth's atmosphere is always changing.

(a) Gases in the Earth's early atmosphere caused changes on the Earth.

Draw **one** line from each change to the gas that caused the change.

Change	Gas that caused the change
	Ammonia
Oceans formed	Carbon dioxide
	Nitrogen
Sedimentary rocks formed	Oxygen
	Water vapour

(2)

The table below shows the percentage of some gases in the atmospheres of Earth and Mars today.

Gas	Percentage of gas in atmosphere (%)	
	Earth	Mars
Argon	0.90	1.9
Carbon dioxide	0.04	95
Nitrogen	78	2.6
Oxygen	21	0.20

(b) Which gas has the highest percentage in the Earth's atmosphere?

(1)

(c) Calculate how many times more carbon dioxide there is in the atmosphere of Mars than in the atmosphere of Earth.

Use the table above.

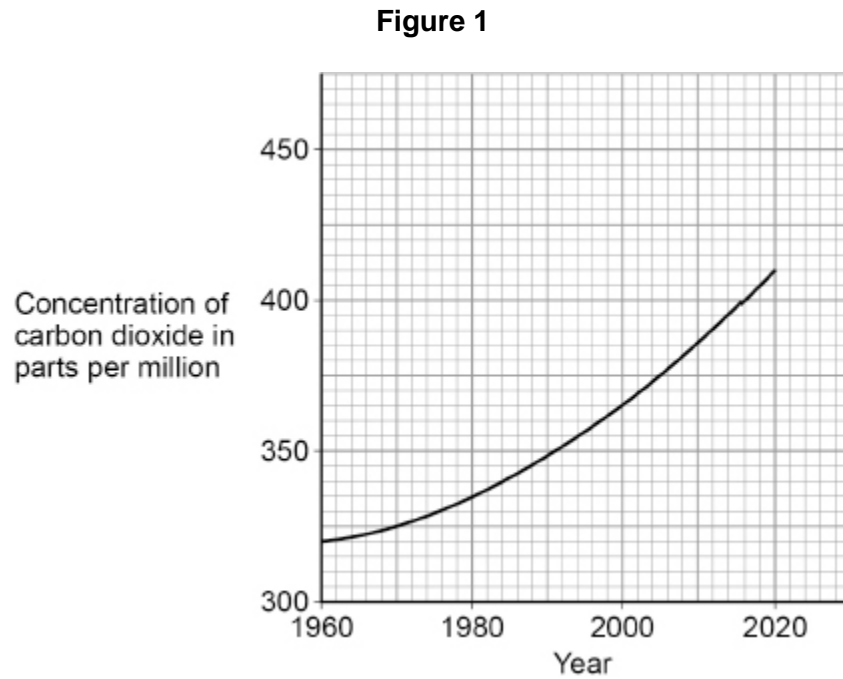
Give your answer in standard form.

Number of times more carbon dioxide (in standard form) = _____

(3)

Carbon dioxide is a greenhouse gas.

- (d) **Figure 1** shows the concentration of carbon dioxide in the Earth's atmosphere from 1960 to 2020.



How has the concentration of carbon dioxide in the Earth's atmosphere changed from 1960 to 2020?

Tick (✓) **one** box.

Decreased

Stayed the same

Increased

(1)

- (e) Cars emit carbon dioxide.

A car emits 17.2 kg of carbon dioxide on a journey.

There are four people in the car.

Calculate the mass of carbon dioxide emitted per person.

Mass of carbon dioxide = _____ kg

(2)

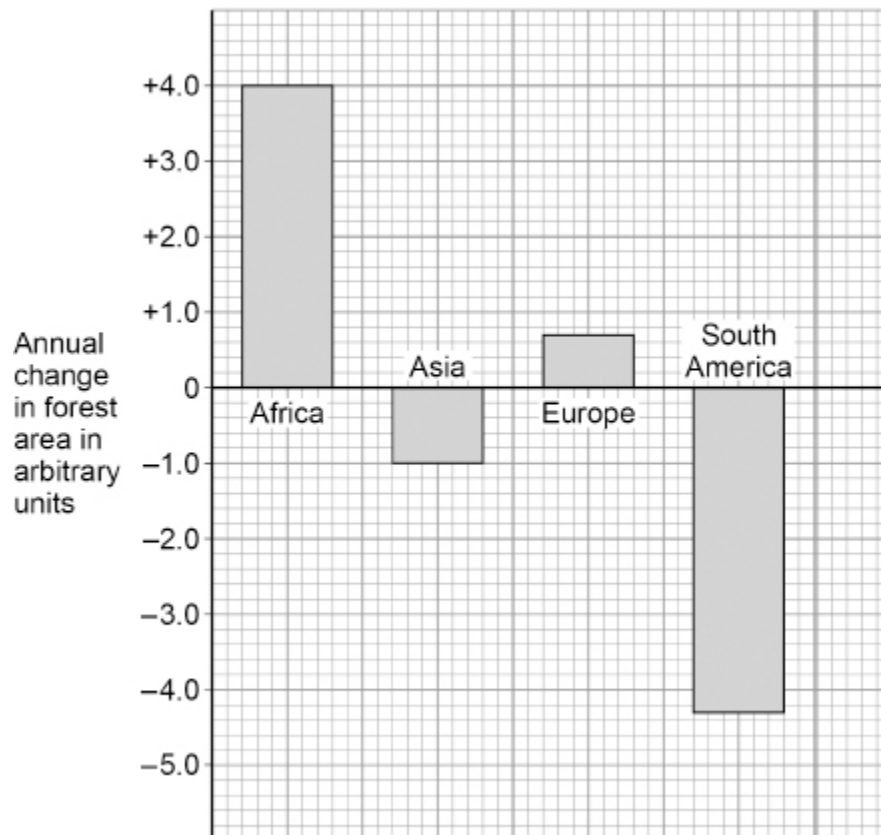
- (f) Planting trees helps to reduce climate change, because trees use carbon dioxide from the Earth's atmosphere.

Name the process in trees which uses carbon dioxide.

(1)

- (g) **Figure 2** shows the annual change in forest area in four different parts of the world.

Figure 2



Give **two** conclusions about the annual change in forest area.

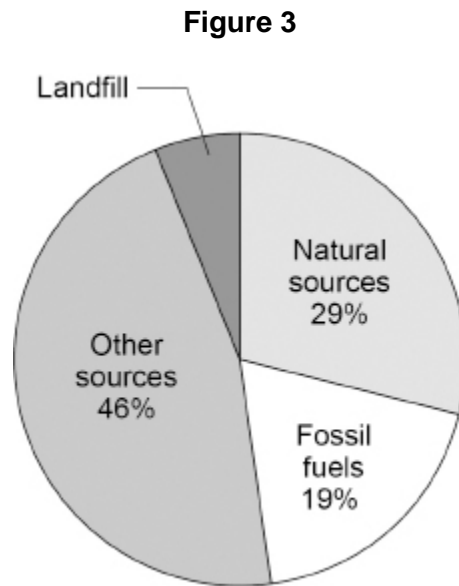
1 _____

2 _____

(2)

(h) Methane is a greenhouse gas.

Figure 3 shows sources of methane emissions.

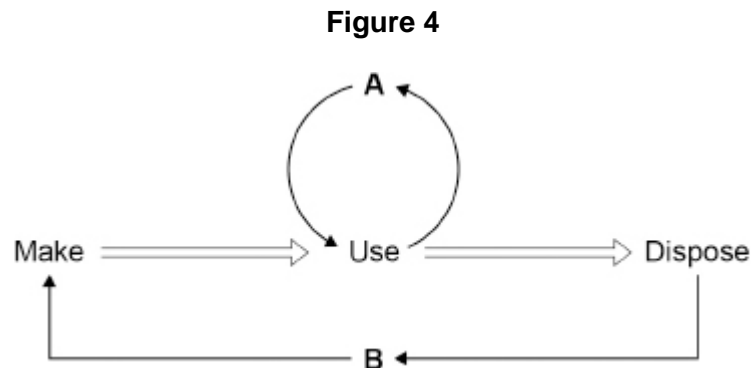


Determine the percentage (%) of methane emissions from landfill.

Percentage = _____ %

(1)

(i) **Figure 4** shows two ways (**A** and **B**) of preventing used items going to landfill.



Name **A** and **B**.

Choose answers from the box.

recycle	reduce	release	reuse	reverse
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A _____

B _____

(2)

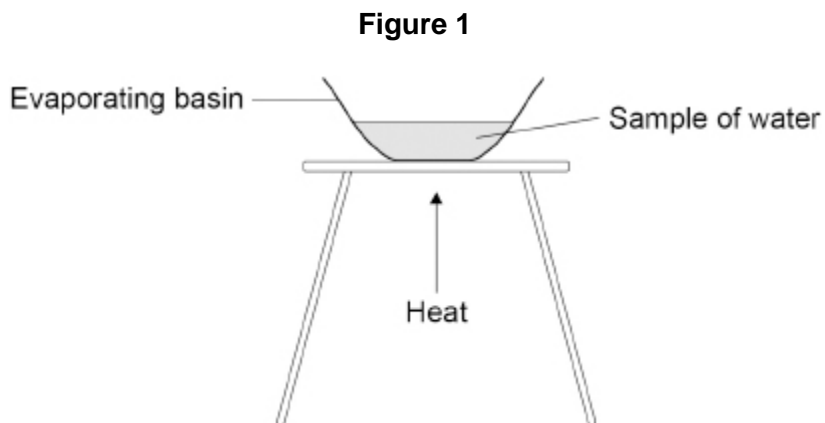
(Total 15 marks)

3.

Some types of water contain dissolved substances.

A student investigated the mass of dissolved solids in distilled water and in sea water.

Figure 1 shows the apparatus.



This is the method used.

1. Weigh an evaporating basin.
2. Add a sample of distilled water to the evaporating basin.
3. Weigh the evaporating basin and the water sample.
4. Heat the water sample.
5. Weigh the evaporating basin and contents.
6. Repeat steps 1 to 5 two more times.
7. Repeat steps 1 to 6 with sea water.

(a) Give **one** safety precaution the student should take.

(1)

(b) The method used did **not** give valid results.

Which **two** improvements could the student make to give valid results?

Tick (✓) **two** boxes.

Heat until the mass of the evaporating basin and contents does not change.

Leave some water in the evaporating basin after heating.

Record the results in a table and plot a bar graph.

Use 25 cm³ of water for each experiment.

Use a beaker instead of an evaporating basin.

(2)

(c) A different student used a method which gave valid results.

The table below shows the results.

Type of water	Mass of dissolved solids in grams		
	Test 1	Test 2	Test 3
Distilled water	0.00	0.00	0.00
Sea water	0.31	0.32	0.27

The student concludes that distilled water is pure.

Suggest **one** reason why.

(1)

Tap water is potable.

One step in producing potable water is sterilisation.

(d) Why is potable water sterilised?

Tick (✓) **one** box.

To improve the taste

To kill bacteria

To remove dissolved solids

(1)

(e) Chlorine is used to sterilise water.

The reaction between chlorine and water is reversible.

Complete the sentence.

Equilibrium is reached when the forward and reverse reactions occur at the same _____.

(1)

(f) The test for chlorine uses damp litmus paper.

Complete the sentence.

Choose the answer from the box.

blue	green	white
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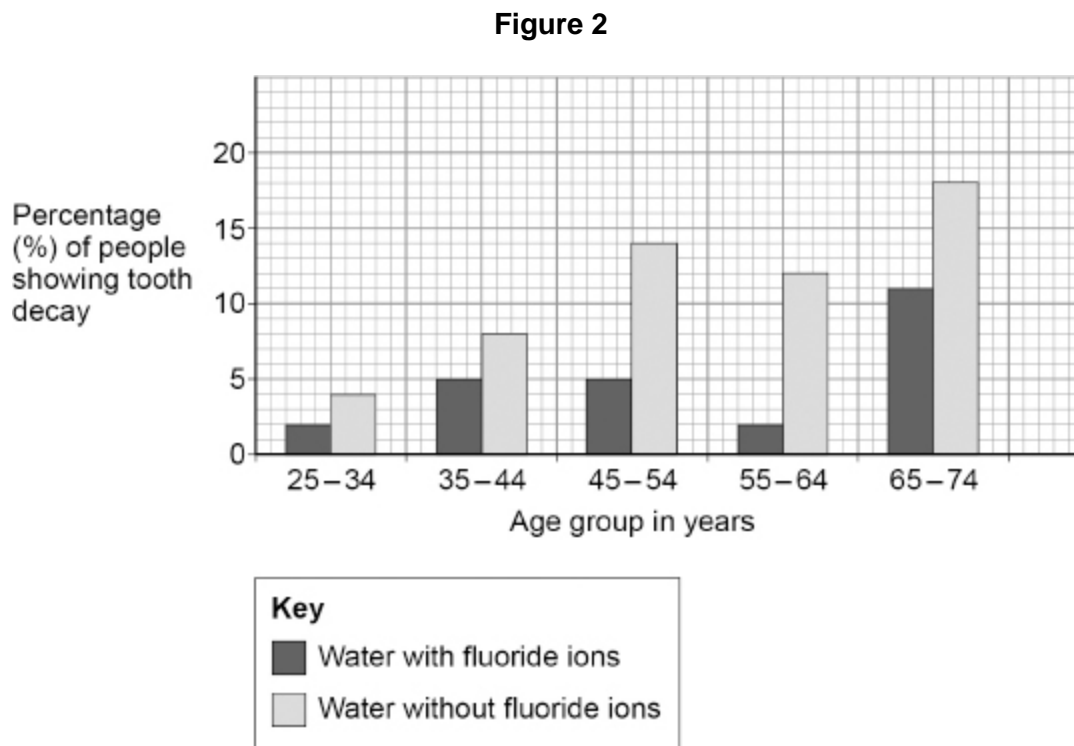
When damp litmus paper is put into chlorine gas

the litmus paper turns _____.

(1)

There is evidence that adding fluoride ions to drinking water reduces tooth decay.

Figure 2 shows the percentage of people showing tooth decay.



- (g) Compare the effects of adding fluoride ions to drinking water on tooth decay in people between the ages of 25 and 74.

Use data from **Figure 2**.

(4)

(h) Student **A** says that water companies should add fluoride ions to all drinking water.

Student **B** disagrees.

Suggest **one** reason why Student **B** may think that fluoride ions should **not** be added to all drinking water.

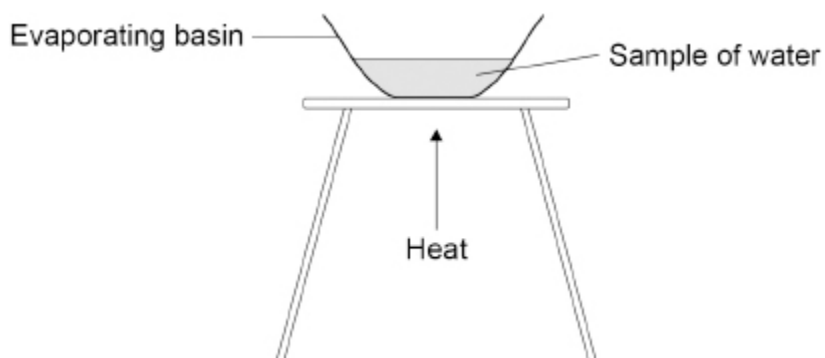
(1)
(Total 12 marks)

4.

Some types of water contain dissolved substances.

A student investigated the mass of dissolved solids in distilled water and in sea water.

The figure below shows the apparatus.



This is the method used.

1. Weigh an evaporating basin.
2. Add 20 cm³ of distilled water to the evaporating basin.
3. Weigh the evaporating basin and the water sample.
4. Heat the water sample for 2 minutes.
5. Weigh the evaporating basin and contents.
6. Repeat steps 1 to 5 two more times.
7. Repeat steps 1 to 6 with sea water.

(a) The method used by the student did **not** give valid results.

Describe **one** improvement the student could make to obtain valid results.

(1)

A different student used a method which gave valid results.

(b) The table below shows the results.

	Mass of dissolved solids in grams			
Type of water	Test 1	Test 2	Test 3	Mean
Distilled water	0.00	0.00	0.00	0.00
Sea water	0.30	X	0.26	0.29

Calculate the value **X** for the mass of dissolved solids in sea water in **Test 2**.

Mass **X** = _____ g

(2)

(c) The student concludes that distilled water is pure.

Describe a test to confirm that distilled water is pure.

Test _____

Result _____

(2)

Tap water is potable.

A stage in the production of potable water is sterilising.

A gas is used to sterilise water.

The equation for the reaction is:



(d) What is meant by the symbol \rightleftharpoons ?

(1)

(e) The reaction is at equilibrium.

The reaction is exothermic.

What happens to the equilibrium position when the temperature is increased?

Tick (✓) **one** box.

Shifts towards the left-hand side	<input type="checkbox"/>
Stays in the same place	<input type="checkbox"/>
Shifts towards the right-hand side	<input type="checkbox"/>

(1)

(f) Describe a test to identify the gas used to sterilise water.

Test _____

Result _____

(2)

A scientist produced potable water from 150 cm³ of salty water.

(b) Which process can be used to produce potable water from salty water?

Tick (✓) **one** box.

Distillation

Electrolysis

Filtration

Sterilisation

(1)

(c) The salty water contains sodium chloride.

The scientist collected 2.40 g of sodium chloride from 150 cm³ of salty water.

Calculate the concentration of sodium chloride in grams per dm³

Concentration of sodium chloride = _____ g/dm³

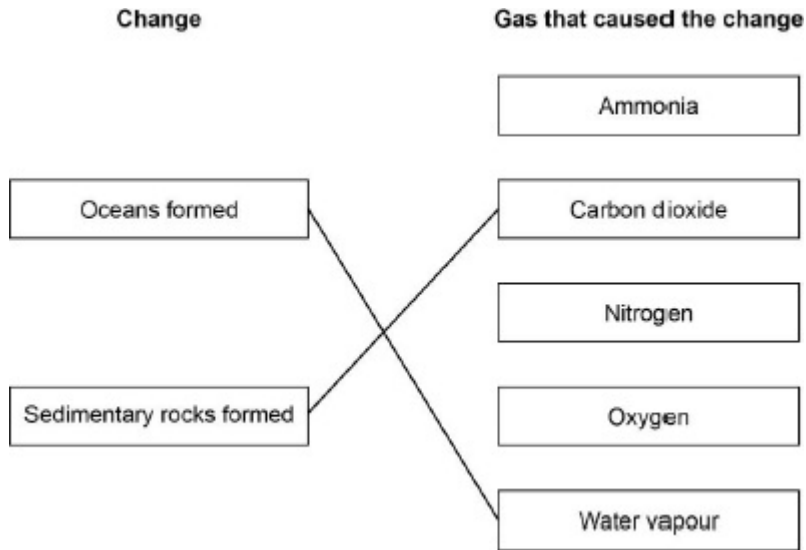
(3)

(Total 10 marks)

Mark schemes

1.	(a) a limited resource	1
	(b) plankton	1
	(c) mixture	1
	(d) evaporate	1
	condense	1
	(e) fuels	1
	(f) burning splint	1
	(g) (percentage =)	
	$\frac{1.53 \times 100}{5.20}$	1
	= 29.42	1
	= 29.4 (%)	
	<i>allow a correctly calculated answer to 3 significant figures from an incorrect calculation which uses values given in the question</i>	1
		[10]

2. (a)



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

2

(b) nitrogen

1

(c) (number of times more =)

$$\frac{95}{0.04}$$

1

$$= 2375$$

1

$$= 2.375 \times 10^3$$

allow a correctly calculated answer in standard form from an incorrect calculation which uses values given in the table

1

(d) increased

1

(e) (mass CO₂ =)

$$\frac{17.2}{4}$$

1

$$= 4.3 \text{ (kg)}$$

1

(f) photosynthesis

1

(g)	any two from: (forest area)	2
	<ul style="list-style-type: none"> • increases in Africa • increases in Europe • decreases in South America • decreases in Asia 	
(h)	6 (%)	1
(i)	(A) reuse	1
	(B) recycle	1
		[15]
3.	(a) wear safety glasses / goggles <i>allow tie hair back</i>	1
	(b) heat until the mass of the evaporating basin and contents does not change	1
	use 25 cm ³ of water for each experiment	1
	(c) no dissolved solids (in distilled water)	1
	(d) to kill bacteria	1
	(e) rate	1
	(f) white	1
	(g) Level 2: Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3-4
	Level 1: Relevant features are identified and differences noted.	1-2
	No relevant content	0

Indicative content

relevant features

- fluoride reduces tooth decay (in all age groups)
- the reduction in tooth decay using fluoride generally increases with age
- tooth decay increases in 25-54 age groups
- tooth decay decreases in 55-64 age group
- tooth decay increases in 65-74 age group

magnitude

- fluoride has the least effect in the 25-34 age group
- fluoride has the greatest effect in the 55-64 age group

- using fluoride decreases tooth decay by 2% in 25-34 age group
- using fluoride decreases tooth decay by 3% in 35-44 age group
- using fluoride decreases tooth decay by 9% in 45-54 age group
- using fluoride decreases tooth decay by 10% in 55-64 age group
- using fluoride decreases tooth decay by 7% in 65-74 age group

(h) any **one** from:

- could be a risk to health
- could have side effects
- could discolour teeth
- people should be able to decide for themselves

1

[12]

4.

(a) heat the evaporating basin and contents to constant mass
allow heat until all of the water has evaporated

1

(b) (mass **X** =)

$$[0.29 \times 3] - [0.30 + 0.26]$$

allow 0.87 - 0.56

allow $\frac{0.3 + X + 0.26}{3} = 0.29$

1

= 0.31 (g)

1

- (c) (test)
determine the boiling point 1
- (result)
(pure water) boils at 100 °C
- OR**
- (test)
determine the freezing point (1)
- (result)
(pure water) freezes at 0 °C (1) 1
- (d) reversible reaction
allow a reaction that can go both ways 1
- (e) shifts towards the left hand side 1
- (f) (test)
damp litmus paper 1
- (result)
litmus paper bleached
allow litmus paper turns white ignore litmus paper turns red 1
- (g) the dissolved solids pass through filter paper 1
- (because) the dissolved solid (particles) are very small 1

[11]

5.

(a) **Level 2:** Scientifically relevant features are identified, the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.

4-6

Level 1: Relevant features are identified and differences noted.

1-3

No relevant content

0

Indicative content

ground water	waste water
easier to obtain	more difficult to obtain
fewer processes	more processes
takes less time	takes more time
filtered through filter beds to remove insoluble particles	screening and grit removal to remove large particles
	sedimentation to produce sewage sludge and effluent
	aerobic biological treatment of effluent to reduce solid waste
sterilised using chlorine, ozone or uv light to kill bacteria	and then sterilised using chlorine, ozone or uv light to kill bacteria
	sludge is anaerobically digested by specific bacteria to remove organic matter

(b) distillation

1

(c) (conversion)
 $(\frac{150}{1000} =)$ or 0.15 (dm³)

1

(concentration =)
 $\frac{2.4 (0)}{0.15}$

allow correct use of incorrect / no conversion

1

= 16 (g/dm³)

1

OR

(conversion)

$$\frac{1000}{150} (1)$$

$$= 6.67 (1)$$

(6.67 × 2.4)

$$= 16 \text{ (g/dm}^3\text{)} (1)$$

OR

(concentration =)

$$\frac{2.4}{150} (1)$$

$$= 0.016 (1)$$

(conversion)

(0.016 × 1000)

$$= 16 \text{ (g/dm}^3\text{)} (1)$$

[10]