Q1.

Diagram 1 below shows the lungs and the trachea, the airway leading to the lungs. One of the lungs is drawn in section.

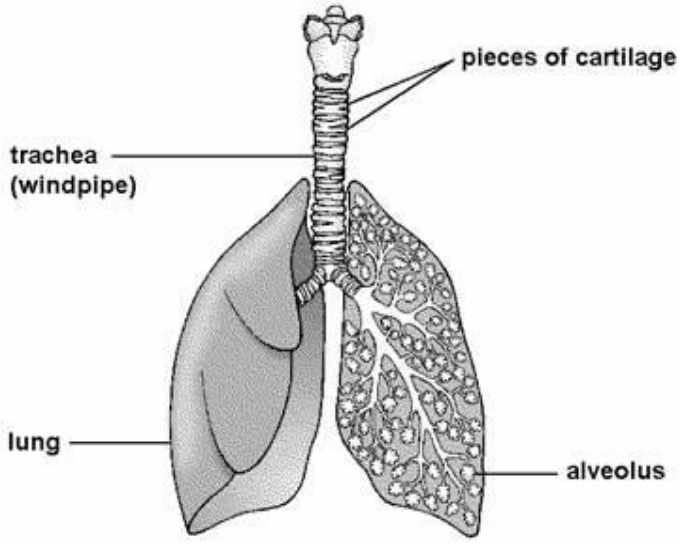


diagram 1

(a) In the wall of the trachea, there are pieces of a stiff material called cartilage.

Why is this stiff material necessary in the wall of the trachea?

.....

.....

1 mark

(b) Diagram 2 below shows one alveolus and its blood supply.

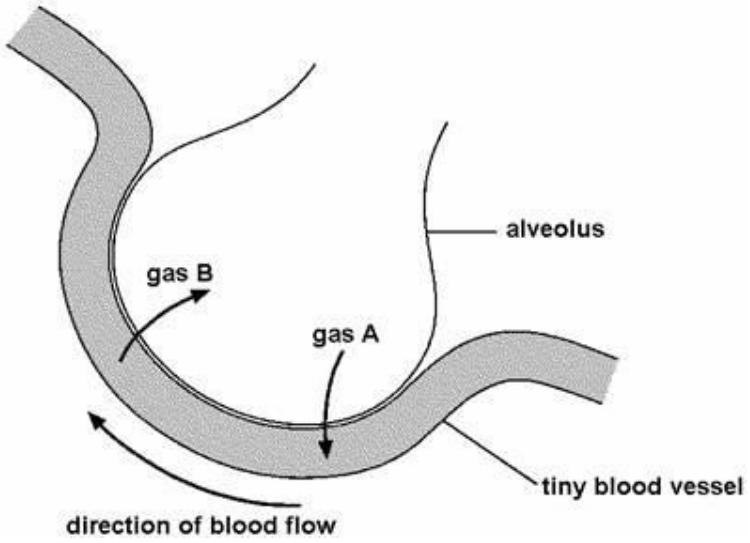


diagram 2

(i) Look at diagram 2, above.
Gas A **enters** the blood from the alveolus.
Gas B **leaves** the blood and enters the alveolus.
What are the names of gases A and B?

gas A .....

gas B .....

1 mark

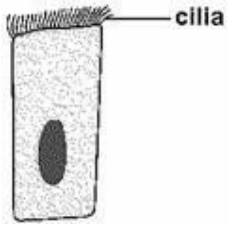
(ii) Give **one** reason why it is easy for gases to pass across the wall of an alveolus.

.....

.....

1 mark

(c) The diagram below shows a ciliated cell from the lining of the airway.



(i) What is the function of this cell in the airway?

.....

.....

1 mark

(ii) This cell is affected by substances in cigarette smoke.
What effect does cigarette smoke have on the cilia?

.....

.....

1 mark

(iii) Give the name of the substance, in cigarette smoke, which causes addiction to smoking.

.....

1 mark

Maximum 6 marks

Q2.

The table shows the recommended daily intake of energy and some of the nutrients needed by different groups of people.

group of people	energy, in kj	nutrients				
		protein, in g	carbohydrate, in g	fat, in g	minerals, in g	
					calcium	iron
male 15 - 18	11510	55.2	360	109	1000	11.3
female 15 - 18	8830	45.0	276	84	800	14.8
male 19 - 50	10600	55.5	331	100	700	8.7
female 19 - 50	8100	45.0	253	77	700	14.8
pregnant female	8900	81.0	278	84	700	14.8

(a) (i) Explain why two 16 year-old males of the same weight might need different amounts of energy.

.....

.....

1 mark

(ii) Which **two** types of nutrient provide most of the energy in our diet?

1. .....

2. .....

2 marks

(b) (i) Calculate the difference in the recommended daily intake of calcium for a 15 year-old male and a 30 year-old male.

..... mg

1 mark

(ii) Calcium is needed for healthy bones. Explain the difference in the amount of calcium needed each day by a 15 year-old male and a 30 year-old male.

.....

.....

1 mark

(c) Look at the table. Explain the difference in the amount of protein needed by a 25 year-old pregnant female and a 25 year-old female who is **not** pregnant.

.....

.....

1 mark

(d) Iron is needed to make blood.
Explain why a 15 year-old female might need more iron than a 15 year-old male.

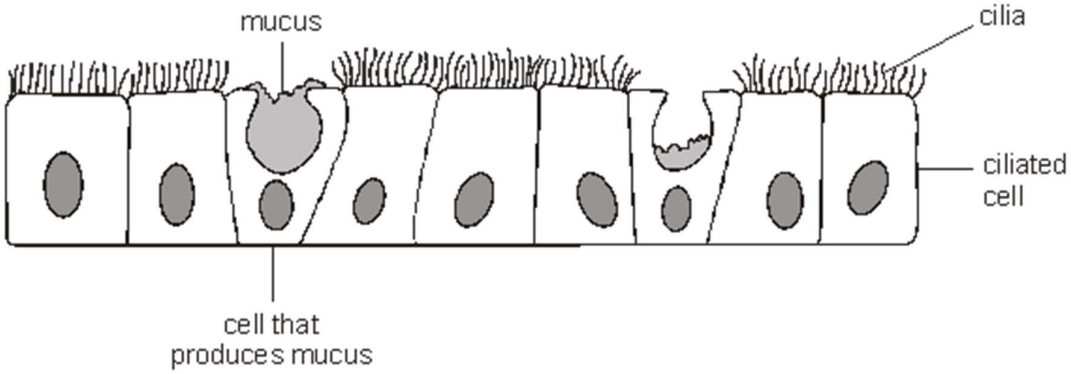
.....

.....

1 mark
Maximum 7 marks

Q3.

(a) The diagram shows two types of cell in the lining of the airway leading to the lungs.



When a person breathes in cigarette smoke, cilia are damaged and much more mucus is produced.
What will be the consequences of this?

.....

.....

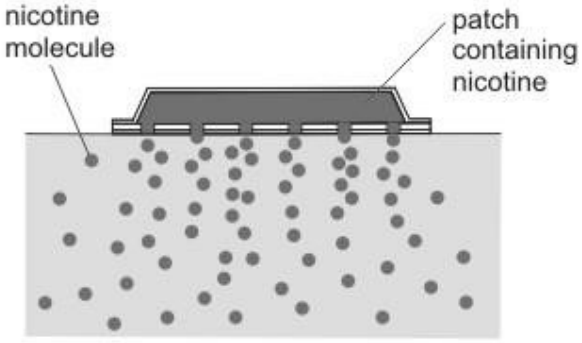
.....

.....

2 marks

(b) Sharna is addicted to smoking and wants to stop.
Instead of smoking she puts nicotine patches on her skin.

nicotine patch on Sharna's skin



a section through a nicotine patch on Sharna's skin

The table shows the mass of nicotine in different patches and the number of weeks each type of patch is used over an eight-week period.

mass of nicotine in each patch (mg)	weeks
21	1-4
14	5-6
7	7-8

Use information in the table to describe how this eight-week course of treatment should help to reduce Sharna's addiction to smoking.

.....

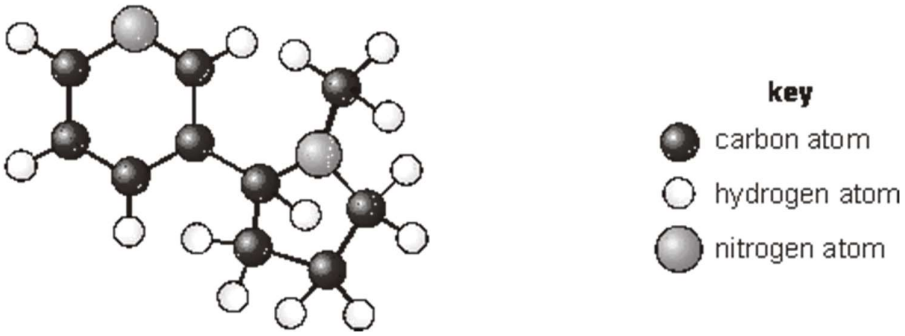
.....

.....

2 marks

(c) The diagram below shows a nicotine molecule.

It contains atoms of three elements



(i) Nicotine is a compound. How does the diagram show this?

.....

.....

1 mark

(ii) When nicotine in a cigarette is burned in air, nitric oxide is formed from the nitrogen in the nicotine.

Look at the elements in nicotine.

Give the names of **two** other compounds formed when nicotine burns in air.

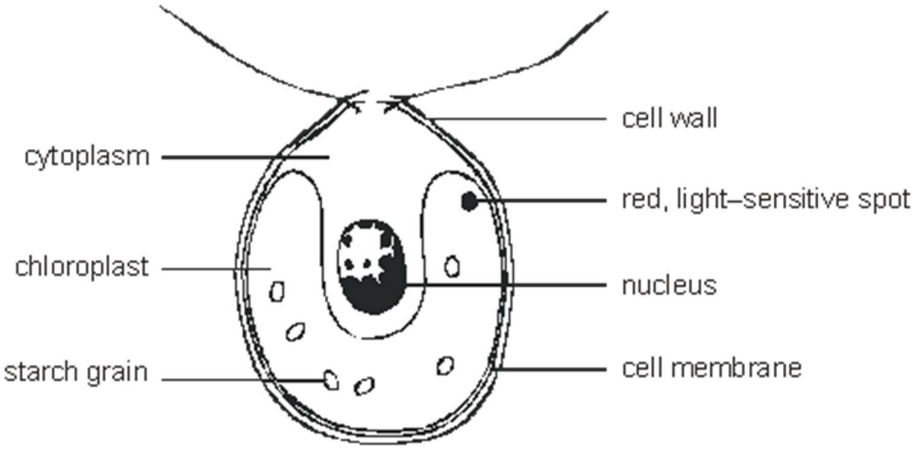
1 .....

2 .....

2 marks
maximum 7 marks

Q4.

The diagram below shows a single-cell organism called Chlamydomonas. It lives in pond water.



Use the information in the diagram to help you answer the questions below.

(a) Give **two** features of Chlamydomonas which show that it is more like a plant cell than an animal cell.

1. .....

2. .....

2 marks

(b) Chlamydomonas makes a sugar called glucose.

(i) Give the name of the process in which Chlamydomonas makes glucose.

.....

1 mark

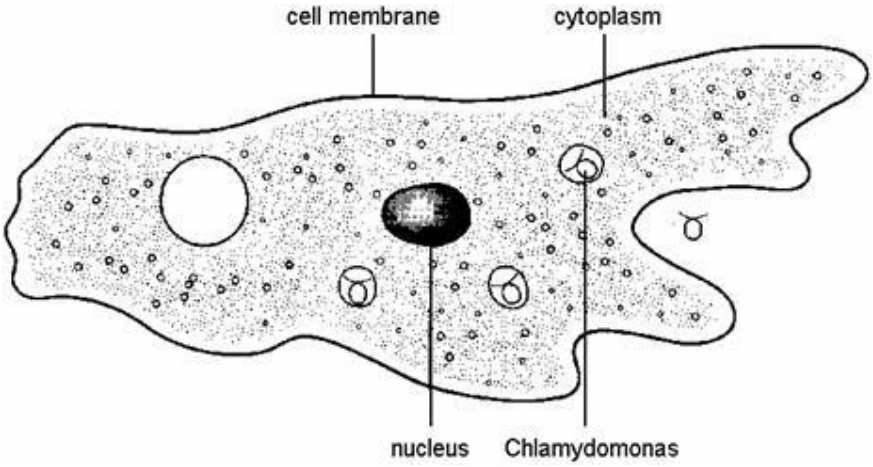
(ii) Chlamydomonas produces starch grains from glucose.

Suggest what will happen to the number of starch grains in the cell if Chlamydomonas is kept in the dark.

.....

1 mark

(c) The diagram below shows another single-cell organism called Amoeba.
It also lives in pond water. Amoeba traps a Chlamydomonas and digests it.



not to scale

Starch is a carbohydrate. Amoeba's digestive enzymes break down the starch in the Chlamydomonas.

Suggest what substance is produced from the starch and what it is used for.

.....

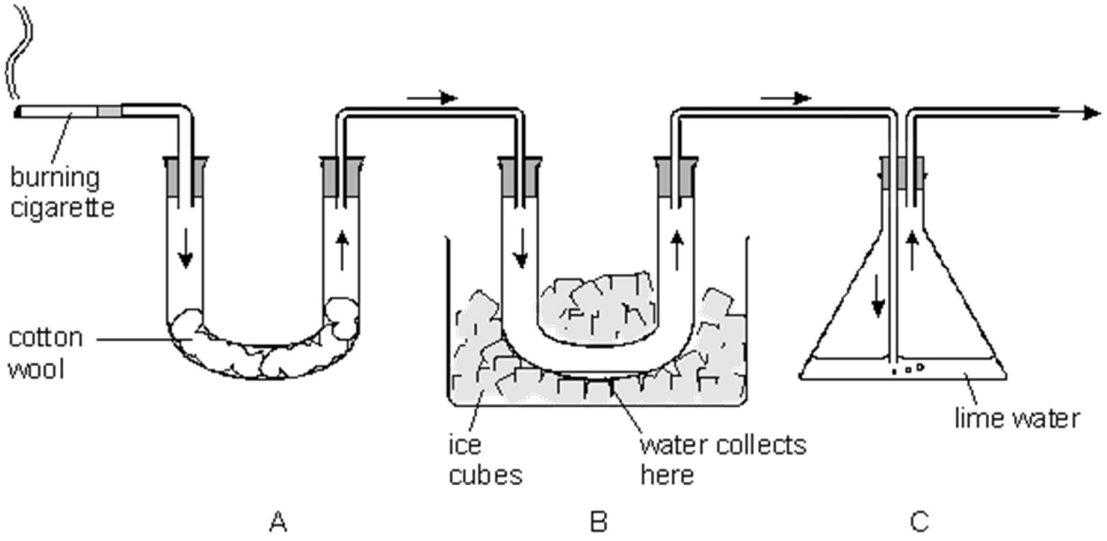
.....

.....

2 marks
Maximum 6 marks

Q5.

A teacher set up the following apparatus to separate the chemicals in cigarette smoke.
The chemicals pass through the apparatus in the direction of the arrows.



(a) In A, a brown sticky substance collected on the cotton wool. This substance causes lung cancer. Give the name of the brown substance.

.....

1 mark

(b) As the cigarette burned, water vapour was produced and water collected in B.

(i) Why were ice cubes needed in B?

.....

.....

1 mark

(ii) In the boxes below, draw the arrangement of particles of water vapour and particles of liquid water.
Use a circle, O, to represent each particle.

2 marks

(c) The lime water in C became cloudy. What gas turns lime water cloudy?

.....

1 mark
Maximum 5 marks

Q6.

This table shows where different pollutants in the air come from.

	source of pollutants		
pollutants	percentage from power stations	percentage from road traffic	percentage from other sources
sulphur dioxide	72	2	26
nitrogen oxides	28	51	21
smoke	6	46	48
carbon monoxide	1	90	9

(a) Which **two** pollutants in the table above cause acid rain?

1. .....

2. .....

2 marks

(b) Lichens are organisms which grow on buildings and trees. They are affected by some pollutants.

Use the information in the table to suggest why few lichens survive close to power stations but many survive alongside roads.

.....

.....

.....

1 mark

(c) The **two** products of complete combustion of petrol are not shown in the table. Give the names of the **two** products of complete combustion of a fuel such as petrol.

1. .....

2. .....

2 marks

(d) Smoke contains particles of carbon. These can burn when there is enough oxygen present. Write a word equation for the reaction of carbon with **excess** oxygen.

.....

1 mark

(e) Which term best describes the combustion process?

Tick **one** box.

decomposition ☐

oxidation ☐

pollution ☐

respiration ☐

1 mark
Maximum 7 marks

Q7.

An alloy is a mixture of elements.
The table shows the mass of each element present in 100 g of five different alloys, **bronze, solder, steel, stainless steel** and **brass.**

alloy	mass of each element in 100 g of alloy							
	lead (g)	**tin (g)**	**copper (g)**	**zinc (g)**	**carbon (g)**	**iron (g)**	**chromium (g)**	**nickel (g)**
bronze		4	95	1				
solder	62	38						
steel					1	99		
stainless steel						70	20	10
brass			67	33				

(a) Which **alloy** in the table above contains an element which is a non-metal?

.....

1 mark

(b) Which **two alloys** in the table contain only **two metals**?

..... and .....

1 mark

(c) Another alloy called nichrome contains only the elements chromium and nickel.
100 g of nichrome contains 20 g of chromium.

How much nickel does it contain?

…… g

1 mark

(d) Before 1992, two-pence coins were made of bronze.
Steel rusts but bronze does **not** rust.

(i) Why does bronze **not** rust?
Use information in the table above to help you.

.....

.....

1 mark

(ii) Rusting requires water and a gas from the air.
Give the name of this gas.

.....

1 mark
maximum 5 marks

Q8.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Aluminium is used to make many items.

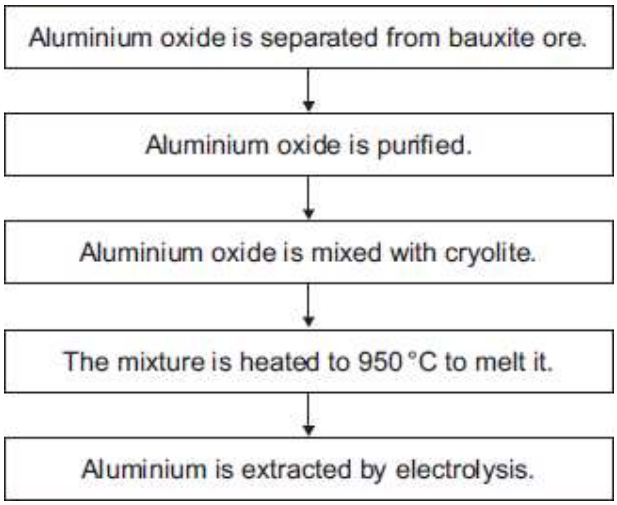




Window © Sergei Popov/iStock Airplane © Luminis/iStock
Pylon © afj1977/iStock Can © fotofermer/iStock
Car © tridland/iStock

Aluminium is extracted from aluminium ore. Aluminium ore is called bauxite, which is impure aluminium oxide.

The flow chart shows the main steps in the extraction of aluminium from aluminium ore.



Most aluminium is recycled.

Aluminium is recycled by melting scrap aluminium at 700 °C.

Use your own knowledge and the information given to answer the question.

Suggest why most aluminium is recycled.

.....

.....

.....

.....

.....

.....

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.....

.....

.....

(Total 6 marks)

Q9.

(a) The table gives the names of three different rocks and how they are classified.

name of rock	class of rock
granite	igneous
marble	metamorphic
shale	sedimentary

In the table below, draw lines to connect the name of each rock to the description of how the rock was formed and then to the correct description of features of the rock.

how the rock was formed	name of rock	features of the rock
layers of mud and tiny dead animals compressed and turned into rock	granite	large interlocking crystals
magma cooling slowly underground in the Earth's crust	marble	crumbly, layered, containing fossils
limestone changed by heat and pressure	shale	hard, shiny, white with veins of colour, fizzes with acid

3 marks

(b) The diagram shows a section through a limestone cliff.

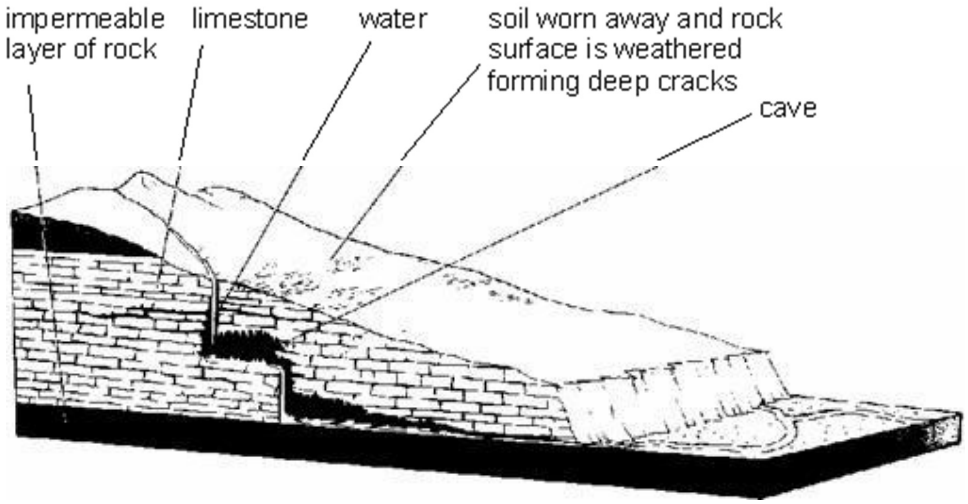


Diagram: Mary Jones, Geoff Jones, David Acaster, Cambridge Coordinated Science: *Chemistry*, 1993

(i) There are caves in the limestone.

Explain how **chemical** weathering causes caves to form in limestone.

……

……

……

……

2 marks

(ii) Limestone is a porous rock. Water can enter the spaces in limestone. Describe how this causes **physical** weathering of the limestone.

……

……

……

2 marks
Maximum 7 marks

Q10.

(a) Space probes have shown that there are mountains, dry river-valleys and volcanoes on Mars.

Scientists believe Mars, like Earth, has all three types of rock: igneous, metamorphic and sedimentary. Using the information above, explain why.

.....

.....

.....

.....

.....

.....

3 marks

(b) Temperatures on Mars can vary from 10° C in the afternoon to –100° C during the following night.
State how this could affect the rocks on the surface of Mars, and explain why.

.....

.....

2 marks
Maximum 5 marks

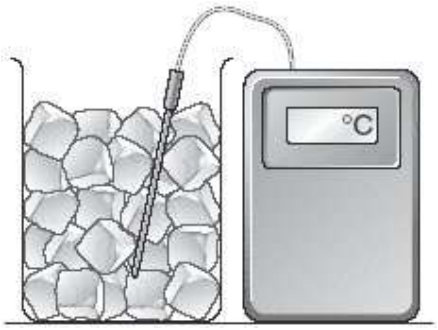
Q11.

(a) Draw a line from each change of state to the correct name.
Draw only **four** lines.

change of state	name
solid to liquid	evaporating
liquid to gas	melting
gas to liquid	condensing
liquid to solid	freezing

3 marks

(b) Kate made some ice cubes from pure water.
She used a sensor to measure the temperature of the ice.



What temperature will the sensor show when the ice is melting?

..... °C

1 mark

(c) Kate made some more ice cubes from salt solutions. She used a different amount of salt in each ice cube.

The table shows the temperature at which the ice cubes melted.

mass of salt in each ice cube (g)	temperature ice cube melted (°C)
5	−4
10	−8
15	−11
20	−15

Look at the table above.
As the mass of salt increased, what happened to the temperature at which the ice cube melted?

.....

1 mark

(d) In very cold weather a mixture of salt and sand is spread on roads.

Why are salt **and** sand used?
Tick the **two** correct boxes.

Salt makes the roads white.	☐	Sand dissolves in water.	☐
Salt makes water freeze.	☐	Sand increases friction between car tyres and the road.	☐
Salt makes ice melt.	☐	Sand makes water freeze.	☐

2 marks
maximum 7 marks

Q1.

(a) any **one** from

- to prevent it collapsing
  accept 'protects against collapse'
- to keep it open
  'for protection' is insufficient
- for support
  accept 'for strength'
  accept 'for flexibility'

1 (L5)

(b) (i) *A*: oxygen
accept 'O_2'

B: carbon dioxide
accept 'CO_2'
***both** answers are required for the mark*

1 (L5)

(ii) any **one** from

- it is thin
- it is one cell thick
- it is close to the blood supply
  accept 'there is a diffusion gradient'
  accept 'it is moist'

1 (L6)

(c) (i) any **one** from

- it moves mucus
  accept 'it moves bacteria'
- it sweeps dust from lungs
  'to clear or clean the airways' is insufficient

1 (L6)

(ii) any **one** from

- it paralyses the cilia
- it stops the cilia working
- it clogs the cilia
  accept 'it destroys them'
  *do **not** accept 'it kills cilia'*

1 (L5)

(iii) nicotine

1 (L6)

[6]

Q2.

(a) (i) one is more active

*accept 'one does sport **or** plays football'*
accept 'they have different metabolic rates'
*accept 'one works harder **or** does more work'*

1 (L5)

(ii) carbohydrates

answers may be in either order
accept a named carbohydrate,
*eg 'sugar' **or** 'glucose' **or** 'starch'*

1 (L5)

fats

1 (L5)

(b) (i) 300

1 (L5)

(ii) any **one** from

- a boy's bones **or** teeth are still growing
  *accept '15 year-old male is growing **or** still developing'*
- by 30 the bones have already developed
  accept '30 year-old male has stopped growing'

1 (L5)

(c) any **one** from

- a pregnant female supplies the baby with protein
  accept 'she supplies the baby'
- a pregnant female needs protein for herself and the baby
  accept 'she needs it for herself and the baby'
- the baby needs protein

1 (L6)

(d) any **one** from

- a 15 year-old female menstruates
- a 15 year-old female has periods

1 (L6)

[7]

Q3.

(a) any **two** from

- mucus will build up
- airways will be (partially) blocked

  accept 'cilia cannot move'
  *accept 'narrower airways' **or** named part of the airway*
  accept 'breathing will be more difficult'
  'cilia do not work as well' is insufficient
  *do **not** accept 'lungs will be blocked'*

2 (L7)

(b) any **two** from

- reduction in nicotine
- she gets used to les nicotine

  accept 'mass of nicotine goes down'
  accept 'it reduces the craving'
  ***or** 'it reduces the amount she needs'*

- the patch **or** it provides her with nicotine so she does not need to smoke
- it provides her with less nicotine than a cigarette

2 (L7)

(c) (i)
- the elements are combined **or** joined **or** bonded

  accept 'the atoms are joined'
  accept 'it has a definite composition'
  'it has three elements' is insufficient as it is given in the question

1 (L7)

(ii)
- any **two** from
- carbon dioxide
- water
- carbon monoxide

  accept 'CO_2'
  *accept 'hydrogen oxide' **or** steam **or** H_2O'*
  accept 'CO'
  *accept 'carbon oxide' if neither 'carbon dioxide' **nor** 'carbon monoxide' is given*

2 (L7)

[7]

Q4.

(a) **answers may be in either order**

cell wall

1 (L6)

chloroplast

accept 'starch grains'

1 (L6)

(b) (i) photosynthesis

1 (L6)

(ii) it decreases

*accept 'it gets less' **or** 'they are used up'*
*do **not** accept 'they die out'*

1 (L6)

(c) glucose

accept 'sugar'

1 (L6)

any **one** from

- for energy
- for respiration

1 (L6)

[6]

Q5.

(a) tar

1 (L5)

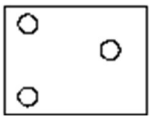
(b) (i) any **one** from

- to cool the vapour
- to condense the vapour

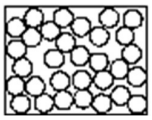
accept 'energy is transferred from the water vapour to the ice'

1 (L5)

(ii)



a random arrangement of particles most of which do not touch



a random arrangement of particles most of which touch each other

2 (L6)

(c) carbon dioxide

accept 'CO_2'

1 (L5)

[5]

Q6.

(a) sulphur dioxide

1

nitrogen oxides

1

answers may be in either order

(b) **a reference to sulphur dioxide is required**

any **one** from

- higher concentration of sulphur dioxide by power stations
- sulphur dioxide kills lichens
- lichens affected by sulphur dioxide

1

(c) water

1

carbon dioxide

1

answers may be in either order

(d) carbon + oxygen → carbon dioxide

accept 'C + O_2 → CO_2'
*do **not** accept 'carbon oxide' **or** 'carbon monoxide'*
*do **not** accept 'carbon dioxide + water'*

1

(e) oxidation

if more than one box is ticked award no mark

1

[7]

Q7.

(a) steel

*do **not** accept 'stainless steel'*
*do **not** accept 'carbon'*

1 (L5)

(b) • brass

- solder

answers may be in either order
both answers are required for the mark

1 (L5)

(c) 80

accept '100 – 20'

1 (L5)

(d) (i) it does not contain iron

accept 'it does not contain steel'
*accept 'only iron rusts' **or** 'only steel rusts'*
accept 'it is made of tin, copper and zinc'

1 (L6)

(ii) oxygen

accept 'O_2'

1 (L6)

[5]

Q8.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1–2 marks)
A brief reason is given against extraction or for recycling. There is little scientific terminology used.

Level 2 (3–4 marks)
Some reasons are given with clear statements against extraction and or for recycling. Some scientific terminology is used

Level 3 (5–6 marks)
Several reasons are given with a detailed explanation against extraction and for recycling. Scientific terminology is used accurately

examples of chemistry points made in the response

ignore uses and properties of aluminium. Comparative statements count for both methods

extraction:

- limited resources of aluminium oxide
- higher temperatures required

  allow quoted temperatures eg extracted at 950°C
- large amount of energy required
- expensive
- requires mining / quarrying
- process takes longer / has more stages
- produces more carbon dioxide / greenhouse gases

recycling:

- saves resources
- cheaper to recycle
- uses less energy
- only needs to be melted

  allow quoted temperatures eg melted / recycled at 700°C

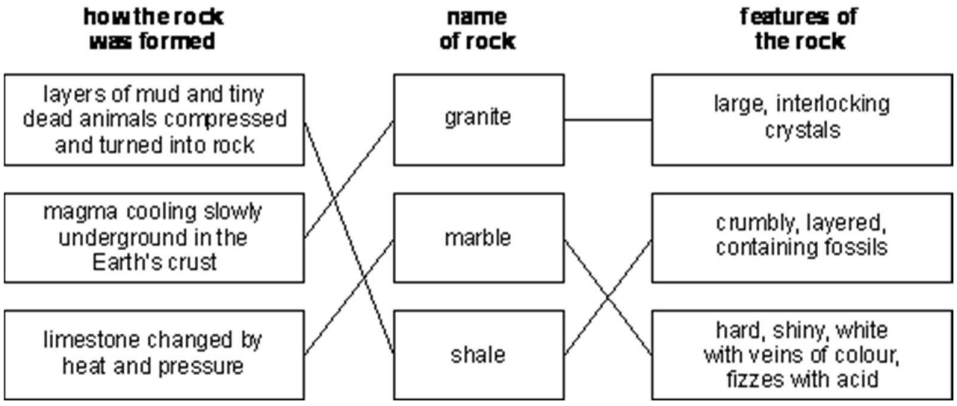
- less electricity needs to be *used*
- less effect on environment
- example of *effect on environment*
  eg less destruction of habitats
- avoids need for disposal / use of landfill
- no need for quarrying
- sustainable

6

[6]

Q9.

(a) **Both the line from the name of the rock to the method of formation and to the features of the rock must be correct for the mark.**



3 (L6)

(b) (i) acidic water drains through cracks
accept 'rain is acidic'

1 (L7)

water reacts with limestone **or** calcium carbonate
accept 'limestone dissolves'

1 (L7)

(ii) any **two** from

- low temperatures make water freeze in cracks
  accept 'water freezes in cracks'
- water expands as it freezes
- ice expanding breaks up the limestone
  accept 'ice forces the rock apart'

2 (L7)

[7]

Q10.

(a) **both the type of rock and the evidence for its formation are required for each mark**

- igneous, because igneous rock comes from volcanoes

  accept 'igneous, because there are volcanoes'

1 (L7)

any **one** from

- metamorphic, because volcanoes show there were high temperatures

  accept 'metamorphic, because volcanoes show there had been molten rock'

- metamorphic, because mountains show that the rocks have been under high pressure

  accept 'metamorphic, because mountains show there has been land movement'

- sedimentary, because there are river valleys and rivers produce sediment

  accept 'sedimentary, because there are river valleys' ***or*** *'sedimentary, because rivers produce sediment'*

2 (L7)

(b) it will break them up **or** split them **or** weather them

accept 'it will cause onion skin weathering'

1 (L6)

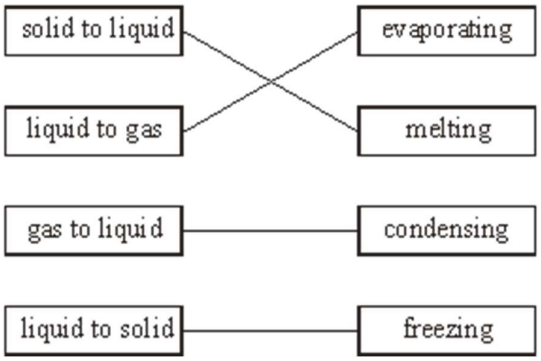
because they will expand and contract

1 (L6)

[5]

Q11.

(a) •



*award three marks for **all four** correct lines*
*award two marks for any **three** correct lines*
*award one mark for any **two** correct lines*
if more than one line is drawn from any change of state, do not credit that change of state

3 (L3)

(b) • 0 °C

accept 'zero'
*do **not** accept 'nothing'*

1 (L4)

(c) • it decreased

accept 'it got colder'
'it dropped to below 0°C' is insufficient
any references to time are insufficient

1 (L3)

(d) • Sand increases friction between car tyres and the road. ✓

• Salt makes ice melt. ✓

if more than two boxes are ticked, deduct a mark for each incorrect box
minimum of zero

2 (L4)

[7]