

GCSE

ADDITIONAL SCIENCE B

Additional Science B Unit 2 Modules B4, C4, P4

Specimen Paper

Candidates answer on the question paper:
Additional materials: ruler (cm/mm), calculator

H **B624/02**

60 mins

Candidate
Name

--

Centre
Number

--	--	--	--	--

Candidate
Number

--	--	--	--

TIME 60 mins

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers on the dotted lines unless the question says otherwise.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- There is a space after most questions. Use it to do your working. In many questions marks will be given for a correct method even if the answer is incorrect.
- Do not write in the bar code. Do not write in the grey area between the pages.
- **DO NOT WRITE IN THE AREA OUTSIDE THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.**

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.

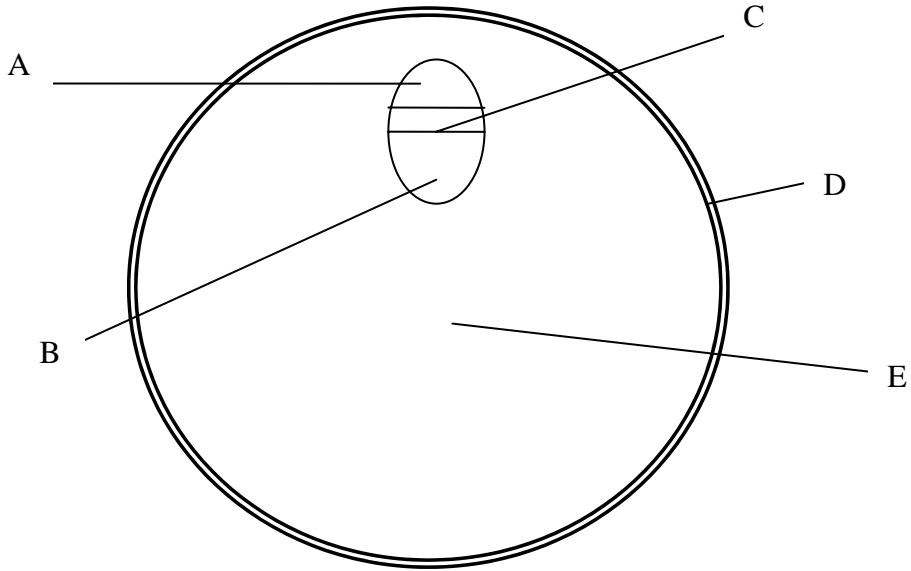
This specimen paper consists of 21 printed pages.

BLANK PAGE

Answer all questions.

Section 1

1. The diagram shows a cross section through a plant stem.



- (a) (i) Which label letter shows the xylem?
 Choose from **A, B, C, D, or E.** [1]
- (ii) Which label letter shows the phloem?
 Choose from **A, B, C, D, or E.** [1]

(b) Water carries dissolved minerals up to the leaves through the xylem.
 The table shows how plants use some of these minerals.
 Complete the table. One example is done for you.

mineral	one substance made using the mineral	use of the substance in the plant
phosphate	DNA	It stores genetic information
magnesium		
nitrate		

[4]

(c) Water travels through the plant by a process called transpiration.

(i) Give **two more** uses of water in a plant.

Water carries dissolved materials up to the leaves.

1.

2.[2]

(ii) Describe how a plant loses water from its leaves.

.....

.....

.....

.....[2]

(d) Rob noticed that his tomato plants wilted on a hot and windy day.

His friend said this was due to transpiration.

Explain why transpiration rate is increased on hot and windy days.

.....

.....

.....[3]

[Total: 13]

2. Woolly mammoths were a type of prehistoric elephant.

They used to live in very cold parts of the world.

They became extinct about 10,000 years ago.

The dead bodies of some mammoths have been found preserved in frozen ground.

Some of the mammoths have been taken out of the frozen ground.

The bodies then started to decay.

Explain why they started to decay.

.....

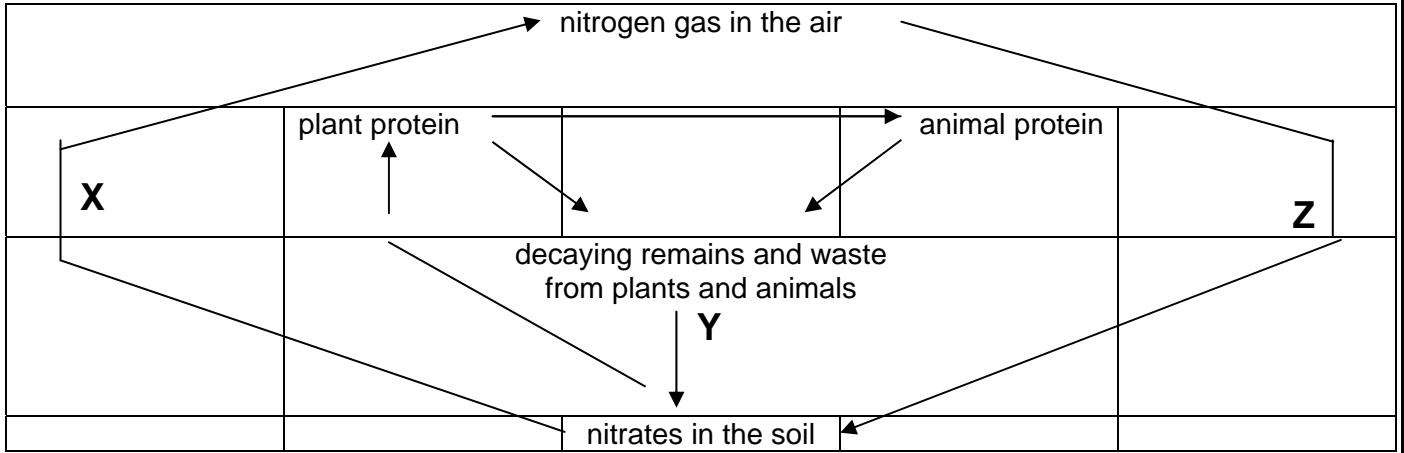
.....

.....

.....[3]

[Total: 3]

3. The diagram shows part of the nitrogen cycle.



(a) What types of microbes cause the changes shown by arrows X, Y and Z?

- X
- Y
- Z

(b) In tropical rainforests, there is a lot of decaying plant and animal material.

However, the amount of nitrate in the soil is low.

Suggest why the amount of nitrate in the soil is low.

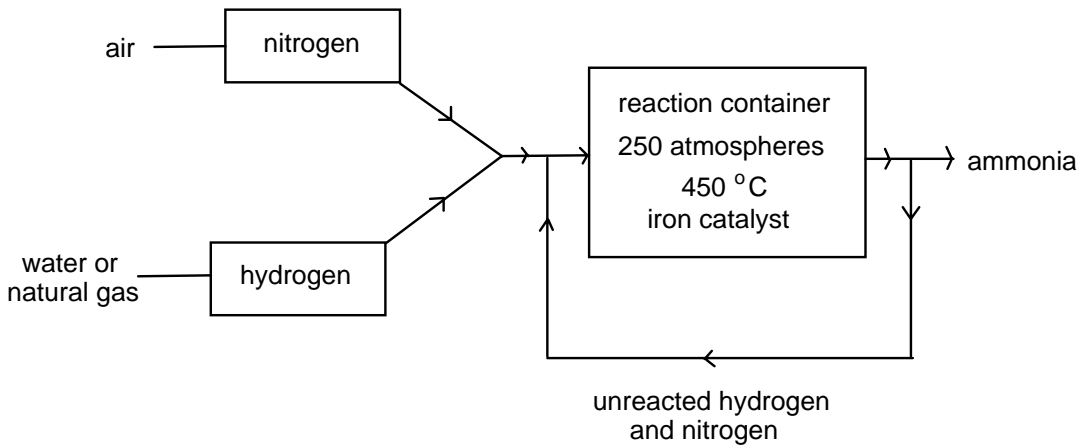
-
-[1]

[Total: 4]

Section 2

4. Ammonia is made from nitrogen and hydrogen.

Look at the flow chart. It shows how ammonia is made using the Haber process.



(a) Nitrogen and hydrogen react together to make ammonia in the converter.

(i) The use of the catalyst reduces the cost of making ammonia.

Explain how.

.....
[1]

(ii) Not all the hydrogen and nitrogen react in the converter.

Unreacted nitrogen and hydrogen are recycled.

Suggest one advantage of this.

.....
[1]

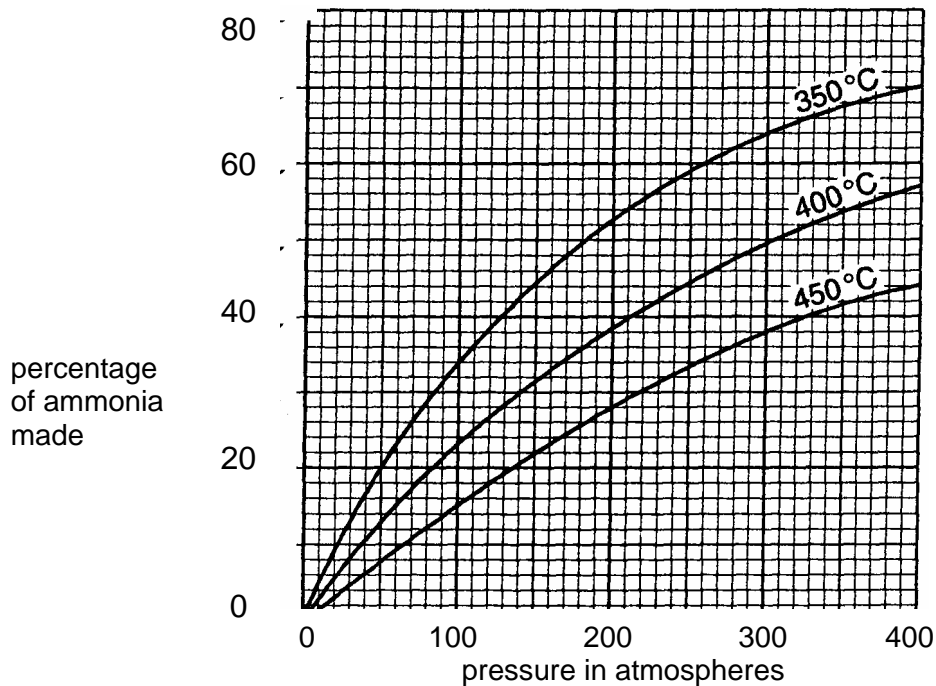
(b) The reaction between nitrogen and hydrogen is reversible.

Explain what this means.

.....
[1]

(c) Look at the graphs.

They show the percentage of ammonia made in the converter at different temperatures and pressures.



(i) Look at the graph for 350 °C.

The percentage of ammonia changes as the pressure increases.

Describe how.

.....[1]

(ii) Look at the graphs.

The percentage of ammonia changes as the temperature increases.

Describe how.

.....[1]

(iii) Look at the graphs.

Write down a temperature and a pressure which make 20% of ammonia.

Temperature°C

Pressure.....atmospheres

[1]

[Total: 6]

5. Ammonium sulphate is a fertiliser.

(a) Ammonium sulphate dissolves in water.

Explain why it is important for fertiliser to be soluble in water.

.....
[1]

(b) Jas and Andy make some ammonium sulphate.

They mix ammonia solution with dilute sulphuric acid.

Ammonia, NH_3 , reacts with sulphuric acid, H_2SO_4 , to make ammonium sulphate, $(\text{NH}_4)_2\text{SO}_4$.

(i) Write down the balanced symbol equation for this reaction.

.....[2]

(ii) They predict that they will make 8.0 g.

They actually make 6.0 g.

Calculate their percentage yield (show your working).

.....

Answer% [2]

(c) The formula for ammonium sulphate is $(\text{NH}_4)_2\text{SO}_4$

Calculate the percentage by mass of nitrogen in ammonium sulphate.

The relative atomic mass of H is 1, of N is 14, of O is 16 and S is 32.

.....

Answer% [3]

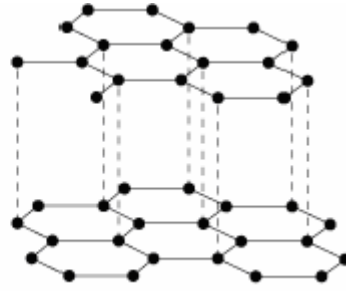
[Total: 8]

6. This question is about diamond and graphite.

Look at the diagrams. They show the structure of diamond and graphite.



Diamond



Graphite

Diamond and graphite are forms of the same element.

Draw a straight line from each use to the reason why diamond or graphite is suitable for this use.

use

Graphite is used in pencil leads

Diamond is used in cutting tools

Graphite is used as an electrode in electrolysis

Diamond is used in jewellery

reason

because it conducts electricity

because it sparkles and is transparent

because it has a high melting point and is very hard

because it is slippery

[3]

[Total: 3]

Section 3

8. (a) Sam rubs a plastic rod with a cloth.

The rod becomes charged.

There are two kinds of electric charge.

(i) Write down the names of these charges.

.....
.....
.....[2]

(ii) Charged particles are transferred between the rod and the cloth.

Write down the name of the charged particles.

.....[1]

(b) Static electricity is used by doctors to restart a patient's heart when it has stopped.

Describe how.

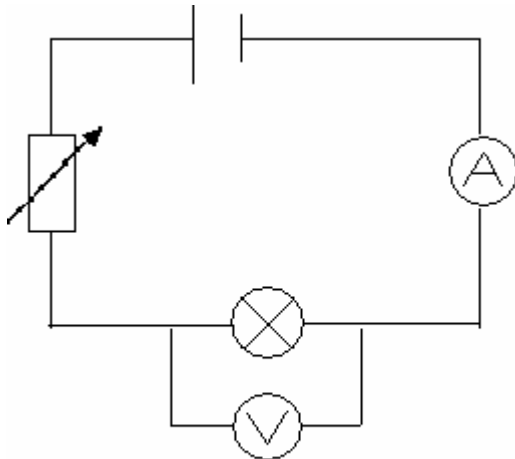
In your answer you should:

- describe what the doctor does
- describe any safety precautions taken

.....
.....
.....
.....[3]

[Total: 6]

9. Jamie does an experiment with electricity.
He makes a circuit.
He measures the current and pd (voltage) across the bulb.
Look at the diagram



The pd (voltage) across the bulb is 12V when the current is 2A.

Calculate the resistance of the bulb.

.....
.....
.....

Answerohms [3]

[Total: 3]

10. In medicine, high energy X-rays are often used instead of gamma rays.

(a) (i) How are **gamma rays** made?

.....[1]

(ii) How are **X-rays** made?

.....

[2]

(iii) Why are X-rays used rather than gamma rays?

.....

[1]

(b) When ${}_{92}^{238}$ Uranium decays, it gives out an alpha particle.

(i) What is an **alpha particle**?

.....[1]

(ii) Describe what happens to the nucleus of the Uranium atom when an alpha particle is emitted.

In your answer you should describe changes in:

- the mass number
- the atomic number
- the number of each type of particle in the nucleus
- the uranium atom

You may use the number equation to help explain your answer if you wish.

.....

[3]

- (c) In a nuclear power station, nuclear fuel, such as uranium, gives out energy.
Write down the name of this process.

.....[1]

- (d) Explain how scientists stop these reactions going out of control.

.....
.....
.....
.....[2]

[Total: 11]

1	2											3	4	5	6	7	8		
		Key																	
		relative atomic mass atomic symbol name atomic (proton) number																	
		1 H hydrogen 1																	4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10		
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18		
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36		
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sb tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54		
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86		
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated								

*The Lanthanides (atomic numbers 58-71) and the Actinides (atomic numbers 90-103) have been omitted
Cu and Cl have not been rounded to the nearest whole number

BLANK PAGE



GCSE

ADDITIONAL SCIENCE B

Additional Science B Unit 2 Modules B4, C4, P4

Specimen Mark Scheme

Maximum mark for this paper is 60

H **B624/02**

60 mins

This specimen mark scheme consists of 3 printed pages.

Question Number	Answer	Max Mark
Section 1 1(a)i 1(a)ii 1(b) 1(c)i 1(c)ii 1(d)	B; A; Magnesium - chlorophyll; Absorbs light energy for photosynthesis; Nitrate - Protein / amino acid / nucleic acid; Growth or any other correct eg making enzymes // storing genetic information AW any two from cooling; photosynthesis; support diffusion; through stomata windy blows molecules; water molecules away; water molecules evaporate from leaf; higher temperature gives water molecules greater energy / kinetic energy water molecules evaporate more quickly <p style="text-align: right;">Total marks</p>	[1] [1] [4] [2] [2] [3] [13]
2	Microorganisms cause decay; Microorganisms become more active / reproduce faster due to higher temperature; Ice melts to make water available to microorganisms; <p style="text-align: right;">Total mark</p>	[3] [3]
3(a) 3(b)	X = denitrifying bacteria; Y= nitrifying bacteria; Z= nitrogen fixing bacteria; small amounts of nitrifying bacteria in the soil; <p style="text-align: right;">Total mark</p>	[3] [1] [4]
Section 2 4(a)i 4(a)ii 4(b) 4(c)i 4(c)ii 4(c)iii	Reduces energy costs because less heat being needed / makes more product in a shorter time / aw; Cuts down on waste / no waste of starting materials / aw; Product can change back to reactants / reaction can go both ways / aw; Increases / goes up / aw; Decreases / goes down / aw; 350 and 50 atmospheres / 400 and 80 - 90 atmospheres / 450 and 135 – 145 atmospheres; <p style="text-align: right;">Total mark</p>	[1] [1] [1] [1] [1] [6]

5(a)	So it can be absorbed by the roots / aw (allow so it can be sprayed easily)	[1]
5(b)i	$2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$ (allow any correct multiple and equation) Correct reactant and products (allow full marks for correct answer with no working out); Balancing;	[2]
5(b)ii	Percentage yield = (actual yield ÷ predicted yield) × 100 75%	[2]
5(c)	Relative molecular mass = 132; (allow wrong Mr) Fraction of nitrogen = 28/132; (allow use of 14 rather than 28) Percentage = 21.2 (%);	[3]
	Total mark	[8]
6	Graphite is used in pencil leads because it is slippery; Diamond is used in cutting tools because it has a high melting point and is very hard; Graphite is used as an electrode in electrolysis because it conducts electricity; Diamond is used as jewellery because it sparkles and is transparent All 4 correct (3) 2 or 3 correct (2) 1 correct (1)	[3]
	Total mark	[3]
7	Any three from Detergent molecule has a hydrophobic tail and a hydrophilic head; (allow fat loving tail + water loving head) Tail forms strong intermolecular forces with fat molecules; Detergent molecules surround the fat droplet; Head forms intermolecular forces with water molecules;	[3]
	Total mark	[3]
Section 3		
8(a)i	positive; negative;	[2]
8(a)ii	electrons;	[1]
8(b)	paddles charged; good electrical contact; with patients chest /AW; charge passed through patient; to make heart contract; care taken not to shock operator; (any three)	[3]
	Total mark	[6]

9	$R = \frac{V}{I}; = \frac{12}{2} = 6\Omega$ <p>2 (correct answer on its own gains 3)</p>	<p>[3]</p> <p>Total mark [3]</p>
<p>10(a)i</p> <p>10(a)ii</p> <p>10(a)iii</p> <p>10(b)i</p> <p>10(b)ii</p> <p>10(c)</p> <p>10(d)</p>	<p>By disintegration of radioactive atom/nucleus;</p> <p>High speed electrons;</p> <p>colliding with metal target;</p> <p>they are easier to control;</p> <p>helium nucleus;</p> <p>mass number decreases by 4;</p> <p>atomic number decreases by 2;</p> <p>neutrons change from 146 to 144 / become 144;</p> <p>protons change from 92 to 90 /become 90;</p> <p>uranium changes to a new element/thorium (any three)</p> <p>Fission;</p> <p>Control rods/rods of boron;</p> <p>Are placed into the reactor;</p> <p>To absorb neutrons; (any two)</p>	<p>[1]</p> <p>[1]</p> <p>[1]</p> <p>[1]</p> <p>[1]</p> <p>[3]</p> <p>[1]</p> <p>[2]</p> <p>Total mark [11]</p> <p>Overall Marks [60]</p>