

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B624/01

ADDITIONAL SCIENCE B

Unit 2 Modules B4 C4 P4 (Foundation Tier)

Candidates answer on the question paper.
A calculator may be used for this paper.

OCR supplied materials:
None

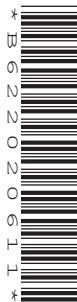
Other materials required:

- Pencil
- Ruler (cm/mm)

Tuesday 7 June 2011

Afternoon

Duration: 1 hour



Candidate forename		Candidate surname	
Centre number		Candidate number	

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- A list of physics equations is printed on page two.
- The Periodic Table is printed on the back page.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

2

EQUATIONS

$$\text{speed} = \frac{\text{distance}}{\text{time taken}}$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{work done} = \text{force} \times \text{distance}$$

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

3

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Question 1 begins on page 4.

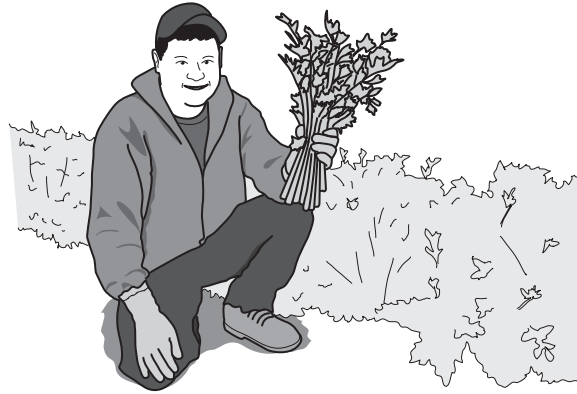
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Answer **all** the questions.

Section A – Module B4

1 Giles is a farmer.

He grows celery.



(a) Giles waters his celery every day.

(i) Which part of the celery plant takes in water?

..... [1]

(ii) On a hot day the celery plants lose water quickly.

What would the plants look like if Giles forgot to water them on a hot day?

..... [1]

(iii) Temperature affects how fast the celery plants lose water.

Write down **one other** factor that affects how fast plants lose water.

..... [1]

(b) The celery plants need sunlight to grow.

Cells in the leaves absorb sunlight.

Which **part** of a cell absorbs sunlight?

..... [1]

- (c) Giles wants his celery plants to grow bigger.

He reads in a book about some treatments he can use on his plants.

These are shown in the table.

treatment	description	what it does
growcrop	rotted compost	natural fertiliser
malathion	chemical powder	kills insects
trifluralin	chemical spray	kills weeds
ladybirds	living organism	eat greenflies
growup	chemical liquid	artificial fertiliser

- (i) Which treatment in the table is a herbicide?

treatment [1]

- (ii) Giles wants to grow his celery organically.

How many of the treatments in the table could he use?

Put a ring around the correct number in this list.

0 1 2 3 4 5

[1]

- (iii) Giles decides to use ladybirds to biologically control pests.

How do ladybirds biologically control pests?

..... [1]

- (d) Celery can be preserved by freezing.

- (i) It is necessary to preserve food if it is to be kept for a long time.

Why is this?

..... [1]

- (ii) Write down **one other** method of food preservation.

..... [1]

[Total: 9]

- 2 Read the article about the possibility of people living on the moon.

Can we live on the moon?



One of the main problems with living on the moon is growing food.

There is no soil on the moon but plants could be grown with their roots in water that contains minerals.

However, it is very cold on the moon.

There is also very little of the gas needed for photosynthesis.

The water to grow the plants would have to come from Earth but minerals are not a problem.

There is a wide selection of minerals in moon dust but no microorganisms.

- (a) (i) The article suggests that there are problems with growing plants on the moon.

Put a tick (✓) next to **one** problem suggested by the article.

not enough nitrates

☐

not enough oxygen for photosynthesis

☐

the temperature is too hot for photosynthesis

☐

not enough carbon dioxide for photosynthesis

☐

[1]

- (ii) Scientists plan to grow the plants in water rather than soil.

What is the name of this type of growing method?

..... [1]

7

- (iii) When people grow plants for food, some parts of the plant are wasted.

Plant waste will **not** rot on the moon.

Write down **two** reasons why plant waste will not rot.

1

2 [2]

- (iv) Moon dust contains minerals that plants need to grow.

Write down **one** mineral that is needed for plant growth.

..... [1]

- (b) The scientists investigate a number of different food plants that they might grow.

They use a computer to predict the yield of food plants when grown in water.

The table shows how this yield compares with the yield when grown in soil.

food plant	yield when grown in soil in arbitrary units	yield when grown in water in arbitrary units	percentage of plant that can be eaten
beans	2.4	20.0	22
broccoli	3.8	13.0	33
cabbage	10.8	41.4	67
cucumbers	5.4	65.7	20

Suggest the advantages and disadvantages of choosing cucumbers to grow in water on the moon.

Use data from the table to support your answer.

.....

.....

.....

.....

..... [3]

[Total: 8]

3 Scientists are developing power stations that do not use fossil fuels.

(a) One possibility is to use biomass as a fuel.

Which **two** of these energy sources are made from biomass?

biogas

uranium

water

wood

answer and

[1]

(b) Another alternative to using fossil fuels is using osmosis.

The world's first power station that uses osmosis has opened in Norway.

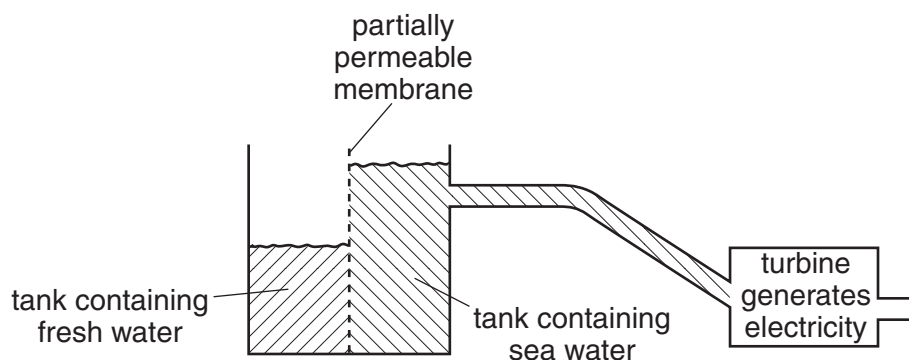


The station has two large tanks of liquid separated by a partially-permeable membrane.

One tank contains fresh water, the other contains sea water.

Sea water contains a higher concentration of salt than fresh water.

The level in the sea water tank rises and this can be used to generate electricity.



9

- (i) The power station uses a **partially-permeable** membrane.

What is meant by partially-permeable?

..... [1]

- (ii) Which statement best describes why the level rises in the sea water tank?

Put a tick (✓) in the box next to the best reason.

Osmosis causes water to move from a dilute salt solution to a concentrated salt solution.

☐

Osmosis causes salt to move from a dilute salt solution to a concentrated salt solution.

☐

Osmosis causes water to move from a concentrated salt solution to a dilute salt solution.

☐

Osmosis causes salt to move from a concentrated salt solution to a dilute salt solution.

☐

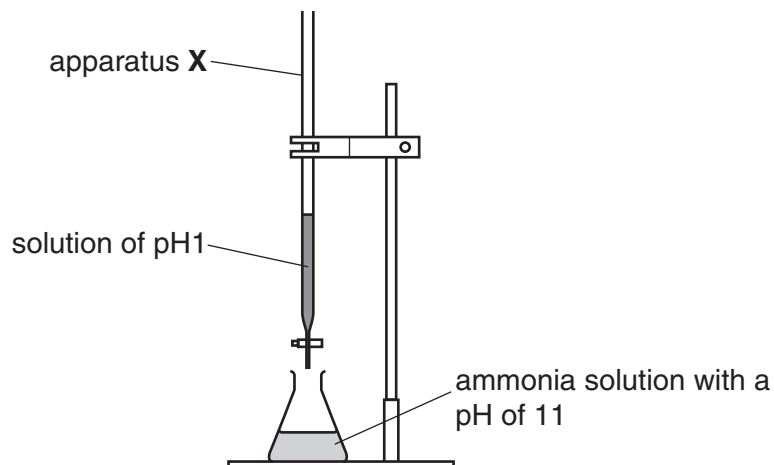
[1]

[Total: 3]

Section B – Module C4

- 4 Mary is making a fertiliser.

Look at the diagram. It shows the apparatus she uses.



Mary adds the liquid in apparatus **X** to the ammonia solution.

She stops adding the liquid when the solution in the flask has a pH of 7.

Mary evaporates the solution in the flask to make the solid fertiliser.

- (a) (i) What is the name of apparatus **X**?

..... [1]

- (ii) Look at the table. It shows three solutions of different pHs.

Complete the table to show the **type** of solution.

Choose from

acid

alkali

neutral

pH of solution	type of solution
11	
7	
1	

[2]

11

- (b) The reaction in the flask is a **neutralisation** reaction.

Complete the word equation about neutralisation.

acid + base → + water [1]

- (c) Mary predicts she will make 4.8 g of fertiliser.

She actually makes 4.2 g.

- (i) Calculate her percentage yield.

.....

.....

answer % [2]

- (ii) Mary's **actual** yield is less than her **predicted** yield.

Suggest why. Use Mary's method to help you.

.....

..... [1]

- (d) Mary grows vegetables in her garden.

Why does Mary add fertiliser to her vegetable garden?

..... [1]

[Total: 8]

- 5 Look at the table. It gives some information about two types of manufacturing process.

process A	process B
runs only when needed	runs 24 hours a day, 7 days a week
makes chemicals on a small scale	makes chemicals on a large scale
can be used to make medicines	can be used to make ammonia

- (a) Complete the sentences to show the **type** of process.

Process **A** is a process.

Process **B** is a process.

[2]

- (b) Most medicines are expensive to make.

One of the costs is the cost of the raw materials.

Write about the **other** costs of making medicines.

.....

.....

.....

..... [3]

[Total: 5]

13

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Question 6 begins on page 14.

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14

6 This question is about washing-up liquid and water.

(a) Link each **ingredient** in washing-up liquid to the **job it does**.

Draw only three straight lines.

ingredient	job it does
detergent	thins out the detergent
rinse agent	softens hard water
water	helps water to drain off dishes
	cleans the grease off dishes

[3]

(b) Washing-up liquid can pollute drinking water.

Another pollutant is nitrates.

Suggest how nitrates could get into drinking water.

..... [1]

(c) Joe is testing some water samples.

He adds silver nitrate solution and barium chloride solution to the water samples.

Look at the table. It shows his results.

water sample	result with silver nitrate solution	result with barium chloride solution
A	white precipitate	colourless solution
B	cream precipitate	colourless solution
C	colourless solution	white precipitate
D		

(i) Bromide ions give a cream precipitate with silver nitrate solution.

Which water sample contains bromide ions?

..... [1]

(ii) Which water sample contains chloride ions?

..... [1]

(iii) Sample **D** contains **iodide** ions and **sulfate** ions.

Complete the table to show Joe's results.

[1]

[Total: 7]

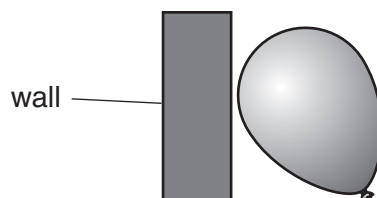
Section C – Module P4

7 This question is about electrostatics.

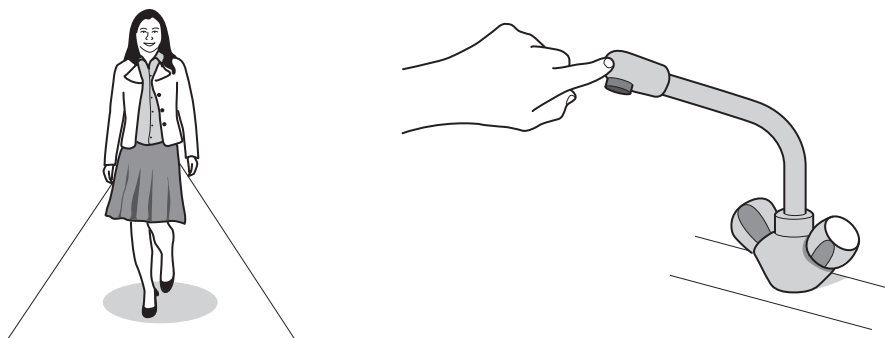
Look at the situations below.

One of these situations may cause an electrostatic shock.

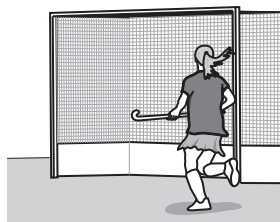
A Gemma rubs a balloon on her sweater and then puts it **near** to a wall.



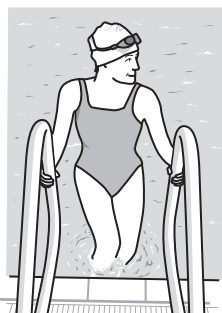
B Hazel walks on a vinyl carpet and then **touches** a cold water tap.



C Anna plays a game of hockey on a grass pitch and **touches** a metal goal post.



D Jackie swims a length of a swimming pool and climbs out by **holding** a metal ladder.



(a) Which situation is most likely to cause an **electrostatic shock**?

Choose from

A B C D

answer

[1]

(b) Kieron combs his hair.

He holds the comb next to some small pieces of paper.

Look at the picture.



What will happen to the small pieces of paper?

.....
..... [1]

(c) Lorna wears a nylon coat. The coat becomes charged.

This is because charged particles move between the coat and Lorna.

Write down the **name** of the charged particles involved.

..... [1]

[Total: 3]

18

8 Static electricity can be useful.

It is used to restart the heart when it has stopped.

Write about how static electricity is used to restart a heart when it has stopped.

Your answer should include

- the method used
- the safety precautions.

.....

.....

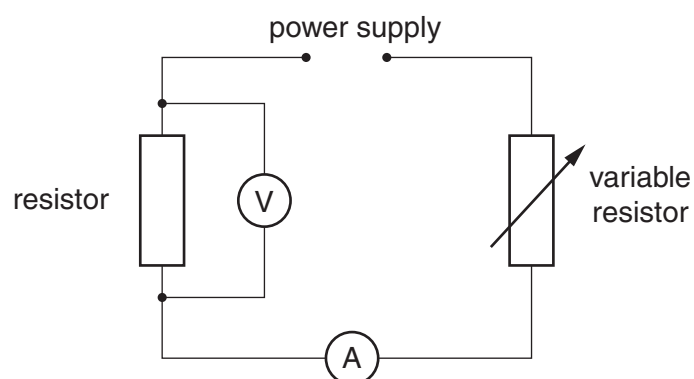
.....

.....

..... [3]

[Total: 3]

- 9 Marc builds the following circuit.



- (a) Complete the sentence.

Marc measures the voltage and the current.

Marc needs to change the current in the circuit.

He does this by [1]

- (b) The reading on the voltmeter is 15V and the reading on the ammeter is 4 A.

Calculate the resistance of the resistor.

The equations on page 2 may help you.

.....

answer ohms [2]

[Total: 3]

10 Ultrasound is used in hospitals.

Write down **two** uses of ultrasound in hospitals.

1

2

[2]

[Total: 2]

11 This question is about nuclear radiation.**(a)** Gamma rays are used in hospitals.

Write down one use of gamma rays **in hospitals**.

.....

..... [1]

(b) Which **part** of an atom gives out gamma rays?

..... [1]

(c) Atoms that give out nuclear radiation are called radioisotopes.**(i)** Write down one use of a radioisotope that produces **alpha particles**.

..... [1]

(ii) Scientists need to make radioisotopes.

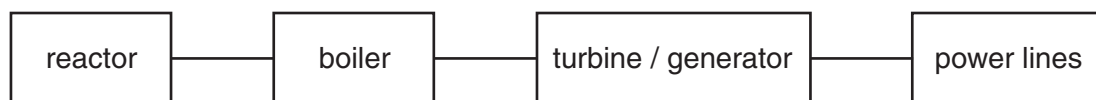
They have to make the material radioactive.

How do they do this?

..... [1]

[Total: 4]

12 Look at the simple diagram of a nuclear power station.



(a) Complete the following sentences.

The name of the fuel used in a nuclear power station is

The reactor produces a large amount of heat.

This heat causes water in the boiler to produce

This passes into the turbine/generator where is produced.

[3]

(b) The waste products of the nuclear power station are radioactive.

A scientist measures the radioactivity of some waste.

The reading on his meter is 25 000.

(i) What is he measuring?

- A the number of elements in the waste
- B the number of atoms in the waste
- C the number of nuclear decays per second
- D the wavelength of the radiation produced

Choose from **A** **B** **C** **D**

answer

[1]

(ii) Several years later the scientist measures the radioactivity again.

Which of the following is most likely to be the new measurement on the meter?

- A** 41 000 **B** 26 000 **C** 25 000 **D** 19 000

Choose from **A** **B** **C** **D**

answer

[1]

[Total: 5]

END OF QUESTION PAPER

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The Periodic Table of the Elements

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1	2	3	4	5	6	7	0
7 Li lithium 3	9 Be beryllium 4	1 H hydrogen 1 relative atomic mass atomic symbol name atomic (proton) number					4 He helium 2
23 Na sodium 11	24 Mg magnesium 12	11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
39 K potassium 19	40 Ca calcium 20	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
85 Rb rubidium 37	88 Sr strontium 38	65 Zn zinc 30	63.5 Cu copper 29	59 Ni nickel 28	59 Co cobalt 27	80 Br bromine 35	84 Kr krypton 36
133 Cs caesium 55	137 Ba barium 56	112 Cd cadmium 48	108 Ag silver 47	106 Pd palladium 46	103 Rh rhodium 45	127 I iodine 53	131 Xe xenon 54
[223] Fr francium 87	[226] Ra radium 88	201 Hg mercury 80	197 Au gold 79	195 Pt platinum 78	192 Ir iridium 77	[209] Po polonium 84	[222] Rn radon 86
Elements with atomic numbers 112-116 have been reported but not fully authenticated							
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 [272] Rg roentgenium 111							
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							
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 46 112 Cd cadmium 48 115 In indium 49 119 Sn tin 50 122 Sb antimony 51 128 Te tellurium 52 127 I iodine 53 [210] At astatine 85							
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 [272] Rg roentgenium 111							
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							

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.