Section A [5 marks]

Answer **all** questions.

Write your answers in the boxes provided at the end of the Section.

1 Which of the following is a compound?

A air

B carbon

C oxygen

D steam

2 Which statement about atoms is correct?

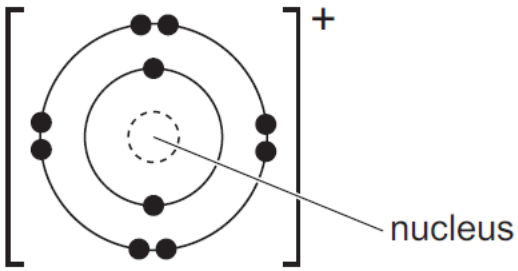
A The mass of an atom is almost entirely due to its nucleus.

B The electrons and neutrons attract one another.

C The protons and neutrons have opposite charges.

D The shell nearest to the nucleus always contains the most electrons.

3 The diagram of an ion is shown.



What can be deduced about the number of protons in this ion?

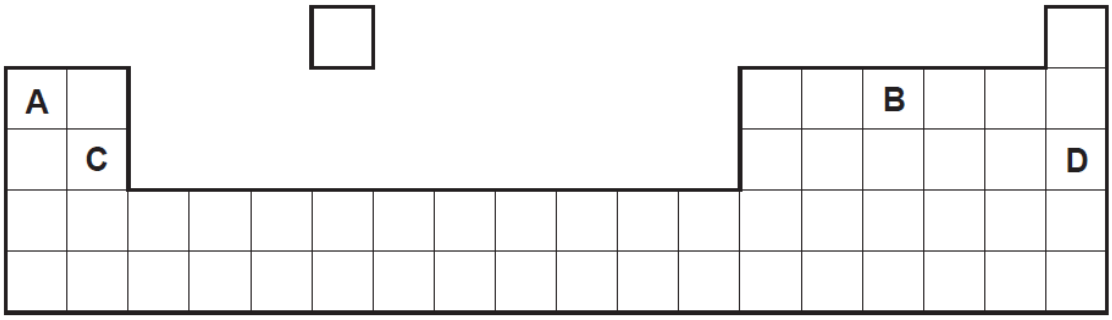
A It has 9 protons.

B It has 10 protons.

C It has 11 protons.

D The number of protons cannot be deduced from this diagram.

4 The diagram shows part of the Periodic Table.



Which element is correctly matched with its electronic configuration?

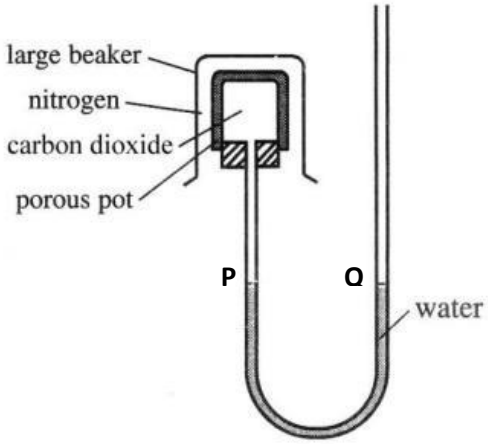
A 2.8.1

B 2.4

C 2.8.2

D 2.8

5 A large beaker containing nitrogen gas (N_2) was placed over a porous pot containing carbon dioxide gas (CO_2) as shown below.



How would the water levels at P and Q change after a few minutes and after a long time?

	after a few minutes	after a long time
A	lower at P than Q	higher at P than Q
B	lower at P than Q	same at P and Q
C	higher at P than Q	same at P and Q
D	higher at Q than P	higher at Q than P

Write your answers for Section A in the boxes below.

1.	2.	3.	4.	5.

Section B [30 marks]
Answer **all** questions.
Write your answers in the spaces provided.

B1 The table below gives the number of protons, neutrons and electrons in some particles.

particle	protons	neutrons	electrons
A	17	18	17
B	17	20	17
C	17	18	18
D	20	20	20
E	37	48	37

(a) Using the data in the table, **explain** which particle is an ion.

…… [1]

(b) Using the data in the table, identify two atoms that are isotopes and explain your choice.

…….. and …… are isotopes.

Reason:

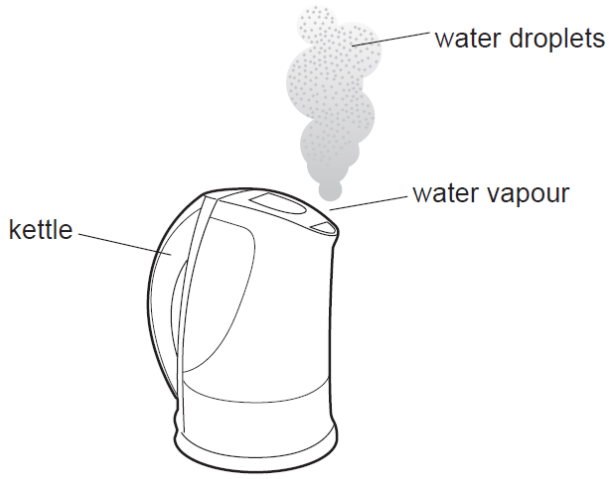
…… [2]

(c) A substance **Z** is formed when particles A and D react.

Draw a 'dot-and-cross' diagram to show the arrangement of the outer shell electrons of the particles in **Z**.

[3]

B2 **(a)** The diagram shows a kettle of boiling water.



As the water vapour cools, it turns back to water droplets.

Describe this change of state in terms of the kinetic particle theory.

In your answer, include

- the difference in the closeness of the water molecules as the water vapour changes to water,
- the difference in the motion of the water molecules as the water vapour changes to water,
- the difference in the strength of the attractive forces between the water molecules as the water vapour changes to water.

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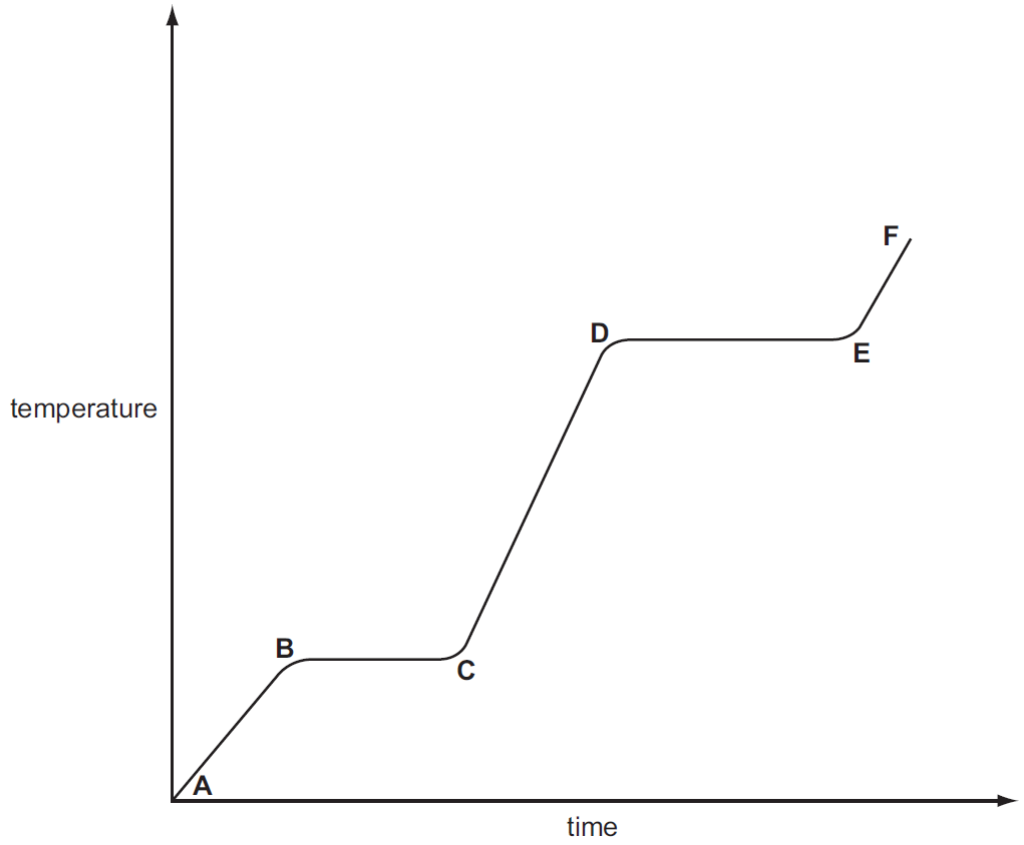
…… [3]

(b) The diagram below shows the heating curve for a solid **Y**.



(i) Name the process that is occurring in the region **D** to **E**.

…….. [1]

(ii) At which region of the curve can you find a mixture of solid and liquid **Y**?

…….. [1]

B3 The Periodic Table is an arrangement of elements in groups and periods.

(a) Describe how the position of an element in the Periodic Table is related to its electronic configuration.

……

……

…… [2]

(b) Barium in Group II of the Periodic Table forms the following ion:

$$^{138}_{56}Ba^{2+}$$

Complete the table about this barium ion.

subatomic particles	number of subatomic particles
electrons	
neutrons	
protons	

[3]

(c) Aluminium is an element in Group III of the Periodic Table.

(i) Deduce the electronic configuration of the aluminium **ion**.

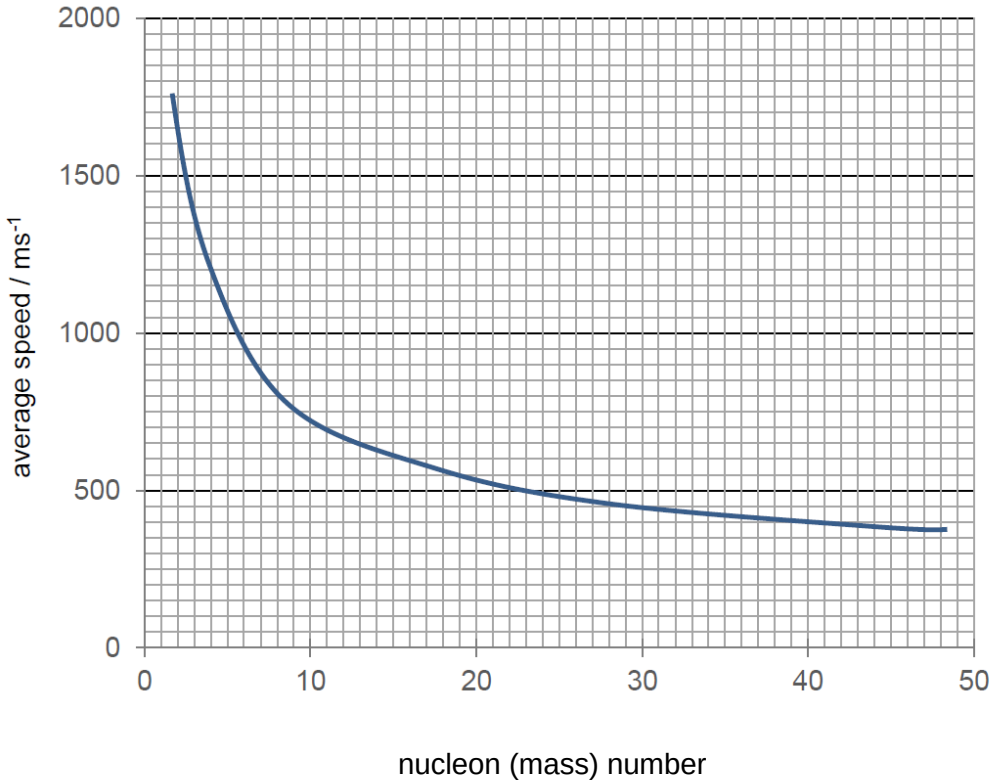
…….. [1]

(ii) Aluminium reacts with oxygen to form the compound aluminium oxide.

Draw a 'dot-and-cross' diagram to show the arrangement of the outer shell electrons in aluminium oxide.

[3]

B4 The graph shows the relationship between the nucleon (mass) number of a gas and the average speed of the gas particles at 25 °C.



(a) What do you understand by the term *nucleon number*?

…… [1]

(b) Based on the graph, describe the relationship between the nucleon (mass) number of a gas and the average speed of the gas particles.

…… [1]

(c) A student makes the following statement:

When the nucleon (mass) number of a gas is doubled, the average speed of the gas particles is reduced by half.

Using **neon** and **argon** atoms as examples, explain if the student's statement is correct.

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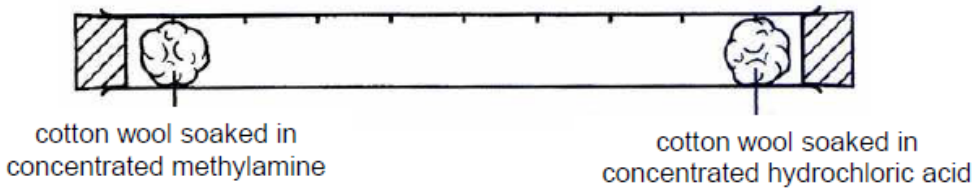
……

……

…… [3]

(d) Methylamine, CH_3NH_2, and hydrogen chloride, HC*l*, are both gases that react to form a white solid, methylammonium chloride.

A student sets up the following apparatus to investigate the reaction between the two gases (Experiment 1).



(i) Predict where the white solid would likely be formed by marking the position with an '**X**'. Explain your answer.

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……

……

…… [3]

(ii) The student repeats the experiment at a higher temperature (Experiment 2).

Suggest one similarity and one difference between the observations made in both experiments.

Similarity: ……

……..

Difference: ……..

…….. [2]

**********End of Paper**********