

Questions

Q1.

In 1871, the Russian chemist Dmitri Mendeleev produced the first version of the periodic table.

Describe how Mendeleev arranged the elements in this first version of the periodic table and why the elements are arranged differently in the modern periodic table.

(3)

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(Total for question = 3 marks)

Q2.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

Calcium has an atomic number of 20.

A calcium atom has a mass number of 40.

(i) Which row of the table shows the number of protons and number of neutrons in this atom of calcium?

(1)

	number of protons	number of neutrons
<input checked="" type="checkbox"/> A	20	20
<input checked="" type="checkbox"/> B	40	20
<input checked="" type="checkbox"/> C	20	60
<input checked="" type="checkbox"/> D	60	20

(ii) Figure 8 shows the arrangement of electrons in an atom of calcium.

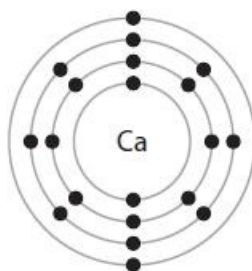


Figure 8

Explain, using the information in Figure 8, in which period of the periodic table calcium can be found.

(2)

.....

.....

.....

.....

(Total for question = 3 marks)

Q3.

In Figure 8, the letters A, E, G, J, X and Z show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

	1	2										3	4	5	6	7	0
	A											E			G		
	J																X
						Z											

Figure 8

Using the letters A, E, G, J, X and Z

(i) give the letters of the two elements that are non-metals

(1)

.....

(ii) give the letters of two elements in period 2

(1)

.....

(iii) give the letter of an element that normally forms an ion with a charge of +1.

(1)

.....

(Total for question = 3 marks)

Q4.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

Chlorine has an atomic number of 17.

Figure 3 shows the arrangement of electrons in an atom of chlorine.

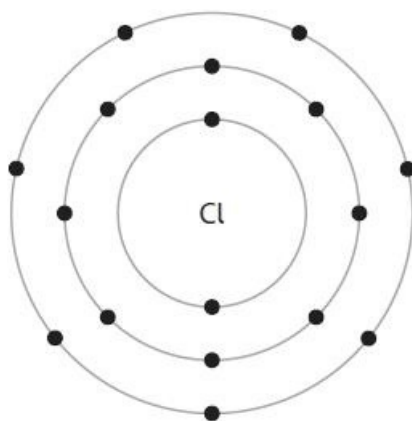


Figure 3

(i) What is the electronic configuration of this atom?

(1)

- A 10.7
- B 17
- C 2.8.7
- D 7.8.2

(ii) Explain, using Figure 3, why chlorine belongs to group 7 of the periodic table.

(2)

.....

.....

.....

.....

(Total for question = 3 marks)

Q5.

Gallium is in the same group in the periodic table as aluminium and in the same period in the periodic table as bromine.

(i) State in which group and period of the periodic table gallium can be found.

You may want to refer to the periodic table.

(2)

group =

period =

(ii) Gallium had not been discovered when Mendeleev created his first periodic table.

Figure 9 shows some properties of gallium that Mendeleev predicted and some of the actual properties of gallium.

property	predicted property	actual property
relative atomic mass	about 68	70
density in g/cm ³	about 6.0	5.9
melting point	lower than 40 °C	29.8 °C
density of oxide in g/cm ³	about 5.5	5.9

Figure 9

Describe how Mendeleev predicted these properties of gallium.

(2)

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.....

.....

.....

(Total for question = 4 marks)

Q6.

State how you know that calcium is a metal from its position in the periodic table.

(1)

.....
.....

(Total for question = 1 mark)

Q7.

In the 19th century, Mendeleev arranged the elements known at the time to form his periodic table.

Mendeleev's periodic table is different from the modern periodic table.

State one difference between Mendeleev's periodic table and the modern periodic table.

(1)

.....
.....

(Total for question = 1 mark)

Q8.

In Figure 8, the letters A, E, G, J, X and Z show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

	1	2										3	4	5	6	7	0
	A											E			G		
	J																X
						Z											

Figure 8

Element X has an atomic number of 18.

State the electronic configuration of an atom of element X.

(1)

.....

(Total for question = 1 mark)

Q9.

Complete the following sentences.

(i) The name given to group 7 in the periodic table is

(1)

(ii) The name given to group 0 in the periodic table is

(1)

(Total for question = 2 marks)

Q10.

Explain how the electronic configuration of an atom of potassium is related to its position in the periodic table.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q11.

Potassium and caesium are in the same group of the periodic table.

Explain, in terms of electrons, why potassium and caesium are in the same group.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q12.

This question is about elements in group 1 of the periodic table.

Figure 3 shows the symbols of the first three elements in group 1 of the periodic table and their melting points.

symbol	melting point in °C
Li	181
Na	98
K	64

Figure 3

Use the periodic table to answer these questions.

(i) Give the symbol of another element in group 1.

(1)

.....

(ii) Give the atomic number of lithium.

(1)

.....

(iii) Describe the trend in the melting points of the elements in Figure 3.

(2)

.....

.....

(Total for question = 4 marks)

Q13.

Potassium reacts with oxygen to form potassium oxide.

(i) Describe the test to show that a gas is oxygen.

(2)

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

(ii) Potassium oxide is ionic.

Write the electronic configurations for the ions in potassium oxide, K₂O.

(2)

potassium ion:

oxide ion:

(Total for question = 4 marks)

Q14.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

An atom of potassium has atomic number 19 and mass number 39.

(i) Give the electronic configuration of this potassium atom.

(1)

.....

(ii) This potassium atom forms the ion K^+ .

Which row shows the number of protons and the number of neutrons in this potassium ion, K^+ ?

(1)

	number of protons	number of neutrons
<input checked="" type="checkbox"/> A	19	19
<input checked="" type="checkbox"/> B	19	20
<input checked="" type="checkbox"/> C	20	19
<input checked="" type="checkbox"/> D	20	20

(Total for question = 2 marks)

Q15.

A chlorine atom contains 17 electrons, 18 neutrons and 17 protons.

(i) State the mass number of this chlorine atom.

(1)

.....

(ii) Give the electronic configuration of this chlorine atom.

(1)

.....

(Total for question = 2 marks)

Q16.

The elements in group 7 of the periodic table are known as the halogens.

Name the halogen that is in period 4 of the periodic table.

(1)

.....

(Total for question = 1 mark)

Q17.

A carbon atom contains 6 electrons, 7 neutrons and 6 protons.

(i) State the mass number of this carbon atom.

(1)

.....

(ii) Give the electronic configuration of this carbon atom.

(1)

.....

(Total for question = 2 marks)

Q18.

Answer the questions with a cross in the boxes you think are correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

Fluorine, chlorine, bromine and iodine are elements in group 7 of the periodic table.

(i) State the name given to the group 7 elements.

(1)

.....

(ii) Name one other element that is in group 7.

Use the periodic table on the back of this exam paper to help you.

(1)

.....

(iii) Which element is liquid at room temperature and pressure?

(1)

- A fluorine
- B chlorine
- C bromine
- D iodine

(iv) Which element is dark-grey in colour at room temperature and pressure?

(1)

- A fluorine
- B chlorine
- C bromine
- D iodine

(Total for question = 4 marks)

Q19.

This question is about the noble gases.

Mendeleev produced one of the earliest periodic tables.

State why he could not include any of the noble gases in his periodic table.

(1)

.....

(Total for question = 1 mark)

Q20.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

What are the elements in group 1 of the periodic table called?

(1)

- A alkali metals
- B fullerenes
- C halogens
- D noble gases

(Total for question = 1 mark)

Q21.

Some of the elements in the periodic table are metals.

The electronic configuration of a metal is 2.8.3

Which row shows the group and period of the periodic table where this metal is found?

(1)

	group	period
<input type="checkbox"/> A	2	3
<input type="checkbox"/> B	2	8
<input type="checkbox"/> C	3	2
<input type="checkbox"/> D	3	3

(Total for question = 1 mark)

Q22.

Argon is in group 0 of the periodic table.

Identify, using the periodic table on the back cover of this paper, which of these elements is in the same period as argon.

(1)

- A bromine
- B iron
- C magnesium
- D xenon

(Total for question = 1 mark)

Mark Scheme

Q1.

Question number	Answer	Mark
	<p>An answer that provides a description by making reference to three of the following points:</p> <ul style="list-style-type: none"> • using the properties of the known elements and their compounds at the time (1) • leaving gaps for elements / predicting existence and properties of elements yet to be discovered / newly discovered elements have been added (1) • in order of (increasing) (relative) atomic mass (1) • in modern periodic table elements arranged in order of increasing {atomic number / no of protons} (1) • Mendeleev thought that he had arranged the elements in the order of increasing relative atomic mass, but this was not always true due to the relative abundance of some of the pairs of isotopes (1) <p>Note: do not allow 'mass number' in MP 3.</p>	<p>(3) EXP</p>

Q2.

Question number	Answer	Additional guidance	Mark
(i)	<p>A 20 20 is the only correct answer</p> <p>B, C and D are incorrect because calcium does not have 40 protons; calcium does not have 60 neutrons; calcium does not have 60 protons</p>		(1)

Question number	Answer	Additional guidance	Mark
(ii)	<p>an explanation linking</p> <ul style="list-style-type: none"> • period 4 (1) • four shells of electrons (1) 	reject four outer shells	(2)

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Q3.

Question number	Answer	Additional guidance	Mark
(i)	any two from E, G and X	allow mark if all three given for E allow B / boron for G allow O / O ₂ / oxygen for X allow Ar / argon allow use of lower case letters reject answers with any other letters / element names	(1)
(ii)	any two from A, E and G	allow mark if all three given for A allow Li / lithium for E allow B / boron for G allow O / O ₂ / oxygen allow use of lower case letters reject answers with any other letters / element names	(1)
(iii)	A / J	allow mark if both given for A allow Li / lithium for J allow Na / sodium allow use of lower case letters reject answers with any other letters / element names reject answers with + or – charges	(1)

Q4.

Question number	Answer	Mark
(i)	C 2.8.7 A, B, D do not represent electronic configurations	(1)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking <ul style="list-style-type: none"> • in {outer / 3rd} shell (1) • seven electrons (1) or <ul style="list-style-type: none"> • number of electrons in outer shell (1) • is the same as group number (1) 	allow last shell / outer ring MP2 depends on MP1 allow 7 is the last number of the electronic configuration / OWTTE (1)	(2)

Q5.

Question number	Answer	Mark
(i)	group = 3 period = 4	(2) AO3- 1a - 1 1b - 1

Question number	Answer	Additional guidance	Mark
(ii)	<p>A description including:</p> <ul style="list-style-type: none"> compared to the elements in same {group / period} (1) (and used the) {trend/pattern} going {down the group / across a period} (1) 	<p><i>MP1 is for idea of which other elements to consider</i></p> <p>allow elements {above and below / to left and right / around}</p> <p>reference to reactivity can score MP2 but not MP1 e.g elements get more reactive down the group (1)</p> <p>reject incorrect alternatives to 'element' (allow 'metals') but mark on</p> <p><i>MP2 is for idea of how properties predicted from elements selected in MP1</i></p> <p>allow {'averaged' / value between} surrounding elements</p> <p>reject compare Ga with elements with similar properties/ reactions</p>	(2) AO1-1

Q6.

Question number	Answer	Mark
	It is on left / in group 2 / column 2	(1) AO2

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Q7.

Question number	Answer	Additional guidance	Mark
	arranged by order of (relative) atomic mass / (in Mendeleev's early periodic table) gaps / missing elements / fewer elements / noble gases were not present	assume answer refers to Mendeleev's table unless specifically referred to modern table so reverse arguments apply	(1)

Q8.

Question number	Answer	Additional guidance	Mark
	2.8.8	allow 2,8,8 2/8/8 2 8 8 or other separator allow correct electron shell diagram	(1)

Q9.

Question number	Answer	Additional guidance	Mark
(i)	halogens or halogen	reject halide	(1)
(ii)	noble gases or inert gases or rare gases	Do not allow gases alone	(1)

Q10.

Question number	Answer	Mark
	An explanation linking <ul style="list-style-type: none"> number of electrons on outer shell gives the group number / 1 electron on outer shell so group 1 (1) number of electron shells gives the period number / 4 electron shells so period 4 (1) 	(2) AO1

Q11.

Question number	Answer	Additional guidance	Mark
	An explanation linking <ul style="list-style-type: none"> outer (electron) shell (1) (both have) {same number / 1} electron(s) (1) 	allow both lose 1 electron (to form ion / to form noble gas configuration) reject same number of outer shells / same number of electrons MP2 depends on MP1	(2)

Q12.

Question number	Answer	Additional guidance	Mark
(i)	Rb / Cs / Fr	symbols must have uppercase letter then lowercase letter reject answers with any other symbols ignore any names	(1) AO2 1

Question number	Answer	Mark
(ii)	3 / three	(1) AO2 1

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Question number	Answer	Additional guidance	Mark
(iii)	A description including <ul style="list-style-type: none"> (the melting points) decrease (1) as the atomic number increases/ as you go down {the group / the alkali metals / group 1} (1) 	allow (melting points) {go down / get smaller} ignore less heat needed to melt it MP2 depends on MP1 allow (going) down (the table / list) allow down the periodic table ignore references to boiling point higher the atomic number, lower the melting point (2) ORA higher in {group/ table} the higher the melting point (2) ORA	(2) A03 1

Q13.

Question number	Answer	Additional guidance	Mark
(i)	A description to include <ul style="list-style-type: none"> use of glowing splint (1) (glowing splint) relights (1) 	2 nd mark dependent on correct test	(2) A01

Question number	Answer	Additional guidance	Mark
(ii)	potassium ion: 2.8.8 (1) oxide ion: 2.8 (1)	Allow other separators between the numbers including spaces	(2) A01

Q14.

Question number	Answer	Additional guidance	Mark
(i)	2.8.8.1	allow any separator including gaps e.g. 2 8 8 1 send to review any diagrams	(1)

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Question number	Answer	Mark
(ii)	<p>B 19 (protons) 20 (neutrons) This is the only correct answer.</p> <p>A is incorrect because there are 20 neutrons in the ion C is incorrect because there are 19 protons and 20 neutrons D is incorrect because there are 19 protons in the ion</p>	(1)

Q15.

Question Number	Answer	Additional guidance	Mark
(i)	35	reject 35.5	(1) AO 1 1

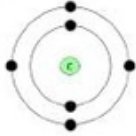
Question Number	Answer	Additional guidance	Mark
(ii)	2.8.7	allow any separator including gaps e.g. 2 8 7	(1) AO 1 1

Q16.

Question number	Answer	Additional guidance	Mark
	bromine	ignore Br	(1) AO1 1

Q17.

Question number	Answer	Additional guidance	Mark
(i)	13/thirteen	allow 6 + 7	(1)

Question number	Answer	Additional guidance	Mark
(ii)	2.4 	allow commas allow 2.4.0. allow diagram	(1)

Q18.

Question number	Answer	Mark
(i)	halogens	(1) AO1

Question number	Answer	Additional guidance	Mark
(ii)	astatine	allow At / At ₂	(1) AO1

Question number	Answer	Mark
(iii)	C bromine A and B are not correct as they are gases at room temperature and pressure D is not correct as iodine is a solid at room temperature and pressure	(1) AO1

Question number	Answer	Mark
(iv)	D iodine A is not correct as fluorine is pale yellow at room temperature and pressure B is not correct as chlorine is green at room temperature and pressure C is not correct as bromine is red-brown liquid at room temperature and pressure	(1) AO1

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Q19.

Question number	Answer	Mark
	had yet to be discovered / unknown / did not know about them	(1) AO1

Q20.

Question number	Answer	Mark
	<p>A alkali metals</p> <p>A is the only correct answer.</p> <p>B is incorrect because fullerenes are not a group in the periodic table</p> <p>C is incorrect because halogens are group 7</p> <p>D is incorrect because noble gases are group 0</p>	(1)

Q21.

Question number	Answer	Mark
	<p>D 3 3 is the only correct answer.</p> <p>A is incorrect as the metal is in group 3</p> <p>B is incorrect as the metal is in group 3, period 3</p> <p>C is incorrect as the metal is in period 3</p>	(1)

Q22.

Question Number	Answer	Mark
	<p>C magnesium</p> <p>1. The only correct answer is C</p> <p><i>A is not correct because this element is in period 4</i></p> <p><i>B is not correct because this element is in period 4</i></p> <p><i>D is not correct because this element is in period 5</i></p>	<p>(1)</p> <p>AO 3 2b</p>