Topic 5 The Periodic Table: Periodic Trends and Group Properties

PAPER 3

MULTIPLE-CHOICE QUESTIONS

For each question, there are four possible answers. Choose the one you consider correct and record your choice (A, B, C or D) in the brackets provided.

1. The table lists the halogens and their appearance.

halogen	appearance
fluorine	pale yellow gas
chlorine	pale yellow/green gas
bromine	brown liquid
iodine	dark purple solid
astatine	?

Astatine would be expected to be a (2011/P3/Q10)

A brown gas. **B** grey liquid.
C black solid. **D** yellow solid. ( )

2. In the Periodic Table the elements are arranged in order of their (2011/P3/Q11)

A atomic mass. **B** chemical reactivity.
C electron shells. **D** proton number. ( )

3. Which property of an atom determines the position of the element in the Periodic Table? (2012/P3/Q10)

A electrons plus neutrons **B** electrons plus protons
C nucleon number **D** proton number ( )

4. Element X exists as diatomic molecules.
In which group of the Periodic Table is X? (2012/P3/Q11)

A Group 0 **B** Group I
C Group II **D** Group VII ( )

5. Which rows shows the trends that occur when moving down Group II of the Periodic Table? (2013/P3/Q10)

	number of valence electrons	proton number
A	decreases	decreases
B	decreases	increases
C	remains the same	decreases
D	remains the same	increases

( )

6. Lithium and potassium are Group I elements.

Which element has the higher melting point and which element reacts more vigorously with water? (2013/P3/Q11)

	higher melting point	more vigorous reaction with water
A	lithium	lithium
B	lithium	potassium
C	potassium	lithium
D	potassium	potassium

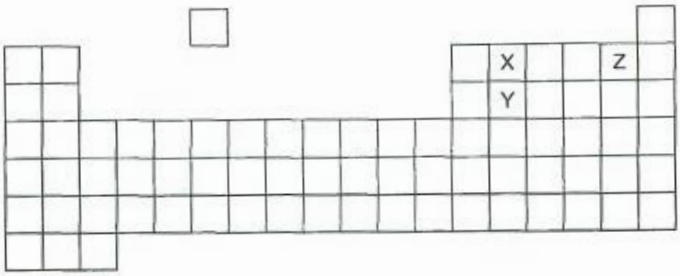
( )

7. Which compound contains three different non-metallic elements? (2014/P3/Q7)

A C_2H_5Cl **B** $LiBH_4$

C SeO_2 **D** Si_2H_6 ( )

8. The diagram shows part of the Periodic Table of the Elements.



Which statement about the proton (atomic) number of X is correct? (2014/P3/Q10)

A It is one less than that of Y.
B It is sixteen less than that of Y.
C It is three less than that of Z.
D It is seven less than that of Z. ( )

9. Which trends in reactivity occur when moving down Group I and Group VII of the Periodic Table? (2014/P3/Q11)

	reactivity of Group I elements	reactivity of Group VII elements
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

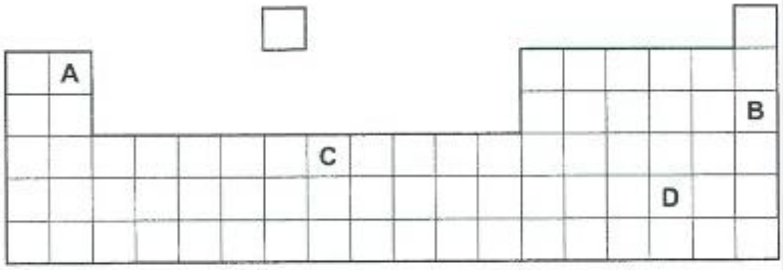
( )

10. How are the elements arranged in the Periodic Table? (2015/P3/Q10)
A in order of chemical reactivity
B in order of electron shells
C in order of proton number
D in order of relative atomic mass ( )

11. What determines the group of an element in the Periodic Table? (2015/P3/Q11)
A the number of completely filled electron shells
B the number of electrons in the shell closest to the nucleus
C the number of electrons in the shell furthest from the nucleus
D the number of protons in the nucleus ( )

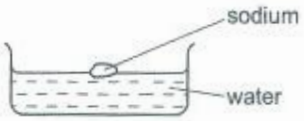
12. Elements X, Y and Z are in Group VII of the Periodic Table.
X is a gas.
Y is less reactive than Z.
Z is a red liquid.
X, Y and Z are placed in order of increasing proton number.
Which order is correct? (2016/P3/Q10)
A $X \rightarrow Y \rightarrow Z$ **B** $X \rightarrow Z \rightarrow Y$
C $Y \rightarrow X \rightarrow Z$ **D** $Y \rightarrow Z \rightarrow X$ ( )

13. An atom of element R has an electronic structure of 2,8,6.
The positions in the Periodic Table of four elements are shown.
Which element will have properties most similar to R? (2016/P3/Q11)



( )

14. When sodium reacts with water, a solution and a gas are produced.



The solution is tested with Universal Indicator paper and the gas is tested with a splint.
Which row describes what happens to the Universal Indicator paper and to the splint?
(2017/P3/Q10)

	Universal Indicator paper	splint
A	turns blue	glowing splint relights
B	turns blue	lighted splint 'pops'
C	turns red	glowing splint relights
D	turns red	lighted splint 'pops'

( )

15. Three elements each have two valency electrons.
Which statement about the elements is correct? (2017/P3/Q11)

A They are all metallic and belong to the same group of the Periodic Table.
B They are all metallic but belong to different groups of the Periodic Table.
C They are all non-metallic and belong to the same group of the Periodic Table.
D They are all non-metallic but belong to different groups of the Periodic Table. ( )

16. The table shows some properties of two elements in Group VII of the Periodic Table.

element	state at 20°C	density at 20°C / g per cm^3	melting point / °C
chlorine	gas	0.0032	–101
bromine	liquid	3.1	–7

What are the properties of fluorine? (2018/P3/Q10)

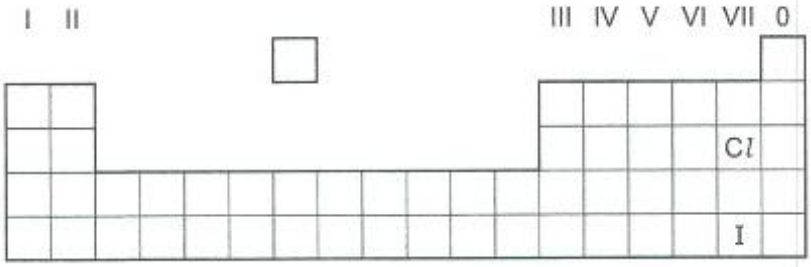
	state at 20°C	density at 20°C / g per cm^3	melting point / °C
A	gas	0.0017	–220
B	gas	0.17	–188
C	liquid	0.0017	–220
D	liquid	0.17	–188

( )

17. Beryllium, magnesium and calcium are all in the same group of the Periodic Table.
Which statement about these elements is correct? (2018/P3/Q11)

A They all have the same number of electrons in their atoms.
B They all have the same number of electrons in their outer shell.
C They all have the same number of protons in their atoms.
D They all have the same total number of protons plus neutrons in the nuclei of their atoms. ( )

18. The positions of two elements iodine, I , and chlorine, *Cl*, in the Periodic Table are shown.



How do the colours and melting points of iodine and chlorine compare? (2019/P3/Q10)

	lighter colour	higher melting point
A	iodine	iodine
B	iodine	chlorine
C	chlorine	iodine
D	chlorine	chlorine

( )

19. Which statement about the element with relative atomic mass 16 is correct? (2019/P3/Q11)

A It forms ions with a charge of 3–.
B It has 8 electrons in its outer shell.
C It has 8 protons in its nucleus.
D It is a metallic element. ( )

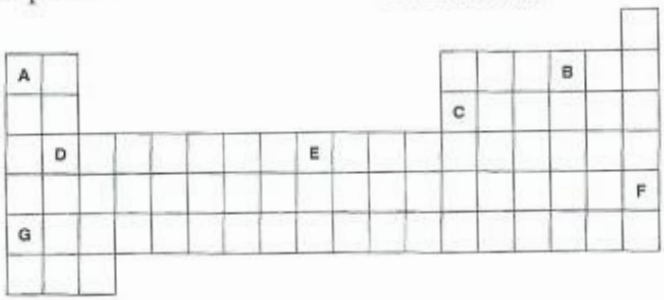
PAPER 4

STRUCTURED QUESTIONS

Section A

Answer the following questions.

1. The diagram shows part of the Periodic Table of the Elements.



Use the letters **A** to **G** in the diagram to answer the following questions.

(a) Which two elements are in the same Group? [1]

(b) Which is the least reactive element? [1]

(2014/P4/Q3)

2. The arrangement of electrons in the atoms of six different elements is shown in the table. The letters do not represent the chemical symbols of the elements.

element	P	Q	R	S	T	U
arrangement of electrons in the atoms	2, 4	2, 6	2, 7	2, 8, 1	2, 8, 6	2, 8, 8

Use the letters, **P**, **Q**, **R**, **S**, **T** and **U** to answer the following questions.

(a) Which element has a proton number of 8? [1]

(b) Which element forms a basic oxide? [1]

(c) Which two elements are in the same group of the Periodic Table? [1]

(2017/P4/Q1)

Section B
Answer the following questions.

1. (a) Complete the table.

element	proton number	arrangement of electrons
lithium	3	
sodium		2, 8, 1
potassium		

[3]

(b) Use the table to explain why these three elements are in the same group of the Periodic Table. [1]

(c) Describe the trend in melting points from lithium to potassium. [1]
(2011/P4/Q6a)

2. Chlorine is a member of the group in the Periodic Table known as the halogens.

(a) Name two other members of the halogen group. [1]

(b) Arrange these three halogens in order of increasing chemical reactivity. [1]
(2013/P4/Q4ai, ii)

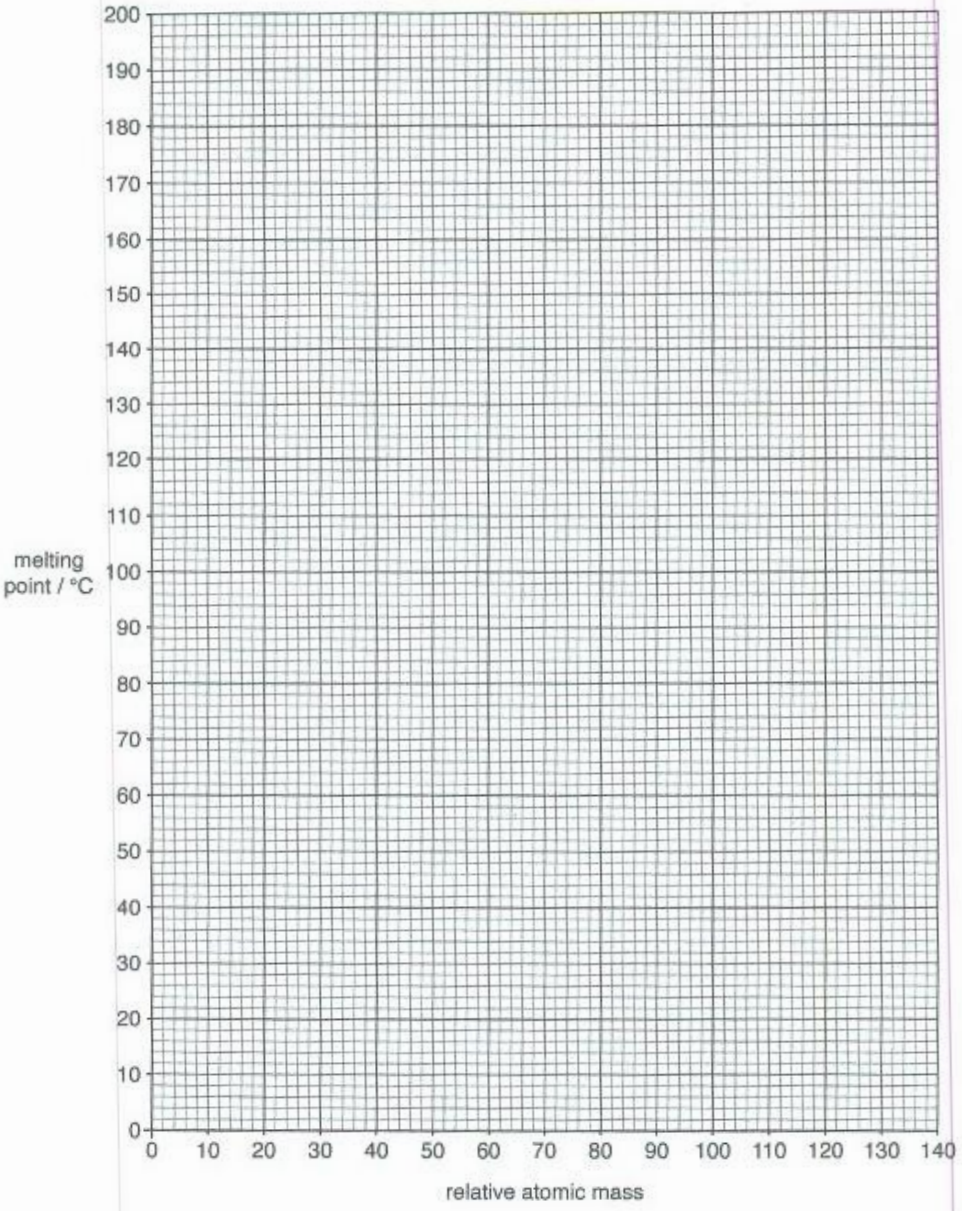
3. To which period of the Periodic Table does the element iron belong? [1]
(2015/P4/Q6a)

4. The table shows the relative atomic masses, A_r, and the melting points of some Group I metals.

metal	relative atomic mass, A_r	melting point/°C
lithium	7	181
sodium	23	98
potassium	39	
rubidium	85	39
caesium	133	28

(a) Plot a graph of melting point against relative atomic mass, marking each point with a cross (×). [1]

(b) Draw a curved line of best fit, taking into account all your plotted points. [1]

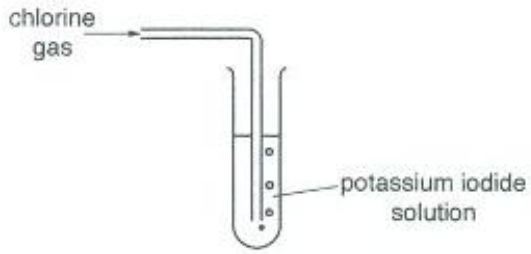


(c) Use your graph to predict the melting point of potassium. [1]

(d) Explain why all these elements are placed in Group I of the Periodic Table. [1]

(2016/P4/Q7a)

5. A teacher uses the apparatus below to bubble chlorine gas through a colourless potassium iodide solution in a fume cupboard.



(a) Write a balanced chemical equation for the reaction that occurs between chlorine and the potassium iodide solution. [2]

(b) Describe an observation that could be made during this chemical reaction. [1]

(2017/P4/Q5b)

6. The table shows some elements from Groups II, V and VI of the Periodic Table and their electronic structures.
The period of the elements is also shown.

element	beryllium	magnesium	calcium	nitrogen	phosphorus	sulfur
electronic structure	2, 2	2, 8, 2	2, 8, 8, 2	2, 5	2, 8, 5	2, 8, 6
group	II	II	II	V	V	VI
period	2	3	4	2	3	3

(a) Use the table to deduce a relationship between the electronic structure and the group in which the element is found. [1]

(b) Use the table to deduce a relationship between the electronic structure and the period in which the element is found. [1]

(c) Describe the change in character of the elements that occurs as you move from left to right across a period of the Periodic Table. [1]

(2019/P4/Q4a)