
SL Paper 1

What happens when sodium is added to water?

- I. A gas is evolved
 - II. The temperature of the water increases
 - III. A clear, colourless solution is formed
-
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

D

Examiners report

[N/A]

Which series is arranged in order of **increasing** radius?

- A. $F < Cl^- < Cl$
- B. $Rb < K < Na$
- C. $Al^{3+} < Mg^{2+} < Na^+$
- D. $I^- < Br^- < Cl^-$

Markscheme

C

Examiners report

[N/A]

Which statements are correct?

- I. Fluorine will react with potassium chloride solution to produce chlorine.
 - II. Iodine will react with sodium chloride solution to produce chlorine.
 - III. Bromine will react with lithium iodide solution to produce iodine.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

B

Examiners report

[N/A]

Which is a characteristic property of sodium oxide?

- A. It turns moist blue litmus paper red.
- B. It turns moist red litmus paper blue.
- C. When it dissolves in distilled water it forms a solution with pH less than 7.
- D. It reacts with magnesium metal.

Markscheme

B

Examiners report

[N/A]

An element is in group 4 and period 3 of the periodic table. How many electrons are in the highest occupied energy level of an atom of this element?

- A. 3
- B. 4
- C. 12
- D. 14

Markscheme

B

Examiners report

[N/A]

Which statement describes the trends of electronegativity values in the periodic table?

- A. Values increase from left to right across a period and increase down a group.
- B. Values increase from left to right across a period and decrease down a group.
- C. Values decrease from left to right across a period and increase down a group.
- D. Values decrease from left to right across a period and decrease down a group.

Markscheme

B

Examiners report

[N/A]

Which properties of the alkali metals decrease going down group 1?

- A. First ionization energy and reactivity
- B. Melting point and atomic radius
- C. Reactivity and electronegativity
- D. First ionization energy and melting point

Markscheme

D

Examiners report

[N/A]

Which pair of elements has the greatest difference in electronegativity?

- A. Cs and F
- B. Cs and Cl

- C. Cs and Br
- D. Cs and I

Markscheme

A

Examiners report

[N/A]

Which property **decreases** down group 7 in the periodic table?

- A. Melting point
- B. Electronegativity
- C. Atomic radius
- D. Ionic radius

Markscheme

B

Examiners report

[N/A]

Which is the best definition of *electronegativity*?

- A. Electronegativity is the energy required for a gaseous atom to gain an electron.
- B. Electronegativity is the attraction of an atom for a bonding pair of electrons.
- C. Electronegativity is the attraction between the nucleus and the valence electrons of an atom.
- D. Electronegativity is the ability of an atom to attract electrons from another atom.

Markscheme

B

Examiners report

With a difficulty index of 24%, this proved to be one of the most challenging questions on the paper and seems to reinforce an impression, also noted elsewhere, that whilst candidates have some general awareness of a concept, they are unable to define it in appropriate detail.

Which statements about atomic structure and the periodic table are correct?

- I. An element in group 2 has 2 electrons in its valence (outer) energy level.
 - II. An element in period 3 has electrons in 3 energy levels.
 - III. The element in group 2 and period 3 has an atomic number of 12.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

D

Examiners report

The term “energy level” was used in this question in order to be consistent with assessment statement 2.3.3.

The electronegativities of four elements are given in the table.

Element	W	X	Y	Z
Electronegativity	0.9	1.1	3.4	4.0

Which statement is correct?

- A. W and X form an ionic compound.
- B. W and X form a covalent compound.
- C. Y and Z form an ionic compound.
- D. Y and Z form a covalent compound.

Markscheme

D

Examiners report

Some teachers commented that two answers were acceptable as the difference of electronegativity between W and X and between Y and Z were both small, which could indicate a covalent bond. Although the students did not have access to the data booklet, the values of electronegativity of W and X were much smaller than those for Y and Z, indicating that they were metals. However, in fairness to the candidates it was decided to accept both

answers B and D.

Which pair of elements shows the greatest difference in electronegativity?

- A. Mg and O
- B. Li and F
- C. K and F
- D. Li and I

Markscheme

C

Examiners report

[N/A]

What is the definition of the term *first ionization energy*?

- A. The energy released when one mole of electrons is removed from one mole of gaseous atoms.
- B. The energy required to remove one mole of electrons from one mole of gaseous atoms.
- C. The energy released when one mole of gaseous atoms gains one mole of electrons.
- D. The energy required to add one mole of electrons to one mole of gaseous atoms.

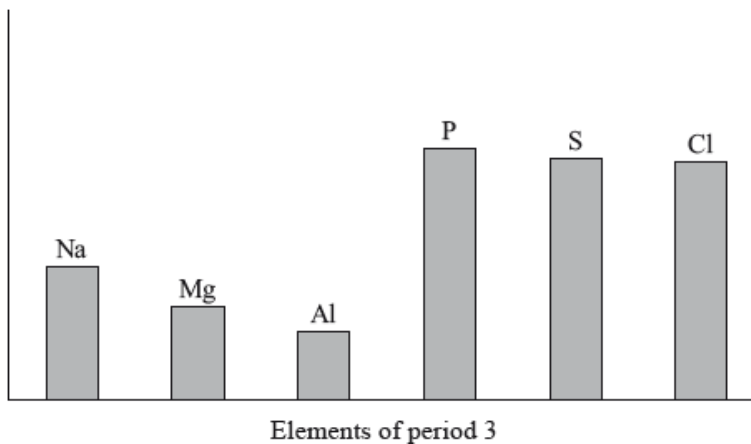
Markscheme

B

Examiners report

[N/A]

The horizontal axis of the bar chart represents the elements of period 3 from sodium to chlorine (excluding silicon). What could the vertical axis represent?



- A. Melting point of the element
- B. Electronegativity of the bonded atom
- C. Ionic radius of the most common ion
- D. First ionization energy in the gaseous state

Markscheme

C

Examiners report

[N/A]

Which combination of properties best describes sodium oxide, Na_2O ?

	Nature of bonding	Acidic or basic behaviour
A.	covalent	acidic
B.	ionic	basic
C.	covalent	basic
D.	ionic	acidic

Markscheme

B

Examiners report

[N/A]

The electronegativities of four different elements are given below (the letters are not their chemical symbols).

Element	W	X	Y	Z
Electronegativity	0.9	1.2	3.4	4.0

Based on this information which statement is correct?

- A. W is a non-metal.
- B. W and X form an ionic compound.
- C. Y is a metal.
- D. Y and Z form a covalent compound.

Markscheme

D

Examiners report

[N/A]

Which oxides produce an acidic solution when added to water?

- I. P_4O_{10}
 - II. MgO
 - III. SO_3
-
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

B

Examiners report

[N/A]

Which oxides are acidic?

- I. P_4O_{10}

- II. SO_3
 - III. Na_2O
-
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

A

Examiners report

[N/A]

What happens when magnesium metal reacts with chlorine gas?

- A. Each magnesium atom loses two electrons and each chlorine atom gains two electrons.
- B. Each magnesium atom gains one electron and each chlorine atom loses one electron.
- C. Each magnesium atom loses two electrons and each chlorine atom gains one electron.
- D. Each magnesium atom gains one electron and each chlorine atom loses two electrons.

Markscheme

C

Examiners report

[N/A]

Which statement concerning electronegativity is correct?

- A. Electronegativity increases from left to right across a period.
- B. Metals generally have higher electronegativity values than non-metals.
- C. Electronegativity increases on descending a group.
- D. Noble gases have the highest electronegativity values.

Markscheme

A

Examiners report

[N/A]

Which series is correctly arranged in order of **decreasing** radius?

- A. $\text{Al}^{3+} > \text{Mg}^{2+} > \text{Na}^+ > \text{F}^-$
- B. $\text{F}^- > \text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+}$
- C. $\text{F}^- > \text{Al}^{3+} > \text{Mg}^{2+} > \text{Na}^+$
- D. $\text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+} > \text{F}^-$

Markscheme

B

Examiners report

[N/A]

Which statements about the periodic table are correct?

- I. The elements Mg, Ca and Sr have similar chemical properties.
 - II. Elements in the same period have the same number of main energy levels.
 - III. The oxides of Na, Mg and P are basic.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

A

Examiners report

[N/A]

Which element is a metalloid?

- A. Co

B. As

C. Cs

D. Es

Markscheme

B

Examiners report

[N/A]

Which property **increases** down group 1?

A. First ionization energy

B. Melting point

C. Reactivity

D. Electronegativity

Markscheme

C

Examiners report

[N/A]

Which statements are correct for the halogens F to I?

I. Melting point increases

II. First ionization energy increases

III. Ionic radius increases

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Markscheme

B

Examiners report

[N/A]

Which combination of the characteristics of element X, a metal, and element Y, a non metal, is most likely to lead to ionic bonding?

	X	Y
A.	low ionization energy	high electronegativity value
B.	low ionization energy	low electronegativity value
C.	high ionization energy	high electronegativity value
D.	high ionization energy	low electronegativity value

Markscheme

A

Examiners report

[N/A]

Element X is in group 5 and period 4 of the periodic table. Which statement is correct?

- A. X has 5 occupied energy levels.
- B. X can form ions with 3⁻ charge.
- C. X is a transition element.
- D. X has 4 valence electrons.

Markscheme

B

Examiners report

[N/A]

Which element is in the p-block?

- A. Pb
- B. Pm

C. Pt

D. Pu

Markscheme

A

Examiners report

[N/A]

Which element is a lanthanide?

A. Hf

B. Tb

C. U

D. Y

Markscheme

B

Examiners report

[N/A]

Which property increases down Group 1, the alkali metals?

A. Atomic radius

B. Electronegativity

C. First ionization energy

D. Melting point

Markscheme

A

Examiners report

[N/A]

Which period 3 oxide, when added to water, forms an acidic solution?

- A. SO_3
- B. MgO
- C. Na_2O
- D. Al_2O_3

Markscheme

A

Examiners report

[N/A]

Which statement is correct for the halogens (F \rightarrow I)?

- A. Electronegativity decreases from fluorine to iodine.
- B. Atomic radius decreases from fluorine to iodine.
- C. First ionization energy increases from fluorine to iodine.
- D. Reactivity of the element with sodium increases from fluorine to iodine.

Markscheme

A

Examiners report

[N/A]

Which metal has the strongest metallic bond?

- A. Li
- B. Na
- C. K
- D. Rb

Markscheme

A

Examiners report

[N/A]

Which properties decrease down both group 1 **and** group 7?

- I. Melting point
 - II. First ionization energy
 - III. Electronegativity
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

C

Examiners report

[N/A]

Which properties **decrease** down group 1?

- I. Melting point
 - II. Atomic radius
 - III. First ionization energy
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

B

Examiners report

[N/A]

Which increase across a period from left to right?

A.	ionic radius	electronegativity
B.	atomic radius	ionic radius
C.	1st ionization energy	atomic radius
D.	1st ionization energy	electronegativity

Markscheme

D

Examiners report

[N/A]

Which equation represents the first electron affinity of chlorine?

- A. $\text{Cl(g)} + \text{e}^- \rightarrow \text{Cl}^-\text{(g)}$
- B. $\frac{1}{2}\text{Cl}_2\text{(g)} + \text{e}^- \rightarrow \text{Cl}^-\text{(g)}$
- C. $\text{Cl}^+\text{(g)} + \text{e}^- \rightarrow \text{Cl(g)}$
- D. $\text{Cl(g)} \rightarrow \text{Cl}^+\text{(g)} + \text{e}^-$

Markscheme

A

Examiners report

[N/A]

Which describes the oxide of sodium, Na_2O ?

	Bonding	Conduction of electricity (pure substance)	pH of aqueous solution
A.	covalent	as a solid and liquid	low
B.	covalent	as a solid only	high
C.	ionic	as a solid and liquid	low
D.	ionic	as a liquid only	high

Markscheme

D

Examiners report

[N/A]

Which combination is correct for the properties of the alkali metals from Li to Cs?

	Atomic radius	Melting point	First ionization energy
A.	increases	increases	increases
B.	increases	decreases	decreases
C.	increases	increases	decreases
D.	decreases	decreases	increases

Markscheme

B

Examiners report

[N/A]

Which statement is correct?

- A. Atomic radius decreases down group 17.
- B. First ionization energy decreases down group 1.
- C. Atomic radius increases across period 3 from Na to Cl.
- D. First ionization energy decreases across period 3 from Na to Cl.

Markscheme

B

Examiners report

[N/A]

Which trends are correct across period 3 (from Na to Cl)?

- I. Atomic radius decreases
- II. Melting point increases
- III. First ionization energy increases

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

Markscheme

B

Examiners report

[N/A]

Which statement is correct for all elements in the same period?

- A. They have the same number of electrons in the highest occupied energy level.
- B. They have the same chemical reactivity.
- C. They have the same number of occupied energy levels.
- D. They have the same number of neutrons.

Markscheme

C

Examiners report

[N/A]

The number of electrons in the valence shell of elements A and B, are 6 and 7 respectively. What is the formula and type of bonding in a compound formed by these elements?

- A. A_2B , covalent
- B. AB_2 , covalent
- C. A_2B , ionic
- D. AB_2 , ionic

Markscheme

B

Examiners report

[N/A]

Which property generally **decreases** across period 3?

- A. Atomic number
- B. Electronegativity
- C. Atomic radius
- D. First ionization energy

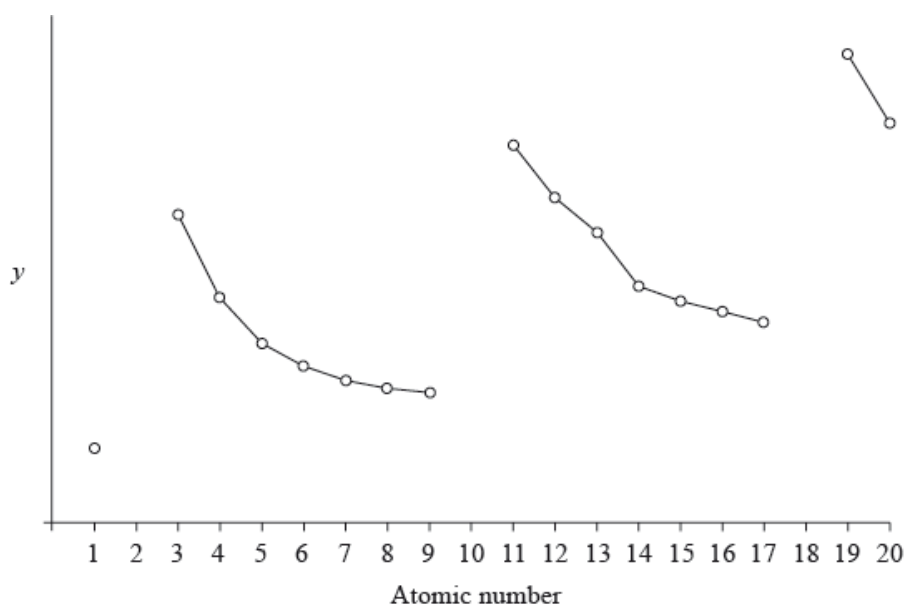
Markscheme

C

Examiners report

[N/A]

Which physical property of elements is represented by y on the graph below?



- A. First ionization energy
- B. Ionic radius
- C. Atomic radius

D. Electronegativity

Markscheme

C

Examiners report

[N/A]

Which oxide dissolves in water to give a solution with a pH below 7?

- A. MgO
- B. Li₂O
- C. CaO
- D. P₄O₁₀

Markscheme

D

Examiners report

[N/A]

Which oxide, when added to water, produces the solution with the highest pH?

- A. Na₂O
- B. SO₃
- C. MgO
- D. CO₂

Markscheme

A

Examiners report

[N/A]

Which solution forms when phosphorus(V) oxide, P_4O_{10} , reacts with water?

	Product	pH of solution
A.	H_3PO_3	< 7
B.	H_3PO_3	> 7
C.	H_3PO_4	< 7
D.	H_3PO_4	> 7

Markscheme

C

Examiners report

[N/A]

Which periodic trend is described correctly?

	Trend in	Down the group (top to bottom)	Across the period (left to right)
A.	atomic radius	increases	increases
B.	ionic radius	decreases	increases
C.	first ionization energy	decreases	decreases
D.	electronegativity	decreases	increases

Markscheme

D

Examiners report

[N/A]