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

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

A. $\mathrm{F} < \mathrm{Cl}^- < \mathrm{Cl}$

B. $\mathrm{Rb} < \mathrm{K} < \mathrm{Na}$

C. $\mathrm{Al}^{3+} < \mathrm{Mg}^{2+} < \mathrm{Na}^+$

D. $\mathrm{I}^- < \mathrm{Br}^- < \mathrm{Cl}^-$

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

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.

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

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.

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

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

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

A. Melting point

B. Electronegativity

C. Atomic radius

D. Ionic radius

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.

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

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.

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

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

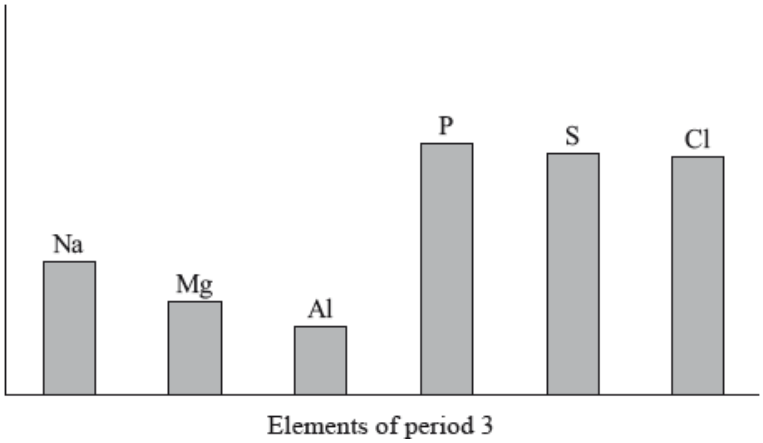
A. The energy released when one mole of electrons is removed from one mole of gaseous atoms.

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.

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

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

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.

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

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

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.

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.

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

A. $\mathrm{Al}^{3+} > \mathrm{Mg}^{2+} > \mathrm{Na}^{+} > \mathrm{F}^{-}$

B. $\mathrm{F}^{-} > \mathrm{Na}^{+} > \mathrm{Mg}^{2+} > \mathrm{Al}^{3+}$

C. $\mathrm{F}^{-} > \mathrm{Al}^{3+} > \mathrm{Mg}^{2+} > \mathrm{Na}^{+}$

D. $\mathrm{Na}^{+} > \mathrm{Mg}^{2+} > \mathrm{Al}^{3+} > \mathrm{F}^{-}$

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

Which element is a metalloid?

A. Co

B. As

C. Cs

D. Es

Which property **increases** down group 1?

A. First ionization energy

B. Melting point

C. Reactivity

D. Electronegativity

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

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

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.

Which element is in the p-block?

A. Pb

B. Pm

C. Pt

D. Pu

Which element is a lanthanide?

A. Hf

B. Tb

C. U

D. Y

Which property increases down Group 1, the alkali metals?

A. Atomic radius

B. Electronegativity

C. First ionization energy

D. Melting point

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

A. $\mathrm{SO_3}$

B. MgO

C. $\mathrm{Na_2O}$

D. $\mathrm{Al_2O_3}$

Which statement is correct for the halogens $(\mathrm{F} \rightarrow \mathrm{I})$?

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.

Which metal has the strongest metallic bond?

A. Li

B. Na

C. K

D. Rb

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

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

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

Which equation represents the first electron affinity of chlorine?

A. $Cl(g)+e^- \rightarrow Cl^-(g)$
B. $\frac{1}{2}Cl_2(g) + e^- \rightarrow Cl^-(g)$
C. $Cl^+(g) + e^- \rightarrow Cl(g)$
D. $Cl(g) \rightarrow Cl^+(g) + e^-$

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

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

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.

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

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.

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. $\mathrm{A_2B}$, covalent

B. $\mathrm{AB_2}$, covalent

C. $\mathrm{A_2B}$, ionic

D. $\mathrm{AB_2}$, ionic

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

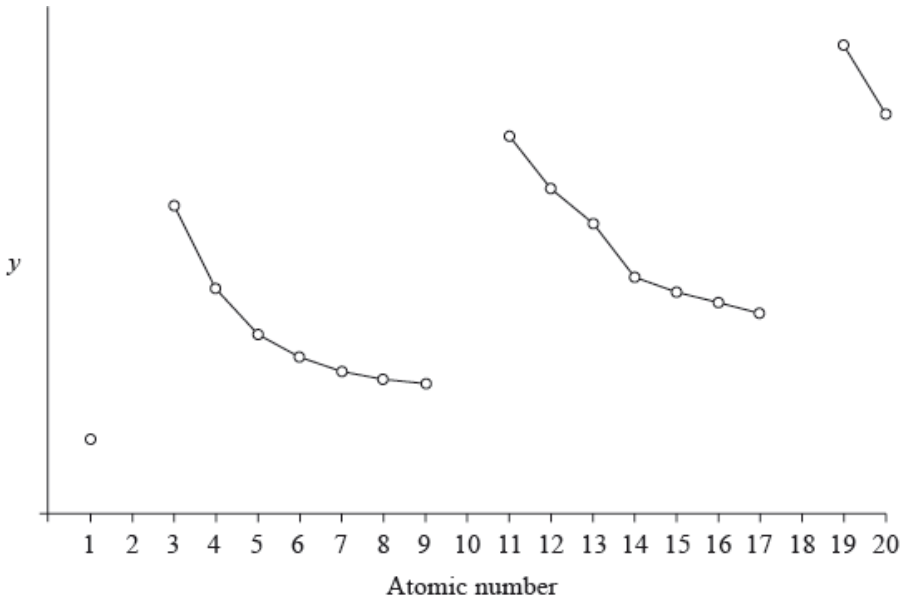
A. Atomic number

B. Electronegativity

C. Atomic radius

D. First ionization energy

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

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

A. MgO

B. Li_2O

C. CaO

D. P_4O_{10}

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

A. Na_2O

B. SO_3

C. MgO

D. CO_2

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

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