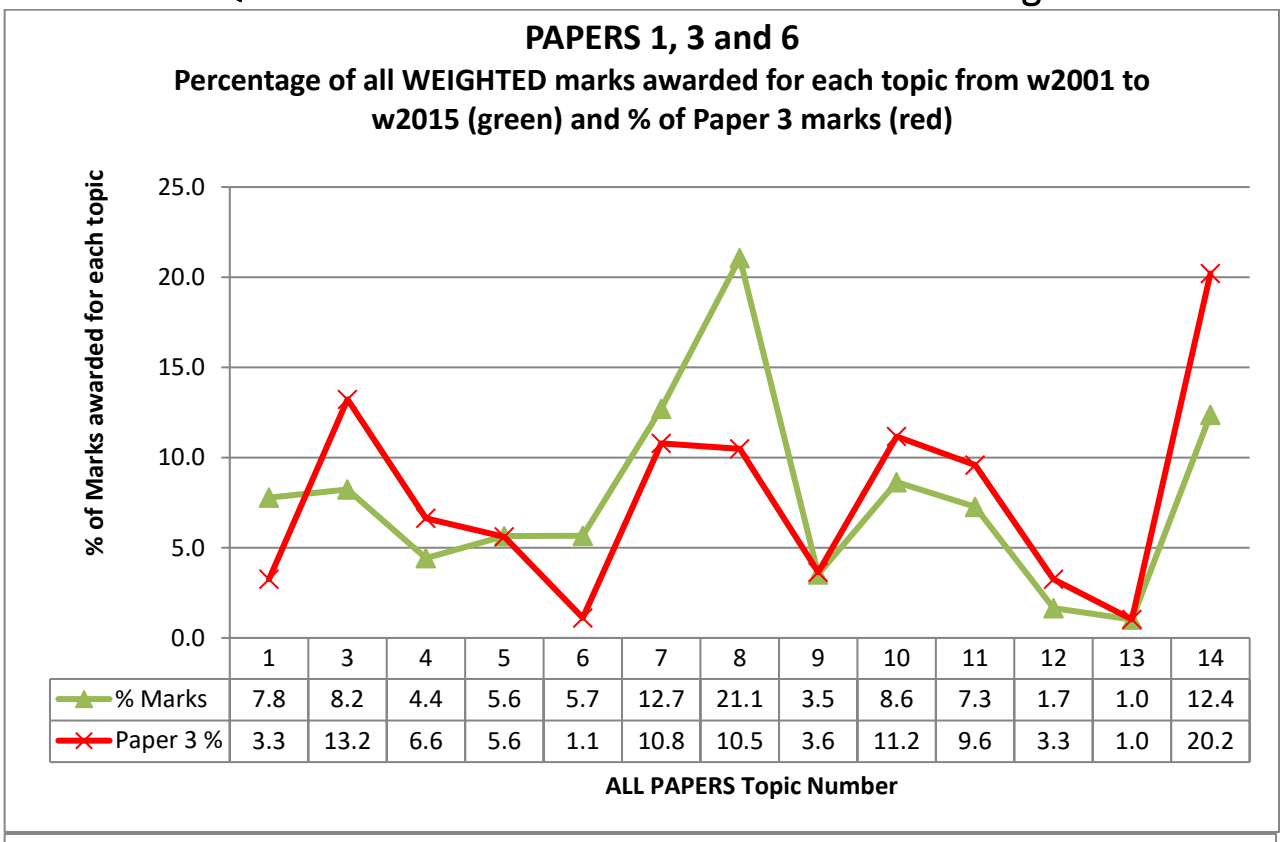
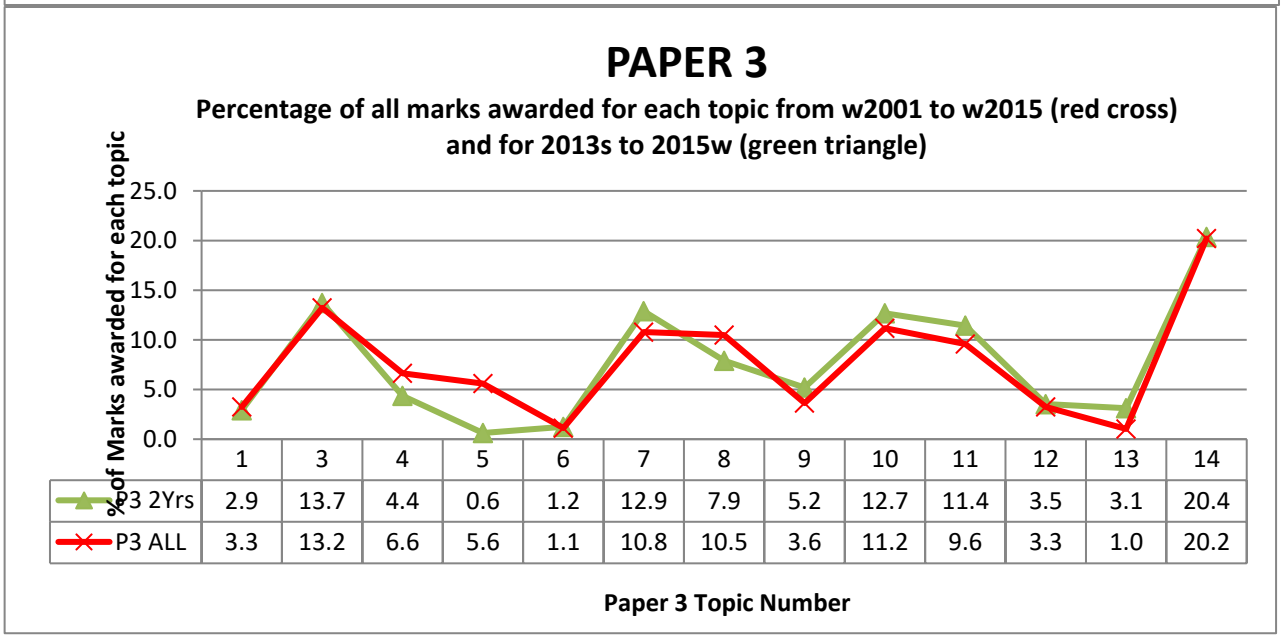
iG Chem 3 EQ P3 15w to 01s 4Students NEW 309marks 54Pgs



	1	3	4	5	6	7	8	9	10	11	12	13	14
% Marks	7.8	8.2	4.4	5.6	5.7	12.7	21.1	3.5	8.6	7.3	1.7	1.0	12.4
Paper 3 %	3.3	13.2	6.6	5.6	1.1	10.8	10.5	3.6	11.2	9.6	3.3	1.0	20.2



	1	3	4	5	6	7	8	9	10	11	12	13	14
P3 2Yrs	2.9	13.7	4.4	0.6	1.2	12.9	7.9	5.2	12.7	11.4	3.5	3.1	20.4
P3 ALL	3.3	13.2	6.6	5.6	1.1	10.8	10.5	3.6	11.2	9.6	3.3	1.0	20.2

	Total	1	3	4	5	6	7	8	9	10	11	12	13	14
Total Marks	2320	76	309	155	131	26	252	245	85	261	224	76	24	472
% of Marks	2336	3.3	13.2	6.6	5.6	1.1	10.8	10.5	3.6	11.2	9.6	3.3	1.0	20.2
# of Questions		20	58	39	25	6	46	53	19	54	46	14	5	79
Average marks per Q		**3.8**	**5.3**	**4.0**	**5.2**	**4.3**	**5.5**	**4.6**	**4.5**	**4.8**	**4.9**	**5.4**	**4.8**	**6.0**

	1st Paper	1st P rank	Last Paper	Last P rank	Total # Papers	Marks/ paper	Theor. All Papers	Actual All Marks	Difference	Weight per paper	Weight per mark
Paper 1	**2002s**	**5**	**2012w**	**26**	**22**	**40**	**880**	**869**	**-11**	**30**	**0.75**
Paper 3	**2001w**	**4**	**2015w**	**32**	**29**	**80**	**2320**	**2336**	**16**	**50**	**0.625**
Paper 6	**2001w**	**4**	**2015w**	**32**	**29**	**60**	**1740**	**1890**	**150**	**20**	**0.625**

Topic	**14**	**3**	**10**	**7**	**8**	**11**	**4**	**5**	**9**	**1**	**12**	**6**	**13**
Rank ALL Papers	2	4	5	3	1	6	9	8	11	7	12	10	13
Rank P3: A* Focus	1	2	3	4	5	6	7	8	9	10	10	12	13
All Syllabus Word Count RANK	1	2	5	3	6	4	9	7	10	8	12	11	13

CIE iGCSE Chemistry Syllabus Details

(syllabus code 0620)

The core material is examined in all three exam papers (papers 1,3 and 6) and is intended to assess understanding up to a grade C level. From 2016, the Supplement material is **examined in all three papers**, however, before 2016 papers 1 and 6 did not contain any Supplement material. If the number of marks that can be awarded above a C grade will remain the same, in practice this means that:

1. Paper 3 will contain fewer Supplement marks, so more core marks so will be easier (if you can answer the Paper 3 questions from before 2016 then you will be fine)
2. Papers 1 and 3 will contain Supplement marks, unlike in all papers before 2016, so will assess material they have not done before, so will be harder because of the questions and as there are no previous questions to practice on, will be harder because of the newness.

Material that is new or changed in 2016 is highlighted with BLACK LINES next to it.

3. Atoms, elements and compounds	
3.1 Atomic structure and the Periodic Table **Core**	**Supplement**
• State the relative charges and approximate relative masses of protons, neutrons and electrons	
• Define *proton number* (atomic number) as the number of protons in the nucleus of an atom	
• Define *nucleon number* (mass number) as the total number of protons and neutrons in the nucleus of an atom	
• Use proton number and the simple structure of atoms to explain the basis of the Periodic Table (see section 9), with special reference to the elements of proton number 1 to 20	
• Define *isotopes* as atoms of the same element which have the same proton number but a different nucleon number	• Understand that isotopes have the same properties because they have the same number of electrons in their outer shell
• State the two types of isotopes as being radioactive and non-radioactive	
• State one medical and one industrial use of radioactive isotopes	
• Describe the build-up of electrons in 'shells' and understand the significance of the noble gas electronic structures and of the outer shell electrons (The ideas of the distribution of electrons in s and p orbitals and in d block elements are **not** required.) Note: a copy of the Periodic Table, as shown in the Appendix, will be available in Papers 1, 2, 3 and 4.	

3.2.1 Bonding: the structure of matter **Core** • Describe the differences between elements, mixtures and compounds, and between metals and non-metals • Describe an alloy, such as brass, as a mixture of a metal with other elements	
3.2.2 Ions and ionic bonds **Core** • Describe the formation of ions by electron loss or gain • Describe the formation of ionic bonds between elements from Groups I and VII	**Supplement** • Describe the formation of ionic bonds between metallic and non-metallic elements • Describe the lattice structure of ionic compounds as a regular arrangement of alternating positive and negative ions
3.2.3 Molecules and covalent bonds **Core** • Describe the formation of single covalent bonds in H_2, Cl_2, H_2O, CH_4, NH_3 and HCl as the sharing of pairs of electrons leading to the noble gas configuration • Describe the differences in volatility, solubility and electrical conductivity between ionic and covalent compounds	**Supplement** • Describe the electron arrangement in more complex covalent molecules such as N_2, C_2H_4, CH_3OH and CO_2 • Explain the differences in melting point and boiling point of ionic and covalent compounds in terms of attractive forces
3.2.4 Macromolecules **Core** • Describe the giant covalent structures of graphite and diamond • Relate their structures to their uses, e.g. graphite as a lubricant and a conductor, and diamond in cutting tools	**Supplement** • Describe the macromolecular structure of silicon(IV) oxide (silicon dioxide) • Describe the similarity in properties between diamond and silicon(IV) oxide, related to their structures
3.2.5 Metallic bonding	**Supplement** • Describe metallic bonding as a lattice of positive ions in a 'sea of electrons' and use this to describe the electrical conductivity and malleability of metals

6 Carbon and silicon are elements in Group IV. They both form oxides of the type XO_2.

(a) Silicon(IV) oxide, SiO_2, has a macromolecular structure.

(i) Describe the structure of silicon(IV) oxide.

.....

.....

.....

.....

..... [3]

(ii) State **three** properties which silicon(IV) oxide and diamond have in common.

.....

.....

..... [3]

(iii) How could you show that silicon(IV) oxide is acidic and not basic or amphoteric?

.....

.....

..... [2]

(b) Explain why the physical properties of carbon dioxide are different from those of diamond and silicon(IV) oxide.

.....

..... [1]

1 **(a)** The symbols of six particles are shown below.

Na^+ Ca^{2+} Kr P Si O^{2-}

Select from the list of particles to answer the following questions. A particle may be selected once, more than once or not at all.

(i) Which **two** ions have the same electronic structure? ..... [1]

(ii) Which ion has the same electronic structure as an atom of argon? ..... [1]

(iii) Which atom can form an ion of the type X^{3-}? ..... [1]

(iv) Which atom can form a hydride which has a formula of the type XH_4? ..... [1]

(b) **(i)** How many protons, neutrons and electrons are there in one copper(II) ion $^{64}_{29}Cu^{2+}$?

number of protons .....

number of neutrons .....

number of electrons .....

[2]

(ii) $^{45}_{21}Sc$ represents an atom of scandium.

How many nucleons and how many charged particles are there in one atom of scandium?

number of nucleons .....

number of charged particles .....

[2]

(c) Two different atoms of sodium are $^{23}_{11}Na$ and $^{24}_{11}Na$.

(i) Explain why these two atoms are isotopes.

.....

..... [2]

(ii) $^{24}_{11}Na$ is radioactive. It changes into an atom of a different element which has one more proton.

Identify this element.

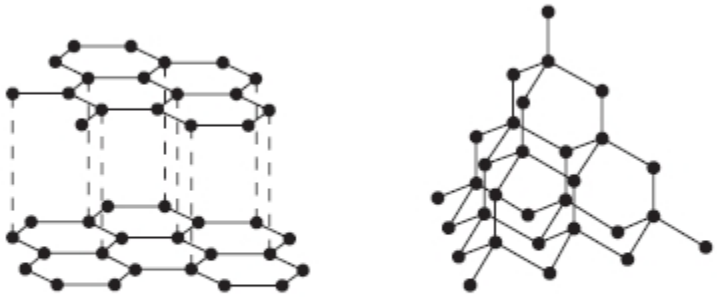
..... [1]

(iii) State **two** uses of radioactive isotopes.

.....

..... [2]

2 Two macromolecular forms of carbon are graphite and diamond. The structures of graphite and diamond are given below.



graphite diamond

(a) Explain in terms of its structure why graphite is soft and is a good conductor of electricity.

.....

.....

.....

.....

..... [3]

(b) State **two** uses of graphite which depend on the above properties.

It is soft .....

.....

It is a good conductor of electricity .....

.....

[2]

(c) Silicon(IV) oxide also has a macromolecular structure.

(i) Describe the macromolecular structure of silicon(IV) oxide.

.....

..... [1]

(ii) Predict **two** physical properties which diamond and silicon(IV) oxide have in common.

.....

..... [2]

7 Nitrogen can form ionic compounds with reactive metals and covalent compounds with non-metals.

(a) Nitrogen reacts with lithium to form the ionic compound lithium nitride, Li_3N.

(i) Write the equation for the reaction between lithium and nitrogen.

..... [2]

(ii) Lithium nitride is an ionic compound. Draw a diagram which shows its formula, the charges on the ions and the arrangement of the valency electrons around the negative ion.

Use x for an electron from a lithium atom.
Use o for an electron from a nitrogen atom.

[2]

(b) Nitrogen fluoride is a covalent compound.

(i) Draw a diagram showing the arrangement of the valency electrons in one molecule of the covalent compound nitrogen trifluoride, NF_3.

Use x for an electron from a nitrogen atom.
Use o for an electron from a fluorine atom.

[2]

(ii) Lithium nitride has a high melting point, 813 °C. Nitrogen trifluoride has a low melting point, –207 °C.
Explain why the melting points are different.

.....

.....

..... [2]

Q# 6/ iGCSE Chemistry/2014/s/Paper 31/

1 The table below gives the composition of six particles which are either atoms or ions.

particle	number of protons	number of neutrons	number of electrons
A	33	40	33
B	19	20	18
C	34	45	36
D	33	42	33
E	13	14	13
F	24	28	21

(a) Which particles are atoms? Explain your choice.

.....

..... [2]

(b) Which particle is a negative ion and why has this particle got a negative charge?

.....

..... [2]

(c) Which particles are positive ions?

..... [1]

(d) Explain why particle **A** and particle **D** are isotopes.

.....

..... [2]

Q# 7/ iGCSE Chemistry/2013/w/Paper 31/

6 Lead is an excellent roofing material. It is malleable and resistant to corrosion. Lead rapidly becomes coated with basic lead carbonate which protects it from further corrosion.

(a) Lead has a typical metallic structure which is a lattice of lead ions surrounded by a 'sea' of mobile electrons. This structure is held together by attractive forces called a metallic bond.

(i) Explain why there are attractive forces in a metallic structure.

.....

..... [2]

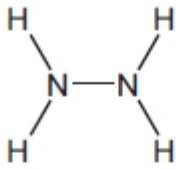
(ii) Explain why a metal, such as lead, is malleable.

.....

..... [2]

Q# 8/ iGCSE Chemistry/2013/s/Paper 31/ Q6

(d) The structural formula of hydrazine is given below.



Draw a diagram showing the arrangement of the valency electrons in one molecule of the covalent compound hydrazine.
Use x to represent an electron from a nitrogen atom.
Use o to represent an electron from a hydrogen atom.

[3]

Q# 9/ iGCSE Chemistry/2013/s/Paper 31/

8 There are three types of giant structure - ionic, metallic and giant covalent.

(a) In an ionic compound, the ions are held in a lattice by strong forces.

(i) Explain the term *lattice*.

.....

..... [2]

(ii) Explain how the ions are held together by strong forces.

.....

..... [1]

(b) Describe the bonding in a typical metal.

.....

.....

..... [3]

(c) The electrical conductivities of the three types of giant structure are given in the following table.

type of structure	conductivity of solid	conductivity of liquid
ionic	poor	good
metallic	good	good
giant covalent	poor	poor

Explain the differences in electrical conductivity between the three types of giant structure and the difference, if any, between the solid and liquid states of the same structure.

.....

.....

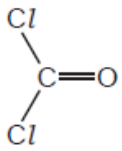
.....

.....

..... [5]

Q# 10/ iGCSE Chemistry/2012/w/Paper 31/ Q5

(c) The structural formula of carbonyl chloride is given below.



Draw a diagram showing the arrangement of the outer (valency) electrons in one molecule of this covalent compound.

Use o to represent an electron from a carbon atom.
Use x to represent an electron from a chlorine atom.
Use • to represent an electron from an oxygen atom.

[3]

Q# 11/ iGCSE Chemistry/2012/w/Paper 31/ Q2

(b) A radioactive isotope of iodine, $^{131}_{53}I$, is used to treat cancer.

(i) Define the term *isotope*.

.....

..... [2]

(ii) How many protons, electrons and neutrons are there in one atom of $^{131}_{53}I$?

number of protons .....

number of electrons .....

number of neutrons ..... [2]

(iii) When this isotope, $^{131}_{53}I$, emits radiation, a different element with a proton number of 54 is formed.
What is the name of this element?

..... [1]

Q# 12/ iGCSE Chemistry/2012/w/Paper 31/

4 Silicon(IV) oxide, SiO_2, and zirconium(IV) oxide, ZrO_2, are both macromolecules.
They have similar physical properties but silicon(IV) oxide is acidic and zirconium(IV) oxide is amphoteric.

(a) Define the term *macromolecule*.

.....

..... [1]

(b) (i) Predict **three** physical properties of these two oxides.

.....

.....

..... [3]

(ii) Name an element which has the same physical properties as these two oxides.

..... [1]

7 Both strontium and sulfur have chlorides of the type XCl_2. The table below compares some of their properties.

	strontium chloride	sulfur chloride
appearance	white crystals	red liquid
formula	$SrCl_2$	SCl_2
melting point / °C	874	–120
boiling point / °C	1250	59
conductivity of liquid	good	poor
solubility in water	dissolves to form a neutral solution	reacts to form a solution of pH 1

(a) (i) Use the data in the table to explain why sulfur chloride is a liquid at room temperature, 25 °C.

.....

..... [2]

(ii) Strontium is a metal and sulfur is a non-metal. Explain why both have chlorides of the type XCl_2.
The electron distribution of a strontium atom is 2 + 8 + 18 + 8 + 2.

.....

.....

..... [2]

(iii) Deduce the name of the acidic compound formed when sulfur chloride reacts with water.

..... [1]

(iv) Explain the difference in the electrical conductivity of liquid strontium chloride and liquid sulfur chloride.

.....

.....

..... [3]

Q# 14/ iGCSE Chemistry/2012/s/Paper 31/

4 Vanadium is a transition element. It has more than one oxidation state.
The element and its compounds are often used as catalysts.

(a) Complete the electron distribution of vanadium by inserting one number.

2 + 8 + ... + 2

[1]

Q# 15/ iGCSE Chemistry/2012/s/Paper 31/
3

(b) Lithium reacts with nitrogen to form the ionic compound, lithium nitride.

(i) State the formula of the lithium ion. ..... [1]

(ii) Deduce the formula of the nitride ion. ..... [1]

(iii) In all solid ionic compounds, the ions are held together in a lattice.
Explain the term *lattice*.

.....

..... [1]

(iv) What is the ratio of lithium ions to nitride ions in the lattice of lithium nitride?
Give a reason for your answer.

..... lithium ions : ..... nitride ions

.....

..... [2]

Q# 16/ iGCSE Chemistry/2011/w/Paper 31/

1 This question is concerned with the following oxides.

sulfur dioxide
carbon monoxide
lithium oxide
aluminium oxide
nitrogen dioxide
strontium oxide

[question continued on the next page]

(c) Lithium oxide is an ionic compound.

(i) Identify another ionic oxide in the list on page 3.

..... [1]

(ii) Draw a diagram which shows the formula of lithium oxide, the charges on the ions and the arrangement of the valency electrons around the negative ion.
Use x to represent an electron from an atom of oxygen.
Use o to represent an electron from an atom of lithium.

[2]

Q# 17/ iGCSE Chemistry/2011/s/Paper 31/ Q3

(c) Both iron and steel have typical metallic structures - a lattice of positive ions and a sea of electrons.

(i) Suggest an explanation for why they have high melting points.

.....

.....

..... [2]

(ii) Explain why, when a force is applied to a piece of steel, it does not break but just changes its shape.

.....

..... [2]

Q# 18/ iGCSE Chemistry/2011/s/Paper 31/ Q2

(b) The electron distribution of a selenium atom is 2 + 8 + 18 + 6.

(i) Selenium forms an ionic compound with potassium. Draw a diagram which shows the formula of this ionic compound, the charges on the ions and the arrangement of the **valency** electrons around the negative ion.
Use o to represent an electron from an atom of potassium.
Use x to represent an electron from an atom of selenium.

[3]

(ii) Draw a diagram showing the arrangement of the valency electrons in one molecule of the covalent compound selenium chloride.
Use x to represent an electron from an atom of selenium.
Use o to represent an electron from an atom of chlorine.

[3]

(iii) Predict **two** differences in the physical properties of these two compounds.

.....

..... [2]

Q# 19/ iGCSE Chemistry/2010/w/Paper 31/ Q6

(c) (i) Give the formulae of lithium fluoride and nitrogen fluoride.

lithium fluoride .....

nitrogen fluoride ..... [2]

(ii) Predict **two** differences in their properties.

.....

..... [2]

(iii) Explain why these two fluorides have different properties.

.....

..... [2]

Q# 20/ iGCSE Chemistry/2010/w/Paper 31/

6 The table below shows the elements in the second period of the Periodic Table and some of their oxidation states in their most common compounds.

element	Li	Be	B	C	N	O	F	Ne
number of outer electrons	1	2	3	4	5	6	7	8
oxidation state	+1	+2	+3	+4	–3	–2	–1	0

(a)

(iii) Select **two** elements in the table which exist as diatomic molecules of the type X_2.

..... [1]

Q# 21/ iGCSE Chemistry/2010/w/Paper 31/

4 Ammonia is an important industrial chemical.

(a) (i) Give the electron structure of an atom of nitrogen.

..... [1]

(ii) Use this electronic structure, rather than the valency of nitrogen, to explain why the formula of ammonia is NH_3 not NH_4.

.....

.....

..... [2]

2 About 4000 years ago the Bronze Age started in Britain. Bronze is an alloy of copper and tin.

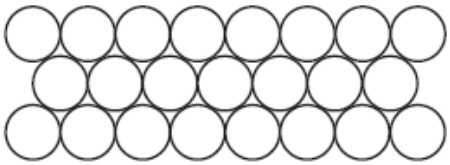
(a) (i) Suggest a reason why a bronze axe was better than a copper axe.

..... [1]

(ii) Brass is another copper alloy. Name the other metal in brass.

..... [1]

(b) The diagram below shows the arrangement of particles in a pure metal.



(i) What is the name given to a regular arrangement of particles in a crystalline solid?

..... [1]

(ii) Draw a diagram which shows the arrangement of particles in an alloy.

[2]

(iii) Explain the term *malleable*.

..... [1]

(iv) Why are metals malleable?

.....

..... [2]

Q# 23/ iGCSE Chemistry/2010/w/Paper 31/

1 The table gives the composition of three particles.

particle	number of protons	number of electrons	number of neutrons
A	15	15	16
B	15	18	16
C	15	15	17

(a) What is the evidence in the table for each of the following?

(i) Particle **A** is an atom.

.....

..... [1]

(ii) They are all particles of the same element.

.....

..... [1]

(iii) Particle **B** is a negative ion.

.....

..... [2]

(iv) Particles **A** and **C** are isotopes.

.....

..... [2]

(b) (i) What is the electronic structure of particle **A**?

..... [1]

(ii) What is the valency of the element?

..... [1]

(iii) Is the element a metal or a non-metal? Give a reason for your choice.

.....

..... [1]

(iii) Explain why graphite is a soft material.

.....

..... [2]

(iv) Give **one** use of graphite.

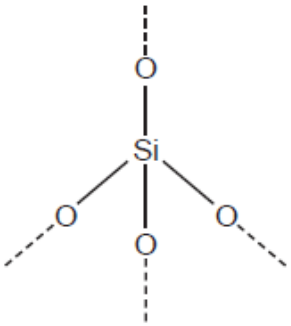
..... [1]

(b) Two of the oxides of these elements are carbon dioxide, CO_2, and silicon(IV) oxide, SiO_2.

(i) Draw a diagram showing the arrangement of the valency electrons in one molecule of the covalent compound carbon dioxide.
Use x to represent an electron from a carbon atom.
Use o to represent an electron from an oxygen atom.

[3]

(ii) A section of the macromolecular structure of silicon(IV) oxide is given below.



Use this diagram to explain why the formula is SiO_2 not SiO_4.

.....

..... [2]

(iii) Predict **two** differences in the physical properties of these two oxides.

.....

..... [2]

Q# 25/ iGCSE Chemistry/2010/s/Paper 31/

5 Carbon and silicon are elements in Group IV. Both elements have macromolecular structures.

(a) Diamond and graphite are two forms of the element carbon.

(i) Explain why diamond is a very hard substance.

.....

.....

..... [2]

(ii) Give **one** use of diamond.

..... [1]

Q# 26/ iGCSE Chemistry/2009/w/Paper 3/ Q4

(c) It is now known that the smell of the seaside is due to the chemical dimethyl sulfide, $(CH_3)_2S$.

(i) Draw a diagram that shows the arrangement of the valency electrons in one molecule of this covalent compound.
Use x to represent an electron from a carbon atom.
Use o to represent an electron from a hydrogen atom.
Use • to represent an electron from a sulfur atom.

[3]

Q# 27/ iGCSE Chemistry/2009/w/Paper 3/

5 The first three elements in Group IV are carbon, silicon and germanium.
The elements and their compounds have similar properties.

(a) The compound, silicon carbide, has a macromolecular structure similar to that of diamond.

(i) A major use of silicon carbide is to reinforce aluminium alloys which are used in the construction of spacecraft. Suggest **three** of its physical properties.

.....

.....

..... [3]

(ii) Complete the following description of the structure of silicon carbide.

Each carbon atom is bonded to four ..... atoms.

Each silicon atom is bonded to ..... carbon atoms. [2]

(b) Germanium(IV) oxide, GeO_2, has the same macromolecular structure as silicon(IV) oxide. Draw the structural formula of germanium(IV) oxide.

[3]

Q# 28/ iGCSE Chemistry/2009/s/Paper 31/

3 The following is a list of the electron distributions of atoms of unknown elements.

element	electron distribution
A	2,5
B	2,8,4
C	2,8,8,2
D	2,8,18,8
E	2,8,18,8,1
F	2,8,18,18,7

(b) Elements **C** and **F** can form an ionic compound.

(i) Draw a diagram that shows the formula of this compound, the charges on the ions and the arrangement of the valency electrons around the negative ion.
Use **o** to represent an electron from an atom of **C**.
Use **x** to represent an electron from an atom of **F**.

[3]

(ii) Predict **two** properties of this compound.

.....

.....

..... [2]

Q# 29/ iGCSE Chemistry/2008/w/Paper 31/ Q6

(b) Potassium and calcium are very reactive metals at the top of the series. Because their ions have different charges, K^+ and Ca^{2+}, their compounds behave differently when heated.

(i) Explain why the ions have different charges.

.....

..... [2]

Q# 30/ iGCSE Chemistry/2008/w/Paper 31/

2 There are three types of giant structure – ionic, metallic and macromolecular.

(a) Sodium nitride is an ionic compound. Draw a diagram that shows the formula of the compound, the charges on the ions and the arrangement of the valency electrons around the negative ion.

Use x to represent an electron from a sodium atom.
Use o to represent an electron from a nitrogen atom.

[3]

(b) (i) Describe metallic bonding.

.....

..... [3]

(ii) Use the above ideas to explain why

metals are good conductors of electricity,

..... [1]

metals are malleable.

..... [2]

(c) Silicon(IV) oxide has a macromolecular structure.

(i) **Describe** the structure of silicon(IV) oxide (a diagram is not acceptable).

.....

.....

..... [3]

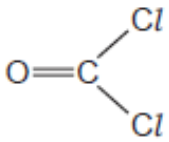
(ii) Diamond has a similar structure and consequently similar properties.
Give **two** physical properties common to both diamond and silicon(IV) oxide.

.....

..... [2]

Q# 31/ iGCSE Chemistry/2008/s/Paper 31/ Q5

(d) The structural formula of carbonyl chloride is given below.



Draw a diagram that shows the arrangement of the valency electrons in one molecule of this covalent compound.
Use x for an electron from a chlorine atom.
Use o for an electron from a carbon atom.
Use • for an electron from an oxygen atom.

[4]

Q# 32/ iGCSE Chemistry/2008/s/Paper 31/

2 **(a)** Complete the table which gives the names, symbols, relative masses and relative charges of the three subatomic particles.

name	symbol	relative mass	relative charge
electron	e^-		
proton		1	
	n		0

[3]

(b) Use the information in the table to explain the following.

(i) Atoms contain charged particles but they are electrically neutral because they have no overall charge.

.....

..... [2]

(ii) Atoms can form positive ions.

.....

..... [2]

(iii) Atoms of the same element can have different masses.

.....

..... [2]

(iv) Scientists are certain that there are no undiscovered elements missing from the Periodic Table from hydrogen to lawrencium.

..... [1]

Q# 33/ iGCSE Chemistry/2007/w/Paper 3/

3 Magnesium reacts with bromine to form magnesium bromide.

(a) Magnesium bromide is an ionic compound. Draw a diagram that shows the formula of the compound, the charges on the ions and the arrangement of outer electrons around the negative ion.
The electron distribution of a bromine atom is 2, 8, 18, 7.

Use x to represent an electron from a magnesium atom.
Use o to represent an electron from a bromine atom. [3]

(b) In the lattice of magnesium bromide, the ratio of magnesium ions to bromide ions is 1:2.

(i) Explain the term *lattice*.

.....

..... [2]

(ii) Explain why the ratio of ions is 1:2.

..... [1]

Q# 34/ iGCSE Chemistry/2007/w/Paper 3/

2 The table below gives the number of protons, neutrons and electrons in atoms or ions.

particle	number of protons	number of electrons	number of neutrons	symbol or formula
A	9	10	10	$^{19}_{9}F^-$
B	11	11	12	
C	18	18	22	
D	15	18	16	
E	13	10	14	

(a) Complete the table. The first line is given as an example. [6]

(b) Which atom in the table is an isotope of the atom which has the composition 11p, 11e and 14n? Give a reason for your choice.

.....

..... [2]

Q# 35/ iGCSE Chemistry/2007/s/Paper 3/

2 Complete the following table.

type of structure	particles present	electrical conductivity of solid	electrical conductivity of liquid	example
ionic	positive and negative ions	poor	.....	.....
macro molecular	atoms of two different elements in a giant covalent structure	poor	poor	.....
metallic	..... and	good	.....	copper

[Total: 6]

Q# 36/ iGCSE Chemistry/2007/s/Paper 3/

4 Use your copy of the periodic table to help you answer these questions.

(a) Predict the formula of each of the following compounds.

(i) barium oxide ..... [1]

(ii) boron oxide ..... [1]

(b) Give the formula of the following ions.

(i) sulphide ..... [1]

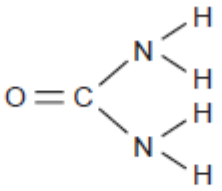
(ii) gallium ..... [1]

(c) Draw a diagram showing the arrangement of the valency electrons in one molecule of the covalent compound nitrogen trichloride.

Use x to represent an electron from a nitrogen atom.
Use o to represent an electron from a chlorine atom. [3]

Q# 37/ iGCSE Chemistry/2006/w/Paper 3/ Q5

(d) Give a diagram showing the arrangement of the valency electrons in one molecule of the covalent compound urea. Its structural formula is given below.



Use o to represent an electron from a carbon atom.
Use x to represent an electron from a hydrogen atom.
Use • to represent an electron from a nitrogen atom.

[3]

Q# 38/ iGCSE Chemistry/2006/w/Paper 3/
6

(c) Two of the elements in chalcopyrite are the metal, copper, and the non-metal, sulphur. These have different properties. Copper is an excellent conductor of electricity and is malleable. Sulphur is a poor conductor and is not malleable, it is brittle. Explain, in terms of their structures, why this is so.

difference in electrical conductivity

.....

..... [2]

difference in malleability

.....

..... [2]

Q# 39/ iGCSE Chemistry/2006/w/Paper 3/

2 The table shows the melting points, boiling points and electrical properties of the six substances **A** to **F**.

substance	melting point / °C	boiling point / °C	electrical conductor at room temperature	electrical conductor of substance dissolved in water
A	961	2193	good	does not dissolve
B	113	444	does not conduct	does not dissolve
C	0	100	very poor	very poor
D	803	1465	does not conduct	good
E	–5 to -10	102 to 105	good	good
F	-85	-60	does not conduct	does not dissolve

(i) Which **three** substances are solids at room temperature?

..... [1]

(ii) Which **one** is an ionic compound?

..... [1]

(iii) Which **one** is a gas at room temperature?

..... [1]

(iv) Which **two** substances are liquids at room temperature?

..... [1]

(v) Which substance is a metal?

..... [1]

(vi) Which **one** is an impure substance?

..... [1]

Q# 40/ iGCSE Chemistry/2006/s/Paper 3/ QiGCSE Chemistry/201 (b)

(ii) Use the Periodic Table to work out the number of protons and the number of neutrons in one atom of iron.

number of protons = ... number of neutrons = ... [1]

Q# 41/ iGCSE Chemistry/2006/s/Paper 3/ Q6

(b) Some radioactive isotopes are used as nuclear fuels.

(ii) Give another use of radioactive isotopes.

..... [1]

Q# 42/ iGCSE Chemistry/2006/s/Paper 3/

4 The first three elements in Group IV are
carbon,
silicon,
germanium.

(a) The element germanium has a diamond-type structure. Describe the structure of germanium. A diagram is acceptable.

[2]

(b) Unlike diamond, graphite is soft and is a good conductor of electricity.

(i) Explain why graphite has these properties.

.....

.....

..... [3]

(ii) Give a use of graphite that depends on one of these properties.

property .....

use ..... [1]

(c) Carbon dioxide and silicon(IV) oxide have similar formulae but different types of structure.

(i) Give the formulae of these oxides.

..... [1]

(ii) How are their structures different?

.....

..... [2]

(d) All these elements form compounds with hydrogen called hydrides. The saturated hydrides of carbon are the alkanes. Predict the formula of the hydride of germanium which contains two germanium atoms.

[1]

Q# 43/ iGCSE Chemistry/2005/w/Paper 3/

5 Strontium and zinc are both metals with a valency of 2. Strontium is more reactive than zinc. Its chemistry is similar to that of calcium.

(a) (i) Complete the following table that shows the number of protons, electrons and neutrons in each particle.

particle	protons	electrons	neutrons
^{88}Sr			
^{90}Sr			
$^{65}Zn^{2+}$			

[3]

(ii) Explain why ^{88}Sr and ^{90}Sr are isotopes.

.....

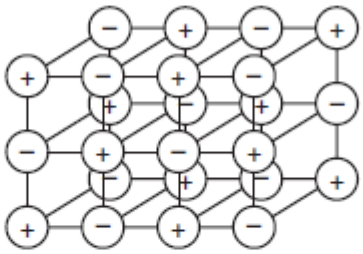
[1]

(iii) Complete the electron distribution of an atom of strontium.

2 + 8 + 18 + ... + ... [1]

Q# 44/ iGCSE Chemistry/2005/w/Paper 3/

1 (a) The structure of a typical ionic compound is a regular arrangement of positive and negative ions.



(i) What is the name of this regular arrangement of particles?

.....

[1]

(ii) Give **two** physical properties of ionic compounds.

.....

.....

[2]

(b) Ions are formed by electron loss or gain. The electron distribution of a magnesium atom is 2 + 8 + 2 and of a nitrogen atom is 2 + 5.

(i) Give the formula of the magnesium ion.

..... [1]

(ii) Give the formula of the nitride ion.

..... [1]

(iii) What is the formula of the ionic compound, magnesium nitride?

..... [1]

(iv) In this compound there is an ionic bond. Why are the two ions attracted to each other?

..... [1]

Q# 45/ iGCSE Chemistry/2005/s/Paper 3/ Q4(b)

(iii) Draw a diagram to show the arrangement of the valency electrons in one molecule of the covalent compound hydrogen sulphide.
Use o to represent an electron from a sulphur atom.
Use x to represent an electron from a hydrogen atom.

[2]

5 Strontium and sulphur chlorides both have a formula of the type XCl_2 but they have different properties.

property	strontium chloride	sulphur chloride
appearance	white crystalline solid	red liquid
melting point / °C	873	-80
particles present	ions	molecules
electrical conductivity of solid	poor	poor
electrical conductivity of liquid	good	poor

(a) The formulae of the chlorides are similar because both elements have a valency of 2. Explain why Group II and Group VI elements both have a valency of 2.

.....

[2]

(b) Draw a diagram showing the arrangement of the valency electrons in one covalent molecule of sulphur chloride.
Use x to represent an electron from a sulphur atom.
Use o to represent an electron from a chlorine atom.

[3]

(c) Explain the difference in electrical conductivity between the following.

(i) solid and liquid strontium chloride

[1]

(ii) liquid strontium chloride and liquid sulphur chloride

[1]

Q# 47/ iGCSE Chemistry/2004/s/Paper 3/ QiGCSE Chemistry/201

(b) Silicon has the same type of macromolecular structure as diamond.

(i) Explain why one atom of either element can form four covalent bonds.

.....

..... [2]

(ii) Predict **two** physical properties of silicon.

.....

..... [2]

(iii) Name a different element that has a similar structure and properties to silicon.

..... [1]

(c)

(iii) Describe the structure of silicon(IV) oxide. You may use a diagram.

..... [2]

Q# 48/ iGCSE Chemistry/2004/s/Paper 3/ Q3

(b) Draw a diagram to show the arrangement of the valency electrons in **one** molecule of nitrogen.

[2]

Q# 49/ iGCSE Chemistry/2004/s/Paper 3/

5 **(a)** Copper has the structure of a typical metal. It has a lattice of positive ions and a "sea" of mobile electrons. The lattice can accommodate ions of a different metal.

Give a **different** use of copper that depends on each of the following.

(i) the ability of the ions in the lattice to move past each other

..... [1]

(ii) the presence of mobile electrons

..... [1]

(iii) the ability to accommodate ions of a different metal in the lattice

..... [1]

Q# 50/ iGCSE Chemistry/2003/w/Paper 3/ QiGCSE Chemistry/201

(e) Another compound that contains nitrogen and hydrogen is hydrazine, N_2H_4.

(i) Draw the structural formula of hydrazine. Hydrogen can form only one bond per atom but nitrogen can form three.

(ii) Draw a diagram that shows the arrangement of the valency electrons in one molecule of hydrazine. Hydrazine is a covalent compound.
Use x to represent an electron from a nitrogen atom.
Use o to represent an electron from a hydrogen atom.

[3]

Q# 51/ iGCSE Chemistry/2003/w/Paper 3/ Q2 (b)

(ii) Describe the structure of a typical metal, such as zinc, and explain why it is malleable.

.....

.....

.....[3]

Q# 52/ iGCSE Chemistry/2003/s/Paper 3/ Q5

(e) Describe, by means of a simple diagram, the lattice structure of an ionic compound, such as caesium chloride.

[2]

Q# 53/ iGCSE Chemistry/2003/s/Paper 3/

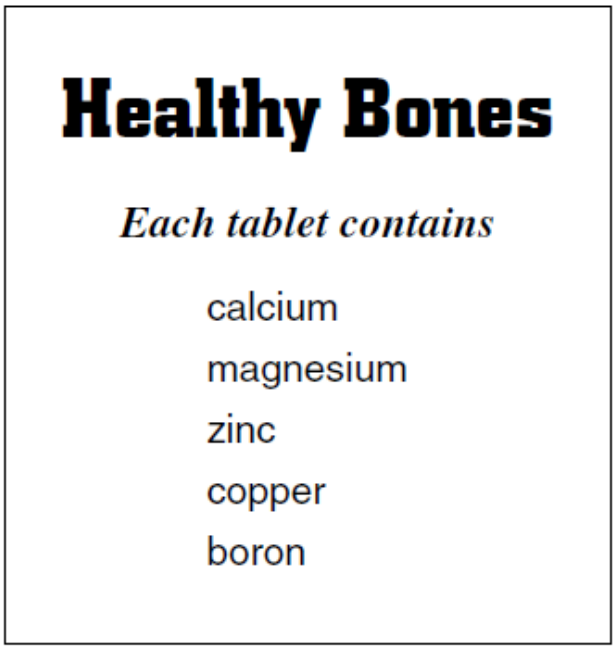
5 The first three elements in Period 6 of the Periodic Table of the Elements are caesium, barium and lanthanum.

(d) Barium chloride is an ionic compound. Draw a diagram that shows the formula of the compound, the charges on the ions and gives the arrangement of the valency electrons around the negative ion.
The electron distribution of a barium atom is 2.8.18.18.8.2

Use x to represent an electron from a barium atom.
Use o to represent an electron from a chlorine atom.

[2]

2 Calcium and other minerals are essential for healthy teeth and bones. Tablets can be taken to provide these minerals.



(a) Boron is a non-metal with a macromolecular structure.

(i) What is the valency of boron?

.....

(ii) Predict **two** physical properties of boron.

.....

.....

(iii) Name another element and a compound that have macromolecular structures.

element .....

compound .....

(iv) Sketch the structure of one of the above macromolecular substances.

[7]

Q# 55/ iGCSE Chemistry/2002/w/Paper 3/ Q3

(e) Draw a diagram that shows the arrangement of the valency electrons in the ionic compound sodium phosphide.

Use o to represent an electron from sodium.
Use x to represent an electron from phosphorus. [3]

Q# 56/ iGCSE Chemistry/2002/w/Paper 3/ Q2 (a)

(ii) Complete the electron distribution of manganese by inserting one number.

2 + 8 + ... + 2 [1]

Q# 57/ iGCSE Chemistry/2002/s/Paper 3/

4 Bromine is one of the halogens in Group VII.

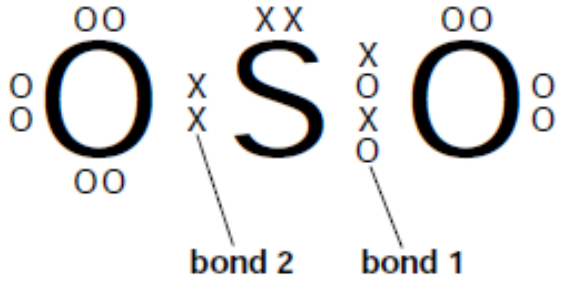
(c) Bromine reacts with phosphorus to form phosphorus tribromide.
Draw a diagram showing the arrangement of the **valency** electrons in one molecule of this covalent compound. The electron distribution of bromine is:

2 + 8 + 18 + 7.

Use x to represent an electron from phosphorus.
Use o to represent an electron from bromine. [3]

(b) The diagram shows a possible arrangement of the valency electrons in a molecule of sulphur dioxide.

O represents an electron from an oxygen atom
X represents an electron from a sulphur atom



(i) What type of covalent bond is labelled **bond 1**?

.....[1]

(ii) What is unusual about the covalent bond labelled **bond 2**?

.....[1]

(c) Sulphur reacts violently with magnesium to form the ionic compound magnesium sulphide. Draw a diagram that shows the arrangement of the valency electrons in this compound.

Use O to represent an electron from a magnesium atom.
Use X to represent an electron from a sulphur atom. [3]

Mark Scheme

Q# 2/ iGCSE Chemistry/2015/w/Paper 31/

Question	Answer	Marks
6(a)(i)	any three from: • each oxygen is joined to two silicons/atoms; • each silicon is joined to four oxygens/atoms; • tetrahedral (around silicon)/similar to diamond; • linear around oxygen;	3
6(a)(ii)	any three from: • high melting point/boiling point; • hard; • strong; • (colourless) crystalline (solid); • brittle/not malleable; • poor/non-conductor (of electricity)/insulator; • insoluble (in water);	3
6(a)(iii)	SiO_2 reacts with or dissolves in or neutralises an acid or acidic oxide; SiO_2 does not react or dissolve in or neutralise an alkali or base or basic oxide;	1 1
6(b)	carbon dioxide has a simple molecular structure;	1

Q# 3/ iGCSE Chemistry/2015/w/Paper 31/

Question	Answer	Marks
1(a)(i)	Na^+/sodium **and** O^{2-}/oxide;	1
1(a)(ii)	Ca^{2+}/calcium;	1
1(a)(iii)	P/phosphorus;	1
1(a)(iv)	Si/silicon;	1
1(b)(i)	• *number of protons* = 29; • *number of neutrons* = 35; • *number of electrons* = 27; three correct = [2]; two correct = [1]	2
1(b)(iii)	*number of nucleons* = 45; *number of charged particles* = 42;	1 1
1(c)(i)	have same proton number/same element/same atomic number; different number of neutrons/nucleons/mass number;	1 1
1(c)(ii)	magnesium/Mg;	1
1(c)(iii)	any two from: • treating cancer or radiotherapy; • biological tracer; • thickness (of paper or foil); • (checking for) leaks/cracks (in pipes); • (carbon) dating; • (generating) energy/electricity; • smoke detectors; • fill levels in packages; • sterilising surgical instruments;	2

Q# 4/ iGCSE Chemistry/2014/w/Paper 31/

2 **(a)** soft because weak forces between layers/sheets/rows [1]

layers can slip/slide [1]

good conductor because electrons can move/mobile [1]

(b) it is soft: pencils **or** lubricant **or** polish [1]
good conductor: electrodes **or** brushes (in electric motors) [1]

(c) **(i)** every silicon atom is bonded/attached to 4 oxygen atoms or every oxygen bonded/attached to two silicon atoms [1]

(ii) Any **two** from:
high melting point/boiling point
hard
colourless crystals/shiny
poor/non-conductor of electricity/insulator
insoluble in water [2]

Q# 5/ iGCSE Chemistry/2014/w/Paper 31/

7 **(a)** **(i)** $6Li + N_2 = 2Li_3N$
species (1) balancing (1)

(ii) N^{3-} ion drawn correctly [1]

Charges correct (minimum 1 × Li ion and 1 nitride ion) [1]

(b) **(i)** 3 × shared pairs between N and 3 × F [1]

only 2 non-bonding electrons on N, 6 non-bonding electrons on each F (COND on first point) [1]

(ii) Strong attractive forces/strong ionic bonds in lithium nitride [1]

weak (attractive) forces between molecules in NF_3 [1]

Q# 6/ iGCSE Chemistry/2014/s/Paper 31/

1 **(a)** A, D, E (1)

same number of protons and electrons / electrically neutral (1) [2]

(b) C (1)

more electrons than protons / $36e^-$ and $34p^+$ / it has gained electrons (1) [2]

(c) B, F (1) [1]

(d) they have same number of protons (1)

different number of neutrons / neutron number (1) [2]

Q# 7/ iGCSE Chemistry/2013/w/Paper 31/

6 (a) (i) (attractive force between) positive ions [1]
and (negative) electrons [1]
opposite charges attract ONLY [1]
electrostatic attraction ONLY [1]

(ii) lattice / rows / layers of lead ions / cations / positive ions [1]
NOT: atoms / protons / nuclei
can slide past each other / the bonds are non-directional [1]

Q# 8/ iGCSE Chemistry/2013/s/Paper 31/ Q6

(d) 4 hydrogen atoms 1 bonding pair each [1]
2 nitrogen atoms with 1 bonding pair between them [1]
one non-bonding pair on each N (need not be seen as a pair) [1]

Q# 9/ iGCSE Chemistry/2013/s/Paper 31/

8 (a) (i) regular arrangement / repeating pattern **NOT** structure [1]
cond: ions [1]
not molecules / atoms

(ii) attraction between opposite charges / electrostatic attraction [1]

(b) delocalised / mobile / free / sea of electrons [1]
positive ions / cations
not atoms / protons / nuclei [1]
attraction between these electrons and ions [1]

(c) **giant covalent**
no ions [1]
no delocalised / free / mobile / sea of electrons **or** all electrons [1]

ionic
in ionic solid ions cannot move [1]
liquid ionic compound ions can move [1]

metallic
(both solid and liquid) metals have delocalised (**or** alternative term) electrons [1]

Q# 10/ iGCSE Chemistry/2012/w/Paper 31/ Q5

(c) each chlorine 1 bp and 3 nbps; [1]
4 e between carbon atom and oxygen atom; [1]
2 nbps on oxygen atom; [1]

Q# 11/ iGCSE Chemistry/2012/w/Paper 31/ Q22

(b) (i) same Z / same number of protons; [1]
accept: atoms of the same element
different number of neutrons / different nucleon number / different mass number; [1]

(ii) 53 protons and 53 electrons; [1]

78 neutrons; [1]

(iii) xenon; [1]

Q# 12/ iGCSE Chemistry/2012/w/Paper 31/

4 (a) giant covalent; [1]
or: polymer made from monomers;

(b) (i) any three from:
high mp / bp;
hard;
brittle;
insoluble (in water);
poor conductor of electricity / heat; [3]

(ii) carbon / diamond / silicon / boron; [1]
not: graphite

Q# 13/ iGCSE Chemistry/2012/w/Paper 31/

7 (a) (i) melting point is below 25°C; [1]
boiling point above 25°C; [1]
accept: argument based on actual values
note: 25°C is between mp and bp = [2]

(ii) strontium loses 2e; [1]
sulfur gains 2e; [1]

(iii) hydrogen chloride / hydrochloric acid; [1]
accept: sulfurous acid or sulfur dioxide

(iv) molten strontium chloride has ions / ionic compound; [1]
which can move; [1]
sulfur chloride has no ions / only molecules / molecular / covalent; [1]

Q# 14/ iGCSE Chemistry/2012/s/Paper 31/

4 (a) 2 + 8 + 11 + 2 [1]

Q# 15/ iGCSE Chemistry/2012/s/Paper 31/

(b) (i) Li^+ [1]

(ii) N^{3-} [1]

(iii) regular arrangement of ions / particles / positive and negative ions alternate; [1]
not: atoms

(iv) 3:1; [1]
ratio to balance charges / reason in terms of valency; [1]

Q# 16/ iGCSE Chemistry/2011/w/Paper 31/
iGCSE Chemistry/201

(c) (i) strontium oxide [1]
accept: aluminium oxide

(ii) use correct formula [1]
cond: charges on ions
6x and 2o around oxygen [1]
ignore: electrons around Li

Q# 17/ iGCSE Chemistry/2011/s/Paper 31/ Q3

(c) (i) strong attractive forces / strong bonds / bonds hard to break / requires a lot of energy to break bonds [1]
not between ions, **not** between positive and negative ions,
not between electrons

between positive ions and (negative) electrons / opposite charges attract [1]

(ii) because the layers, lattice or rows of ions/cations [1]
accept sheets of ions
not atoms / molecules / protons / nuclei

can move / slip / slide past each other [1]

Q# 18/ iGCSE Chemistry/2011/s/Paper 31/ Q2

(b) (i) correct formula [1]

cond following marks conditional on correct formula
If covalent mark 1 only
correct charges [1]
6x and 2o around anion [1]
do **NOT** penalise for incorrect coding
ignore electrons around potassium

(ii) correct formula [1]

If ionic mark 1 only
cond
2 bp and 2 nbp around selenium [1]
1 bp and 3 nbp around both chlorine atoms [1]

(iii) the ionic compound
higher melting point / boiling point / less volatile
conducts when molten or aqueous, covalent compound does not
is soluble in water, covalent is not / ionic insoluble in organic solvents, covalent soluble in organic solvents
harder
any **two** [2]
note there has to be comparison between the ionic compound and the covalent compound
not density

Q# 19/ iGCSE Chemistry/2010/w/Paper 31/ Q6

(c) (i) LiF [1]
NF_3 [1]

(ii) LiF has higher mp / bp
LiF is a (crystalline) solid, NF_3 is probably a gas / a liquid
/ LiF is less volatile
as liquids only LiF conducts
LiF is soluble in water, NF_3 is not
when both solids LiF is harder
any **two** [2]

(iii) LiF is an ionic compound [1]
NF_3 is a covalent/molecular compound [1]
for stating that one is ionic and the other covalent [1] without specifying which is which

Q# 20/ iGCSE Chemistry/2010/w/Paper 31/ Q6 (a)

(iii) any **two** from nitrogen, oxygen and fluorine [1]
accept symbols / molecular formulae

Q# 21/ iGCSE Chemistry/2010/w/Paper 31/

4 (a) (i) nitrogen 2+5 [1]

(ii) needs three electrons [1]
to complete energy level [1]

Q# 22/ iGCSE Chemistry/2010/w/Paper 31/

2 (a) (i) harder / stronger / any sensible suggestion which relates to better properties for purpose
e.g. stays sharp longer / cuts better / more corrosion resistant [1]

(ii) zinc [1]

(b) (i) lattice [1]

(ii) regular pattern of one type of atom [1]
with different atom interspersed [1]
can show the difference – size, shading, label etc.

(iii) can change its shape by force / plastically deform / can be hammered into sheets / can bend etc. [1]

(iv) particles / ions / atoms / layers [1]
cond can slide past each other [1]
or metallic bond is non-directional [1]
particles can move past each other [1]

Q# 23/ iGCSE Chemistry/2010/w/Paper 31/

1 (a) (i) same number of protons and electrons [1]

(ii) all have the same number of protons / same proton number / same atomic number [1]

(iii) more electrons than protons [2]
number of protons and electrons not equal **ONLY** [1]

(iv) same number of protons (and electrons) / same proton number / same atomic number [1]
different number of neutrons / different mass number / nucleon number [1]

(b) (i) 2 + 8 + 5 [1]

(ii) 3 / 5 [1]

(iii) non-metal because it accepts electrons
/ needs 3e to complete outer energy level
/ because it is in Group V or 5e in outer shell [1]
note need both non-metal and reason for [1]

[Total: 9]

Q# 24/ iGCSE Chemistry/2010/s/Paper 31/ Q5 (a)

(iii) layer structure / sheets [1]
molecules / ions in layers = [0]
layers can slide (over each other) [1]

(iv) lubricant / pencils / electrodes [1]
mark first use offered

(b) (i) 4e between carbon and oxygens [1]
2 non-bonding pairs on both oxygens [1]
cond correct coding – only scored if marks 1 and 2 awarded [1]
ignore O_2 in atom

(ii) 4O around each Si [1]
2Si around each O [1]
must refer to diagram **not** valencies **or** electron distributions

(iii) SiO_2 has higher mp or bp
SiO_2 is a solid, CO_2 is a gas (at rtp)
(when both are solids) then SiO_2 is harder
has higher density
SiO_2 insoluble, CO_2 soluble [2]
any **two**, comparison needed

Q# 25/ iGCSE Chemistry/2010/s/Paper 31/

5 (a) (i) macromolecular / giant covalent / giant atomic [1]
all atoms held in position / in tetrahedral structure / to four other carbon atoms / all strong bonds [1]

(ii) jewellery / drilling / cutting / engraving / cutting edges in scalpels [1]
mark first use offered

Q# 26/ iGCSE Chemistry/2009/w/Paper 3/ Q4

(c) (i) correct structural skeleton [1]
COND 4bp around both carbon atoms [1]
2bp and 2nbp around sulfur atom [1]
NOTE marks 2 and 3 can only be awarded if mark 1 has been scored

Q# 27/ iGCSE Chemistry/2009/w/Paper 3/

5 (a) (i) strong
hard
light **or** low density
high melting point **or** high fixed points
Accept high strength to weight ratio for [2]
it includes marks 1 and 3
any **THREE** [3]

(ii) silicon [1]
four [1]

(b) diagram to include:
each germanium atom bonded 4 oxygen atoms [1]
each oxygen to 2 germanium atoms [1]
looks **or** stated to be tetrahedral [1]
"tetrahedral" scores mark even if diagram does not look tetrahedral
independent marking of three points

Q# 28/ iGCSE Chemistry/2009/s/Paper 31/ Q3

(b) (i) CF_2 **or** CaI_2 [1]
COND next two marks conditional on correct formula
C^{2+} and F^- **or** Ca^{2+} and I^- [1]
7× and 1o round F/I [1]
NOTE covalent = 0
Ignore electrons around Ca
accept arrow notation arrow from electron on calcium atom to iodine

(ii) high melting point **or** boiling point
conducts when molten **or** in solution
soluble in water
brittle
correct chemical properties
hard
Any **TWO** [2]
NOT crystalline solid **NOT** does not conduct as a solid

Q# 29/ iGCSE Chemistry/2008/w/Paper 31/ Q6

(b) (i) potassium has one valency electron [1]
or loses one electron
calcium has two valency electrons
or loses two electrons [1]

Q# 30/ iGCSE Chemistry/2008/w/Paper 31/

2 (a) 3Na : 1N correct ratio [1]
correct charges [1]
8e around N [1]

if no symbols then must have correct key
if covalent only mark 1
ignore electrons around sodium
if the response includes both a correct and an incorrect answer
do not select correct one, mark = [0]

(b) (i) positive ions **or** cations [1]
NOT atoms **or** cores **or** nuclei
layers **or** lattice **or** regular pattern [1]
delocalised **or** free **or** mobile electrons **or** sea [1]

OR positive ions **or** cations [1]
NOT atoms **or** cores **or** nuclei
attraction between ions and electrons [1]
delocalised **or** free **or** mobile electrons **or** sea [1]
the attraction/electrostatic bonding must be between ions and delocalised electrons, between cations and anions does not score
ACCEPT bond if qualified - electrostatic bond, etc.
if molecular **or** molecules then cannot score cation mark

(ii) delocalised/free/mobile electrons
or electrons can move [1]

layers **or** ions **or** atoms **or** particles [1]
NB more flexible than **2(b)(i)**
can slip **or** move past each other **or** bonding non-directional [1]

(c) (i) tetrahedral [1]
1Si : 4O bonded/surrounded, etc. [1]
1O : 2 Si [1]

NOT molecules of oxygen, etc.
NOT intermolecular forces
ONLY tetrahedral can score for either of the above

Despite what the question states, **ACCEPT** a clear accurate diagram which shows the above three points.

(ii) hard
high mp **or** bp
colourless (**NOT** clear) **or** shiny **or** translucent
non/poor conductor (of electricity)
brittle
insoluble
any **TWO** [2]
NOT crystalline **or** strong

[Total: 14]

Q# 31/ iGCSE Chemistry/2008/s/Paper 31/ Q5

(d) 8e around both chlorine atoms [1]
4e between carbon and oxygen atoms [1]
8e around carbon atom [1]
8e around oxygen [1]
if a bond contains a line with no electrons, no marks for atoms joined by that line
ignore keying

Q# 32/ iGCSE Chemistry/2008/s/Paper 31/

2 (a)

electron	e^- **or** e	1/1840 **or** 1/2000 **or** 0 1/1837 **or** negligible	-1
proton	p **or** p^+ **or** H^+	1	+1
neutron	n	1	0 **or** neutral

each correct row (1) [3]

(b) (i) equal numbers of protons and electrons of positive and negative charges **or** charges cancel/balance [1]
or net charge = 0 [1]

(ii) lose electron(s) [1]
more protons than electrons [1]
NOT more + than –

(iii) different numbers of neutrons [1]
same number of protons **or** same number of electrons [1]
for just giving- they are isotopes [1] **ONLY**

(iv) an element is known for each proton number [1]
accept any sensible idea, for example no gaps between z = 1 and z = 103

Q# 33/ iGCSE Chemistry/2007/w/Paper 3/

3 (a) Correct ratio $MgBr_2$ **or** Mg 2Br [1]
Accept anywhere in space
IF formula suggests covalency then [1] only for $MgBr_2$
or Mg 2Br
correct charges Mg^{2+} and Br^- [1]
Do not be concerned about location of minus sign
8e around bromine [1]
NOTE do not require correct coding – just 7 and 1 coded differently
NOTE ignore electrons around magnesium

(b) (i) pattern **or** order **or** regular **or** repeat **or** alternate [1]
COND positive and negative ions **or** atoms **or** molecules **or** particles [1]
NOTE Accept a sketch that shows the above, that is particles arranged in a regular way, e.g. any ionic compound such as sodium chloride

(ii) Any reason from the list: [1]
charges must balance
or based on valencies
or group II and group VII
or 2e in outer level and 7e in outer level
or magnesium loses 2 electrons and bromine gains 1 electron (per atom)

Q# 34/ iGCSE Chemistry/2007/w/Paper 3/

2 (a) $^{23}_{11}Na$ [1]

$^{40}_{18}Ar$ [1]

$^{31}_{15}P^{3-}$ [1] for charge and [1] for symbol etc. [2]

$^{27}_{13}Al^{3+}$ [1] for charge and [1] for symbol etc. [2]
ACCEPT +3 and –3
NOTE Only the above are to be awarded the mark

(b) particle B **or** $^{23}_{11}Na$ **or** sodium [1]
COND they have the same proton number **or** the same number of protons
or the same atomic number [1]
NOT the same number of electrons
Accept same number of electrons and protons

[Total: 8]

Q# 35/ iGCSE Chemistry/2008/s/Paper 31/

2 good [1]
named example e.g. sodium chloride [1]
ACCEPT correct formula

silica **or** silicon(IV) oxide **or** sand **or** silicon oxide
named polymer only **TWO** elements [1]

electrons [1] and positive ions [1] [2]
good [1]

Q# 36/ iGCSE Chemistry/2008/s/Paper 31/

4 (a) (i) BaO [1]

(ii) B_2O_3 [1]

(b) (i) S^{2-} [1]

(ii) Ga^{3+} [1]

(c) NCl_3 [1]
COND 8e (1bp and 3nbp) around each chlorine [1]
8e (3bp and 1nbp) around nitrogen [1]

Q# 37/ iGCSE Chemistry/2006/w/Paper 3/ Q5

(d) Correct diagram for urea [3]
one error ONLY [2]
two errors ONLY [1]
three errors 0

Q# 38/ iGCSE Chemistry/2006/w/Paper 3/

6

(c) Copper has delocalised electrons [1]
In sulphur the electrons are localised **or** cannot move in the piece of sulphur [1]

In copper there are layers of copper atoms/ions
Which can slip [1]
In sulphur there are no layers [1]

Q# 39/ iGCSE Chemistry/2006/w/Paper 3/

2 More than required number of answers – [0]
(i) **A**, **B**, **D** [1]
(ii) **D** [1]
(iii) **F** [1]
(iv) **C** and **E** [1]
(v) **A** [1]
(vi) **E** [1]

[TOTAL = 6]

Q# 40/ iGCSE Chemistry/2006/s/Paper 3/ QiGCSE Chemistry/201 (b)

(ii) 26*p* and 30*n* **[1]**

Q# 41/ iGCSE Chemistry/2006/s/Paper 3/ Q6 (b)

(ii) treatment of cancer, autoradiographs, tracer, sterilising food, surgical equipment, measuring thickness, checking welds **[1]**

Q# 42/ iGCSE Chemistry/2006/s/Paper 3/

4 (a) 4 Ge atoms around 1 Ge [1]
Looks tetrahedral **or** stated to be [1]

(b) (i) Graphite has layers [1]
COND that can move/slip
or weak bonds between layers [1]

Graphite has delocalised/free/mobile electrons [1]

(ii) property and use [1]
soft lubricant **or** pencils
OR good conductor electrodes **or** in electric motors

(c) (i) CO_2 and SiO_2 **or** XO_2 [1]

(ii) CO_2 molecular **or** simple molecules **or** simple covalent [1]
SiO_2 macromolecular **or** giant covalent [1]

(d) Ge_2H_6 [1]

Q# 43/ iGCSE Chemistry/2005/w/Paper 3/

Question 5

(a)(i) 38p 38e 50n [1]
38p 38e 52n [1]
30p 28e 35n [1]

(ii) Same number of protons and different number of neutrons [1]

(iii) 8+ 2 [1]

Q# 44/

Question 1

(a)(i) lattice [1]

(ii) high melting point **or** high fixed points
poor conductor as solid
good conductor as liquid, accept either aqueous or molten
hard
soluble in water
Any **TWO** [2]

(b)(i) Mg^{2+} [1]

(ii) N^{3-} [1]

(iii) Mg_3N_2 [1]

(iv) opposite charges [1]
Do NOT accept "attract" it is in the question
accept electrostatic attraction as a phrase

Q# 45/ iGCSE Chemistry/2005/s/Paper 3/ 4 (b)

(iii) 2H to 1S
COND 8e around sulphur atom
2e per hydrogen atom
THREE correct [2]
TWO from above [1]
Ionic structure = [0]

Q# 46/ iGCSE Chemistry/2004/w/Paper 3/

5 (a) Group II metals will lose 2e [1]
Group VI elements will gain 2e [1]

(b) SCl_2 [1]
COND 8e around both chlorine atoms [1]
8e around sulphur with 2nbp and 2bp [1]
If x and o reversed ignore if this is the only error

(c) (i) Ions cannot move in solid **or** can move in liquid [1]

(ii) No ions in sulphur chloride **or** it is covalent **or** only molecules **or** only strontium chloride has ions [1]

Q# 47/ iGCSE Chemistry/2004/s/Paper 3/ QiGCSE Chemistry/201

(b) (i) both have four outer **or** valency electrons [1]
need to share four more [1]
or need four more to complete energy level
NOT four bonds

(ii) hard
brittle
high melting **or** boiling point
poor conductor of electricity **or** semi-conductor
any **TWO** [2]
NOT insoluble in water, **NOT** tough
NOT appearance

(iii) germanium **or** carbon [1]
NOT graphite

(c)
(iii) 4 oxygen atoms around 1 silicon atom [1]
2 silicon atoms around 1 oxygen [1]
tetrahedral **or** diagram that looks tetrahedral [1]
If some wrong chemistry, such as ionic MAX 2/3

Q# 48/ iGCSE Chemistry/2004/s/Paper 3/ Q3

(b) 6 electrons in bond between two nitrogen atoms [1]
2 electrons on each nitrogen [1]
ignore any coding of electrons with dots **or** crosses

Q# 49/ iGCSE Chemistry/2004/s/Paper 3/

5. (a) Has to be three different uses.

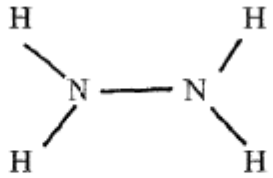
any use that depends on malleability **or** ductility-
jewellery, pipes, wires, sheets, roofing, ornaments [1]
NOT that it is malleable **or** ductile

electrical wires **or** cooking utensils **or** electrodes [1]
(good) conductor

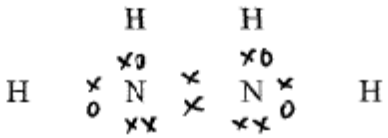
making alloys **or** named alloy [1]

Q# 50/ iGCSE Chemistry/2003/w/Paper 3/ QiGCSE Chemistry/201

(e) (i) correct structural formula [1]



(ii) 8e around nitrogen [1]
2e around each hydrogen [1]



Q# 51/ iGCSE Chemistry/2003/w/Paper 3/ Q2 (b)

(ii) lattice **or** layers of (positive) ions
delocalised **or** free **or** mobile electrons
layers/atoms/particles can slip [3]

Q# 52/ iGCSE Chemistry/2003/s/Paper 3/ Q5

(e) alternating (positive and negative) [1]
pattern [1]

Q# 53/ iGCSE Chemistry/2003/s/Paper 3/
5

(d) correct formula 1Ba to 2C*l*
charges correct
8e around the anion
All three points [2]
Two points ONLY [1]
If covalent [0] out [2]

Q# 54/ iGCSE Chemistry/2003/s/Paper 3/

2 (a) (i) 3 ignore any charges [1]

(ii) high melting **or** boiling point
hard
poor conductor of electricity **or** heat
brittle
Any TWO [2]
NOT insoluble, dull, or malleable

(iii) carbon, graphite diamond silicon, germanium [1]
silicon (IV) oxide **or** silica **or** silicon dioxide **or** silicon oxide
or sand **or** silicon carbide **or** named polymer [1]

(iv) four around one [1]
cond looks tetrahedral **or** shows continuation [1]
For graphite layers [1] weak bonds between layers [1]
Accept any macromolecule, no link with (iii)
For polymer repeat unit [1] continuation [1]

Q# 55/ iGCSE Chemistry/2002/w/Paper 3/ Q3

(e) 3Na to 1P [1]
COND next two marks
correct charges [1]
8e around P [1]
If covalent then only one mark for 3Na to 1P

Q# 56/ iGCSE Chemistry/2002/w/Paper 3/ Q2 (a)

(ii) 13 [1]

Q# 57/ iGCSE Chemistry/2002/s/Paper 3/ Q4

(c) P and 3Br [1]
COND upon first mark being awarded
3bp and 1nbp around phosphorus [1]
8c around each bromine [1]
if charges then first mark only

Q# 58/ iGCSE Chemistry/2001/w/Paper 3/ Q5

(b) (i) double [1]

(ii) both electrons from sulphur or equivalent [1]

(c) 2+ on Mg [1]
2- and 8e on sulphur [1]
1Mg : 1S [1]

DATA SHEET
The Periodic Table of the Elements

Group I	II												III	IV	V	VI	VII	0
																		4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4												11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12												27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42		101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum * 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83		209 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium † 89																

*58-71 Lanthanoid series	140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
†90-103 Actinoid series	232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98				No Nobelium 102	Lr Lawrencium 103

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).