Name: Class: Date:

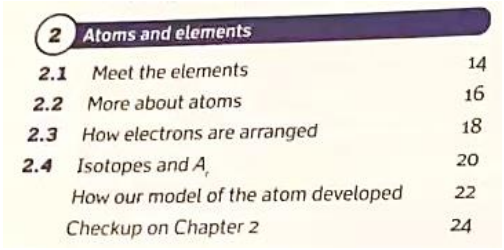
iG Chem 2nw and 12 EQ Revision Resources for G1 (5-7) Chemistry

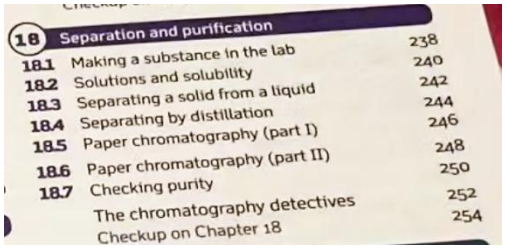
Concentrate on:

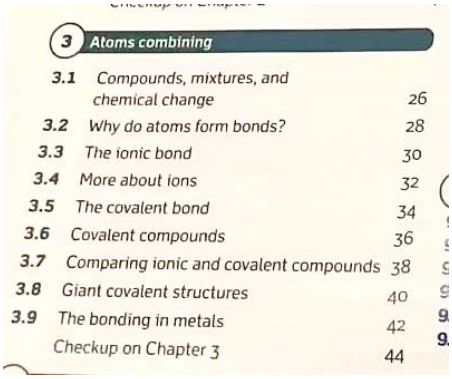
- Atoms and elements (chapter 2)
- Atoms combining (chapter 3)
- Separation and purification (chapter 18)

Past exam questions handed out – concentrate on Atomic structure and bonding **ONLY Q# 7 to Q# 19**, Pages 5 to 11 only

Ignore any questions on moles and concentration calculations (Topic 3), Q# 20 onwards.







For a variety of Keyword exercises, Chinese translations, tests and flashcards for the first 3 topics scan this QR code:

https://quizlet.com/652457468/ig-chem-1-to-3-kw-all-89-key-words-flash-cards/?i=ga2m8&x=1jqt

Past exam questions on important parts of Topic 12 – Separation Techniques

Q#·27/·IGCSE·Chemistry/2017/s/Paper·43/↵

6 Barium carbonate, $BaCO_3$, is an insoluble solid.

(b) Aqueous sodium carbonate is added to aqueous barium nitrate.

(i) Write a chemical equation for the reaction of aqueous sodium carbonate with aqueous barium nitrate.

..... [2]

(ii) Describe how a pure sample of barium carbonate could be obtained from the resulting mixture.

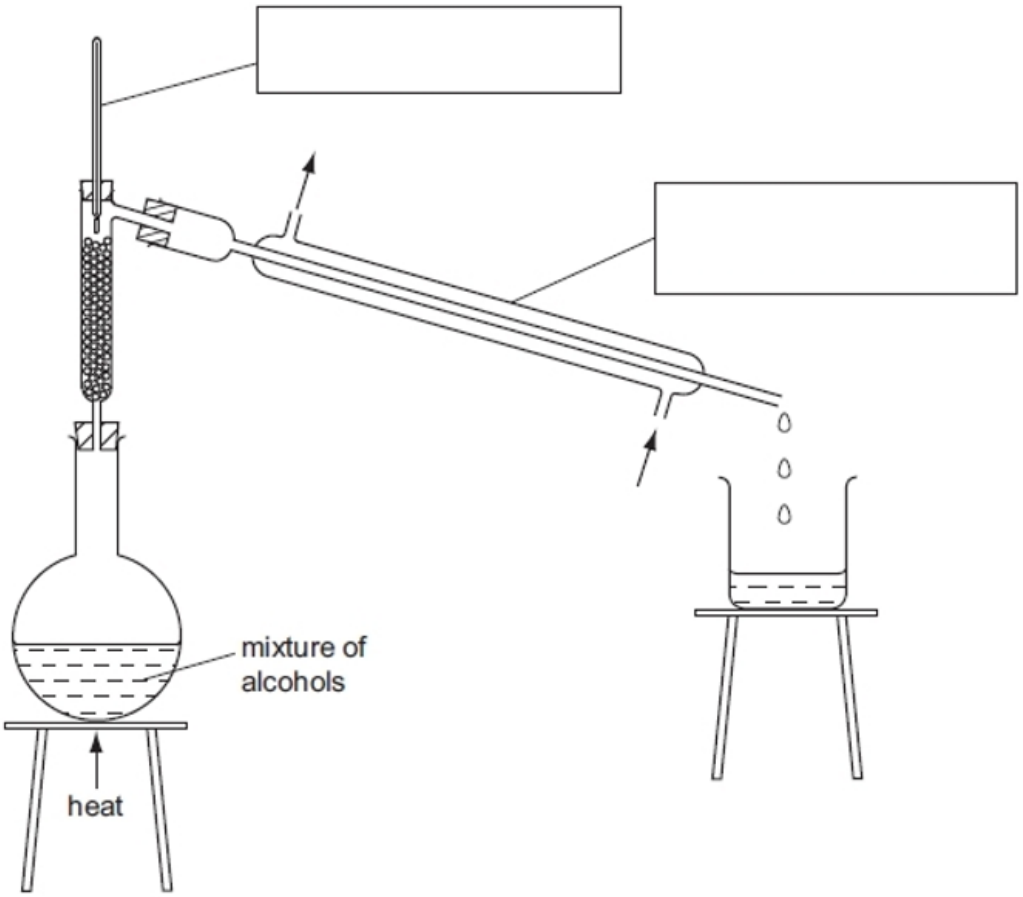
.....

.....

.....

..... [3]

1 A student separated a mixture of two alcohols, ethanol (boiling point 78 °C) and butanol (boiling point 118 °C).
The apparatus used is shown below.



(a) Complete the boxes to identify the pieces of apparatus labelled. [2] ¶

(b) Label the arrows. [1] ¶

(e) Identify and explain a possible hazard in this experiment.

.....

..... [2] ¶

3 Information about the solubility of four solids, P, Q, R and S, is given in the table.

	P	Q	R	S
solubility in water	dissolves	insoluble	insoluble	dissolves

A student attempted to separate mixtures of these solids using the following method.

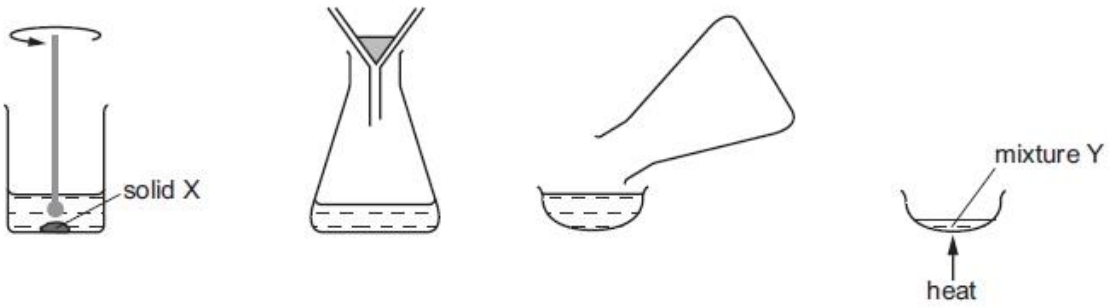
1 Add the mixture to a beaker of water and stir.
2 Filter the mixture.
3 Crystallise one of the solids from the filtrate.

Which of the following mixtures could **not** be separated by this method?

A a mixture of P and R
B a mixture of Q and P
C a mixture of Q and R
D a mixture of R and S

3 A solid X is purified in five steps.

The first four steps of the purification are shown in the diagram.



In **step 5**, how is a pure sample of solid X obtained from mixture Y?

A dissolving

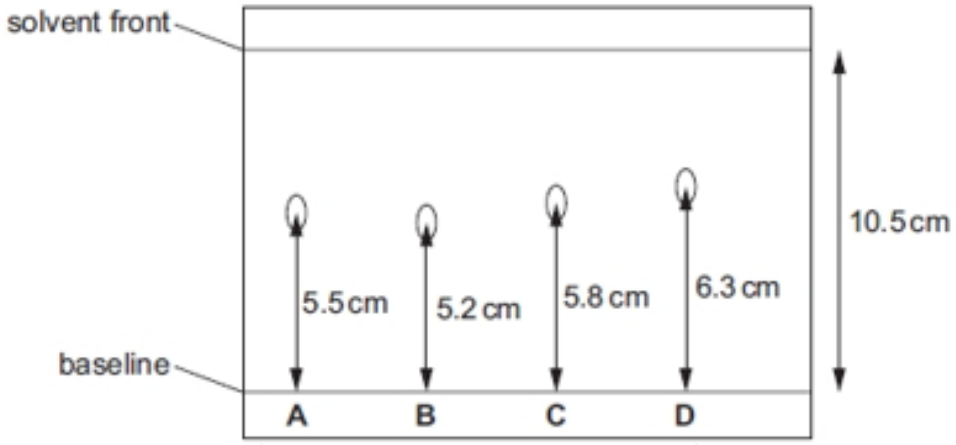
B distillation

C evaporating

D filtering

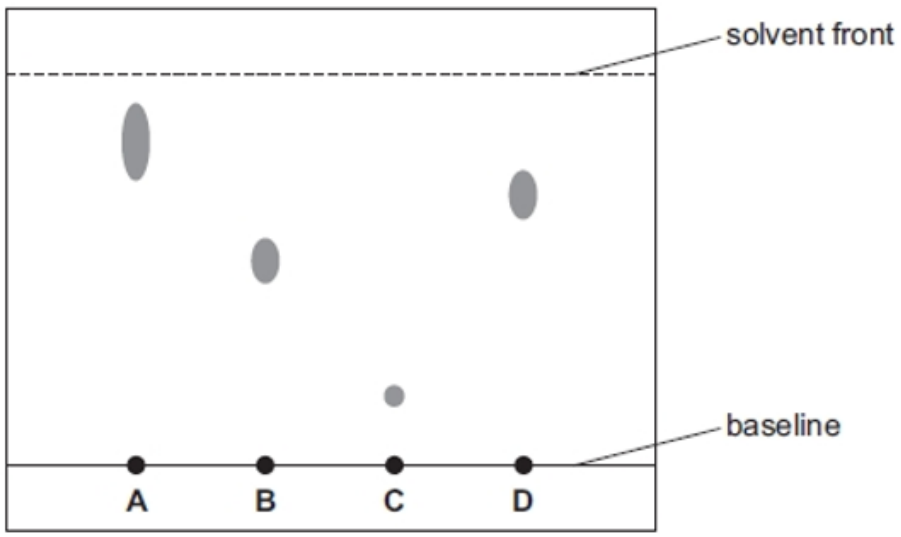
3 A chromatogram obtained from the chromatography of four substances is shown.

Which substance has an R_f value of 0.6?



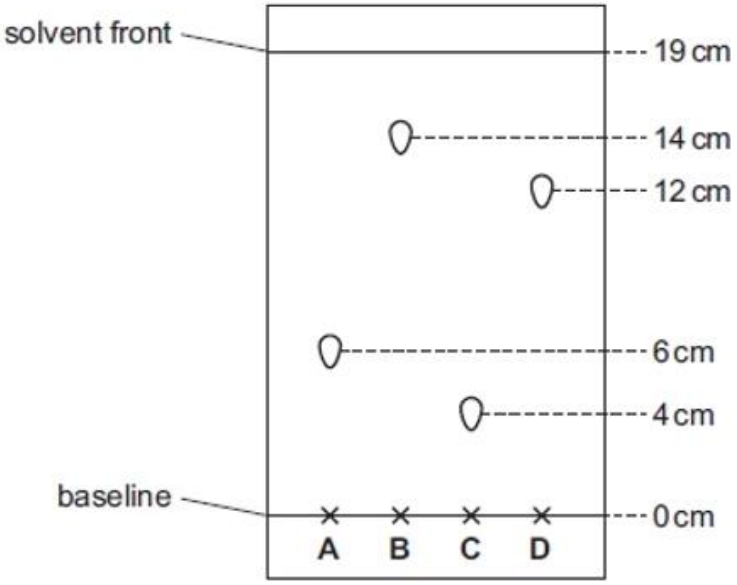
3 The paper chromatogram below was obtained from four different dyes.

Which dye has an R_f value of 0.7?



3 The diagram shows a chromatogram of four substances.

Which substance has an R_f value of approximately 0.32?



Mark Scheme

Q# 27

(a) (i) $Na_2CO_3(aq) + Ba(NO_3)_2(aq) \rightarrow BaCO_3(s) + 2NaNO_3(aq)$
All substances correct [1]
Correct state symbols [1]
(ii) Filter [1]
Rinse (residue) with distilled water [1]
Evaporate to dryness (constant mass) with gentle heat [1]

Q# 3

(a) Thermometer [1]; Condenser (water cooled) [1]
(b) Bottom arrow is water in, higher arrow water out
(c) Alcohols burn easily [1]; Applying heat could cause a fire [1]; use an electronic heater OR do not use a Bunsen burner [1]

Multiple Choice Questions

All questions are numbered 3, so the first couple of words of each is also included to differentiate them from each other

3 Information about the solubility of

solubility in water

3. Information about… Answer: C

3. A solid X… Answer: C

3. A chromatogram… Answer: D

3. A paper… Answer: D

3. The diagram… Answer: A

Topic Chem 1 **Q# 6/** IGCSE Chemistry/2016/w/Paper 42/

1 Particles behave differently when in different physical states.

(a) Solids have a fixed volume and a definite shape.
Gases have no fixed volume and take the shape of the container.

Describe the volume and shape of liquids.

.....

..... [1]

(b) Complete the table to show the separation, arrangement and movement of particles in each physical state.

state	separation of particles	arrangement of particles	movement of particles
solid			
liquid	touching one another	randomly arranged	move over one another
gas			

[6]

(c) Name the following changes of state.

(i) Ice turning into water.

..... [1]

(ii) Solid carbon dioxide turning directly into gaseous carbon dioxide at room temperature.

..... [1]

2 **(a)** Sulfur exists as a number of different isotopes.

What is meant by the term *isotopes*?

.....

.....

..... [2]

(b) A sulfide ion has the symbol shown.

$$^{34}_{16}S^{2-}$$

(i) How many neutrons are contained in this sulfide ion?

..... [1]

(ii) How is a sulfide ion, S^{2-}, formed from a sulfur atom?

..... [1]

(iii) Which element forms an ion with a 2+ charge that has the same number of electrons as a S^{2-} ion?

..... [1]

1 This question is about the structures of atoms and ions.

(a) Define the term *proton number*.

.....

..... [2]

(b) (i) Complete the table to show the number of protons, neutrons and electrons present in atoms of $^{24}_{12}Mg$ and $^{26}_{12}Mg$.

	number of protons	number of neutrons	number of electrons
$^{24}_{12}Mg$			
$^{26}_{12}Mg$			

[2]

(ii) What term is used to describe atoms of the same element, such as $^{24}_{12}Mg$ and $^{26}_{12}Mg$?

..... [1]

(iii) Explain why the chemical properties of $^{24}_{12}Mg$ and $^{26}_{12}Mg$ are the same.

.....

..... [2]

(c) Complete the table to identify the atoms and ions which have the following numbers of protons, neutrons and electrons.

	number of protons	number of neutrons	number of electrons
$^{23}_{11}Na^+$	11	12	10
	4	5	4
	17	20	18

[4]

(d) State the electronic structure of the following atom and ion.

Al .....

S^{2-} .....

[2]

Topic Chem 3 **Q# 9/** IGCSE Chemistry/2018/w/Paper 43/Q1/

1 Answer the following questions using only the substances in the list.
Each substance may be used once, more than once or not at all.

ammonia	**bauxite**	**carbon dioxide**	**carbon monoxide**
hematite	**oxygen**	**sodium chloride**	**sulfur dioxide**

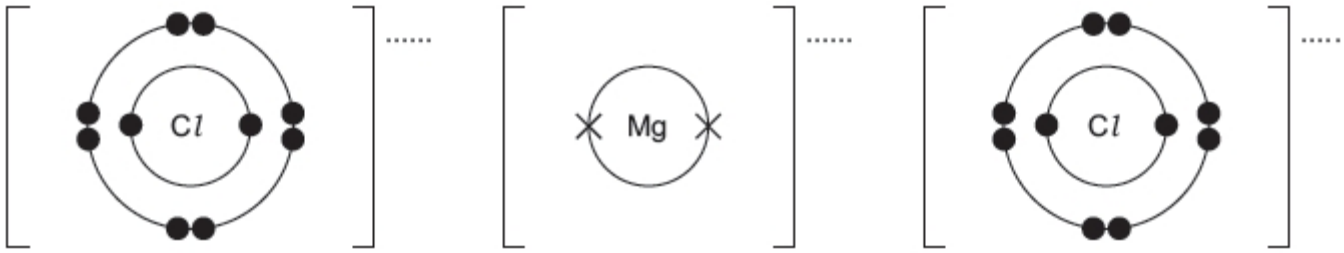
State which substance is:

(f) an ionic compound ..... [1]

Topic Chem 3 **Q# 10/** IGCSE Chemistry/2018/w/Paper 42/Q2/

(d) Magnesium reacts with chlorine to form magnesium chloride, $MgCl_2$. Magnesium chloride is an ionic compound.

(i) Complete the diagrams to show the electronic structures of the ions in magnesium chloride. Show the charges on the ions.



[3]

(ii) Give **three** physical properties that are typical of ionic compounds such as $MgCl_2$.

1 .....

2 .....

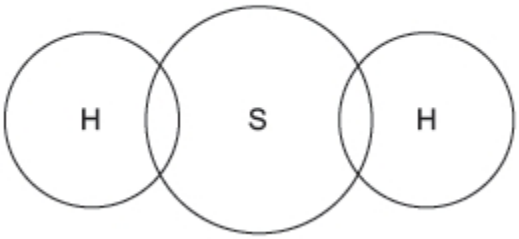
3 .....

[3]

Topic Chem 3 **Q# 11/** IGCSE Chemistry/2018/w/Paper 41/Q4/

(c) The gas hydrogen sulfide, H_2S, is produced when concentrated sulfuric acid is added to solid potassium iodide.

(ii) Complete the dot-and-cross diagram to show the electron arrangement in a molecule of hydrogen sulfide. Show outer shell electrons only.



[2]

(iii) Hydrogen sulfide has a simple molecular structure.

Explain why hydrogen sulfide has a low boiling point.

.....

.....

..... [2]

Topic Chem 3 **Q# 12/** IGCSE Chemistry/2018/w/Paper 41/Q2/

2 The table gives some information about four different particles, **A**, **B**, **C** and **D**.

particle	number of electrons	number of neutrons	number of protons	electronic structure	charge on particle
A	11	12	11	2,8,1	0
B		14	11	2,8,1	0
C	18	20		2,8,8	0
D	18	20	17		

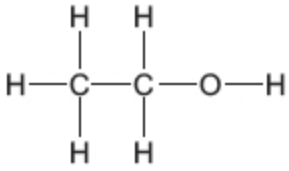
(a) Complete the table. The first row has been done for you. [4]

(b) Give **two** particles from the table which are isotopes of each other.

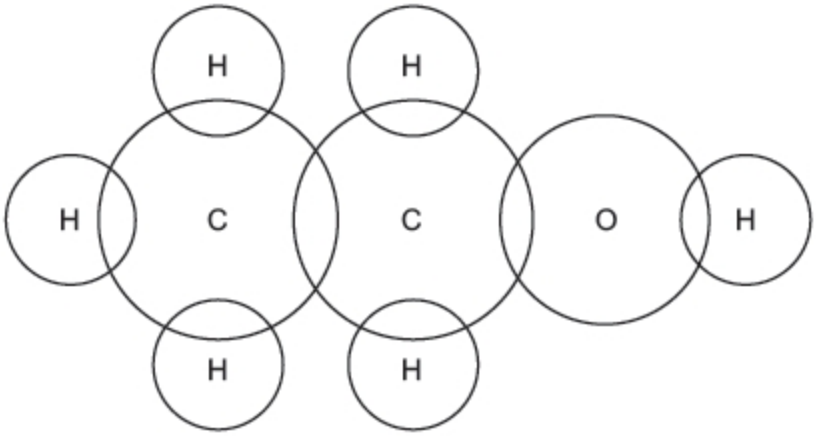
..... [1]

Topic Chem 3 **Q# 13/** IGCSE Chemistry/2018/s/Paper 43/Q4/

(b) The structure of ethanol is shown.



Complete the dot-and-cross diagram to show the electron arrangement in a molecule of ethanol. Show outer shell electrons only.



[2]

Topic Chem 3 **Q# 14/** IGCSE Chemistry/2018/s/Paper 43/

2 **(a)** ^{29}Al is a radioactive isotope of aluminium. The only non-radioactive isotope of aluminium is ^{27}Al.

(i) Describe, in terms of protons, neutrons and electrons, how the isotopes ^{29}Al and ^{27}Al are similar and how they are different.

how they are similar .....

how they are different .....

[2]

(ii) Complete the table to show the number of nucleons, neutrons and electrons in an $^{27}_{13}Al^{3+}$ ion.

	number in $^{27}_{13}Al^{3+}$
nucleons	
neutrons	
electrons	

[3]

Topic Chem 3 **Q# 15/** IGCSE Chemistry/2018/s/Paper 42/

2 This question is about the elements in Period 3 of the Periodic Table.

Na	Mg	Al	Si	P	S	Cl	Ar

For each of the following, identify a Period 3 element which matches the description. Each element may be used once, more than once or not at all.

State which Period 3 element:

(a) forms an oxide with a macromolecular structure

..... [1]

Topic Chem 3 **Q# 16/** IGCSE Chemistry/2018/s/Paper 42/

4 Potassium reacts with bromine at room temperature to form potassium bromide.

(b) Potassium bromide exists as an ionic lattice.
Potassium bromide does **not** conduct electricity when solid but does conduct electricity when molten.

(i) What is meant by the term *ionic lattice*?

.....

..... [2]

(ii) Explain why potassium bromide does **not** conduct electricity when solid but does conduct electricity when molten.

.....

.....

..... [2]

(d) Iodine reacts with chlorine to form iodine monochloride, I*Cl*, as the only product.

(i) Write a chemical equation for this reaction.

..... [2]

(ii) Draw a dot-and-cross diagram to show the electron arrangement in a molecule of iodine monochloride. Show outer shell electrons only.

[2]

(e) Potassium bromide has a melting point of 734 °C.
Iodine monochloride has a melting point of 27 °C.

In terms of attractive forces, explain why there is a large difference between these melting points.

.....

.....

.....

.....

..... [3]

Topic Chem 3 **Q# 17/** IGCSE Chemistry/2018/s/Paper 42/

3 Complete the following table.

particle	number of protons	number of electrons	number of neutrons	number of nucleons
$^{23}_{11}Na$	11	11	.....	23
$^{37}_{17}Cl^-$	.....	.....	20	.....
$^{56}_{26}$.....	26	24	30	56

[6]

Topic Chem 3 **Q# 18/** IGCSE Chemistry/2018/s/Paper 41/

1 Substances can be classified as elements, compounds or mixtures.

(a) What is meant by the term *compound*?

.....

.....

..... [2]

Topic Chem 3 **Q# 19/** IGCSE Chemistry/2018/s/Paper 41/

2 Flerovium, F*l*, atomic number 114, was first made in research laboratories in 1998.

(a) Flerovium was made by bombarding atoms of plutonium, Pu, atomic number 94, with atoms of element **Z**.

- The nucleus of **one** atom of plutonium combined with the nucleus of **one** atom of element **Z**.
- This formed the nucleus of **one** atom of flerovium.

(d) Two isotopes of flerovium are ^{286}F*l* and ^{289}F*l*. The nuclei of both of these isotopes are unstable and emit energy when they split up.

(i) State the term used to describe isotopes with unstable nuclei.

..... [1]

(ii) Complete the table to show the number of protons, neutrons and electrons in the atoms of the isotopes shown.

isotope	number of protons	number of neutrons	number of electrons
^{286}F*l*			
^{289}F*l*			

[2]

(e) Only a relatively small number of atoms of flerovium have been made in the laboratory and the properties of flerovium have not yet been investigated.

It has been suggested that flerovium is a typical metal.

(i) Suggest **two** physical properties of flerovium.

1 .....

2 .....

[2]

(ii) Suggest **one** chemical property of flerovium oxide.

..... [1]

Q# 6/ IGCSE Chemistry/2016/w/Paper 42/

1(a)	fixed volume **AND** take the shape of the container	1
1(b)	<table><tr><td>solid</td><td>touching</td><td>regular</td><td>vibrate</td></tr><tr><td>liquid</td><td></td><td></td><td></td></tr><tr><td>gas</td><td>not touching</td><td>random</td><td>random</td></tr></table>	6
1(c)(i)	melting	1
1(c)(ii)	sublimation	1

Q# 7/ iGCSE Chemistry2019/w/Paper 41/Q2/

2(a)	atoms with same number of protons or atoms of the same element or atoms with same atomic number (1) atoms with different number of neutrons or atoms with different mass number or atoms with different nucleon number (1)	2
2(b)(i)	18	1
2(b)(ii)	gain of two electrons	1
2(b)(iii)	Ca / calcium	1

Q# 8/ iGCSE Chemistry2019/s/Paper 41/Q1/

1(a)	number of protons (1) protons in the nucleus (of an atom) (1)	2
1(b)(i)	12p 12n 12e (1) 12p 14n 12e (1)	2
1(b)(ii)	isotope(s)	1
1(b)(iii)	same number of electrons (1) (same number) of electrons in the outer shell (1)	2
1(c)	$^{9}_{4}Be$ any element symbol with a single negative charge (1) use of *Cl* (1) use of $^{37}_{17}$ (1)	4
1(d)	2 8 3 (1) 2 8 8 (1)	2

Q# 9/ IGCSE Chemistry/2018/w/Paper 43/

1(f)	sodium chloride	1

Q# 10/ IGCSE Chemistry/2018/w/Paper 42/

2(d)(i)	M1 Mg shown with new outer shell with 8 crosses; M2 Both *Cl* atoms with a new outer shell with 7 dots and 1 cross; M3 '2+' charge on Mg **and** '–' charge on each *Cl*;	3
2(d)(ii)	M1 *Physical constants mark* High melting point or high boiling point M2 *Solubility mark* Dissolve in water M3 *Electrical conductivity mark* Conduct (electricity) when molten **or** conduct (electricity) in aqueous solution	3

Q# 11/ IGCSE Chemistry/2018/w/Paper 41/

4(c)(ii)	**M1** one shared pair between each H and S	1
	M2 four unpaired electrons on S giving S a total of 8 outer shell electrons and no other unpaired electrons	1
4(c)(iii)	**M1** weak (attractive) forces **OR** (attractive) forces need little energy to overcome	1
	M2 forces between molecules / intermolecular	1

Q# 12/ IGCSE Chemistry/2018/w/Paper 41/

2(a)	**M1** 11 **M2** 18 **M3** 2.8.8 **M4** –1	4
2(b)	A **and** B	1

Q# 13/ IGCSE Chemistry/2018/s/Paper 43/

4(b)	all bonding pairs correct and no extra incorrect non-bonding electrons	1
	4 non-bonding electrons on O completing oxygen octet	1

Q# 14/ IGCSE Chemistry/2018/s/Paper 43/

2(a)(i)	similarities: number of protons **and** electrons	1
	differences: number of neutrons	1
2(a)(ii)	nucleons: 27	1
	neutrons: 14	1
	electrons: 10	1

Q# 15/ IGCSE Chemistry/2018/s/Paper 42/

2(a)	silicon / Si	1

Q# 16/ IGCSE Chemistry/2018/s/Paper 42/

4(a)	$2K(s) + Br_2(l) \rightarrow 2KBr(s)$ 1 mark for formulae all correct 1 mark for balancing 1 mark for state symbols	3
4(b)(i)	(ionic): made of, positive and negative ions / anions and cations / oppositely charged ions / unlike charged ions / different charged ions	1
	(lattice): regular / sequence / pattern / alternating / repeated / framework / ordered / organised / network / uniform	1
4(b)(ii)	(in solid) ions don't move	1
	(when molten) ions move / ions mobile	1
4(d)(i)	$I_2 + Cl_2 \rightarrow 2ICl$ 1 mark for formulae all correct 1 mark for correct balancing	2
4(d)(ii)	one bonding pair	1
	6 non-bonding electrons on each atom	1
4(e)	(potassium bromide): ionic bonds / attraction between ions	1
	(iodine monochloride): intermolecular forces / forces between molecules / named intermolecular forces, e.g. van der Waals / London forces / dispersion forces / dipole- dipole	1
	bonds in KBr are stronger / need more energy to break bonds / ORA	1

Q# 17/ IGCSE Chemistry/2018/s/Paper 42/

3	particles	number of protons	number of electrons	number of neutrons	number of nucleons	6
				12 (1)		
		17 (1)	18 (1)		37 (1)	
	Fe (1) 2+ (1)					

Q# 18/ IGCSE Chemistry/2018/s/Paper 41/

1(a)	a substance made from **two** (or more) **elements**	**1**
	chemically combined	**1**

Q# 19/ IGCSE Chemistry/2018/s/Paper 41/

2(d)(i)	radioisotopes	**1**
2(d)(ii)	^{286}Fl 114p 172n 114e	**1**
	^{289}Fl 114p 175n 114e	**1**
2(e)(i)	any **two** from: high melting point / boiling point hard dense conduct electricity conduct heat ductile / malleable sonorous lustrous / shiny	**2**
2(e)(ii)	basic (oxide)	**1**