

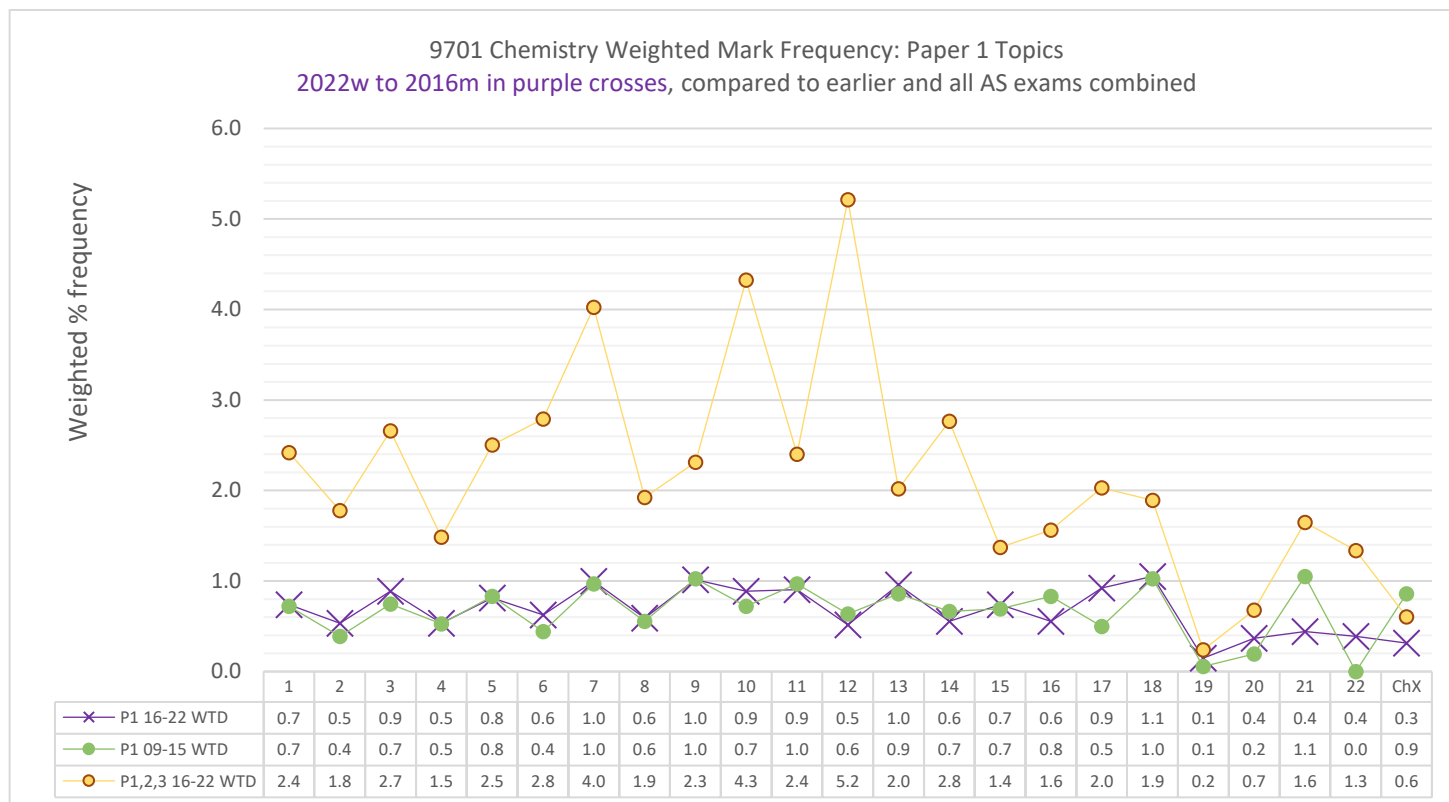
ALyl Chem 2 EQ P1 22w to 09s Paper 1 Atoms, molecules and stoichiometry 43marks

As you start and work through this worksheet you can tick off your progress to show yourself how much you have done, and what you need to do next. The first task is just to read the first question and should take you less than one minutes to complete.

Paper 1 Topic 2

Checklist Tick each task off as you go along

RANK:	P1 Noob	P1 Novice	P1 Bronze	P1 Silver	P1 Gold	P1 ¹ Winner	P1 Hero	P1 Legend
	1 Q started	1 Q done	10% of marks	25% of marks	40% of marks	50% of marks	75% of marks	100% of marks
Topic (marks)	43	1	4	11	17	22	32	43
Time @75s/mark (minutes)	54	1	5	13	22	27	40	54



What the most thoughtful students will get out of their extensive studying will be a capacity to do meaningful brain-based work even under stressful conditions, which is a part of the self-mastery skillset that will continue to deliver value for the whole of their lives. Outstanding grades will also happen, but the most important goal from skillful action in study is being better at any important task, even if circumstances do not feel ideal.

As you are moving through your studies you can learn more about yourself by trying out new ways to manage yourself, and analysing how effective those new techniques were. In this reflective process not only will you get better at working positively and productively to deliver ambitious and successful outcomes, but you will be working towards one aspect of life's highest pursuit, summarised and inscribed on the Temple of Apollo at Delphi: "know thyself".

- To complete these questions, as important as your answer, is checking your answer against the mark scheme.
- For each page or group of 10 questions, convert your mark score into a percentage. This will allow you to see (and feel) your progress as you get more experience and understanding with each topic.
- Multiple choice questions, done carefully where you explain and show yourself your thinking using written notes as you move through each question, can be more useful than just Paper 2 for students aiming for a C or B grade. Paper 2 should be the larger focus for students aiming for A and A* grades, however.

¹ **DO NOT** work on these higher levels of completion in your A2 year unless you have also achieved at least a "Silver" (25%) in the same topic in **Paper 2**, which is **MOST** of your **AS grade**, and Paper 3 which is a smaller part of your year but still important.



4. If you find you get a higher percentage answering short answer questions than multiple choice questions that often means you are NOT using the marking scheme correctly; your correct answer might not be fully complete for all the marks you are awarding. The marks easiest to miss rely on providing the largest amount of detail.

2 Atoms, molecules and stoichiometry

2.1 Relative masses of atoms and molecules

Learning outcomes

Candidates should be able to:

- 1 define the unified atomic mass unit as one twelfth of the mass of a carbon-12 atom
- 2 define relative atomic mass, A_r , relative isotopic mass, relative molecular mass, M_r , and relative formula mass in terms of the unified atomic mass unit

2.2 The mole and the Avogadro constant

Learning outcomes

Candidates should be able to:

- 1 define and use the term mole in terms of the Avogadro constant

2.3 Formulae

Learning outcomes

Candidates should be able to:

- 1 write formulae of ionic compounds from ionic charges and oxidation numbers (shown by a Roman numeral), including:
 - (a) the prediction of ionic charge from the position of an element in the Periodic Table
 - (b) recall of the names and formulae for the following ions: NO_3^- , CO_3^{2-} , SO_4^{2-} , OH^- , NH_4^+ , Zn^{2+} , Ag^+ , HCO_3^- , PO_4^{3-}
- 2
 - (a) write and construct equations (which should be balanced), including ionic equations (which should not include spectator ions)
 - (b) use appropriate state symbols in equations
- 3 define and use the terms empirical and molecular formula
- 4 understand and use the terms anhydrous, hydrated and water of crystallisation
- 5 calculate empirical and molecular formulae, using given data

2.4 Reacting masses and volumes (of solutions and gases)

Learning outcomes

Candidates should be able to:

- 1 perform calculations including use of the mole concept, involving:
 - (a) reacting masses (from formulae and equations) including percentage yield calculations
 - (b) volumes of gases (e.g. in the burning of hydrocarbons)
 - (c) volumes and concentrations of solutions
 - (d) limiting reagent and excess reagent(When performing calculations, candidates' answers should reflect the number of significant figures given or asked for in the question. When rounding up or down, candidates should ensure that significant figures are neither lost unnecessarily nor used beyond what is justified (see also Mathematical requirements section).)
 - (e) deduce stoichiometric relationships from calculations such as those in 2.4.1 (a)–(d)



Q# 65/ AS Chemistry/2022/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 Mixture R consists of one mole of C_3H_6 and one mole of C_4H_8 .

What is the minimum number of moles of oxygen molecules needed for complete combustion of mixture R?

- A 6.5 B 7 C 10 D 20

Q# 66/ AS Chemistry/2022/w/TZ 1/Paper 1/Q# 1//www.SmashingScience.org :o)

1 Which sample contains the same number of the named species as the number of molecules in 35.5 g of chlorine?

- A atoms in 16 g of sulfur
B atoms in 23 g of sodium
C ions in 74.5 g of potassium chloride
D molecules in 88 g of carbon dioxide

Q# 67/ AS Chemistry/2022/s/TZ 1/Paper 1/Q# 4//www.SmashingScience.org :o)

4 A student reacts 1 mol of copper with concentrated nitric acid to produce 1 mol of copper(II) nitrate, 2 mol of water and substance X. No other product is formed.

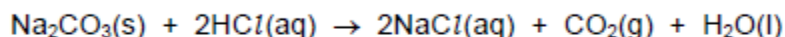
Substance X does not contain copper or hydrogen.

What could be substance X?

- A N_2 B N_2O C NO D NO_2

Q# 68/ AS Chemistry/2022/s/TZ 1/Paper 1/Q# 16//www.SmashingScience.org :o)

16 A 3.0 g sample of Na_2CO_3 powder is stirred into 50 cm^3 of 1.0 mol dm^{-3} HCl. The volume of CO_2 produced is 600 cm^3 .



[M_r : Na_2CO_3 , 106.0]

Which volume of CO_2 is produced if 1.0 g of Na_2CO_3 powder is stirred into 50 cm^3 of 1.0 mol dm^{-3} HCl under the same conditions?

- A 600 cm^3 B 452 cm^3 C 226 cm^3 D 200 cm^3

Q# 69/ AS Chemistry/2022/m/TZ 2/Paper 1/Q# 3//www.SmashingScience.org :o)

3 Compound X contains the elements C, H and O only.

2.00 g of X produces 4.00 g of carbon dioxide and 1.63 g of water when completely combusted.

What is the empirical formula of X?

- A CHO_2 B C_2H_2O C C_2H_4O D CH_2O_2



Q# 70/ AS Chemistry/2022/m/TZ 2/Paper 1/Q# 14//www.SmashingScience.org :o)

14 Which statement about atoms and molecules is correct?

- A The molecular formula of a compound is the simplest whole number ratio of atoms of each element in the compound.
- B One mole of any substance contains 6×10^{23} atoms.
- C The relative atomic mass of an element is the ratio of the average mass of one atom of the element to the mass of an atom of carbon-12.
- D The relative formula mass of a compound is the sum of the individual atomic masses of all the atoms in the formula.

Q# 71/ AS Chemistry/2021/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 2.0 g of ammonium nitrate, NH_4NO_3 , decomposes to give 0.90 g of water and a single gas.

What is the identity of the gas?

- A NO B NO_2 C N_2O D N_2

Q# 72/ AS Chemistry/2021/m/TZ 2/Paper 1/Q# 4//www.SmashingScience.org :o)

4 Originally, chemists thought indium oxide had the formula InO . By experiment they showed that 4.8 g of indium combined with 1.0 g of oxygen to produce 5.8 g of indium oxide. The A_r of oxygen was known to be 16.

Which value for the A_r of indium is calculated using these data?

- A 38 B 77 C 115 D 154

Q# 73/ AS Chemistry/2021/m/TZ 2/Paper 1/Q# 3//www.SmashingScience.org :o)

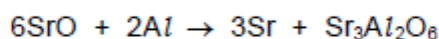
3 Substance Q is a hydrocarbon. When 1.00 g of Q is completely burned, 3.22 g of carbon dioxide is produced.

What could be the identity of Q?

- A cyclohexene
- B cyclopentane
- C ethene
- D pentane

Q# 74/ AS Chemistry/2020/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 Strontium metal can be extracted from strontium oxide, SrO , by reduction with aluminium. One of the possible reactions is shown.



What is the maximum mass of strontium metal that can be produced from the reduction of 100 g of strontium oxide using this reaction?

- A 41.3 g B 42.3 g C 84.6 g D 169.2 g



Q# 75/ AS Chemistry/2020/s/TZ 1/Paper 1/Q# 13//www.SmashingScience.org :o)

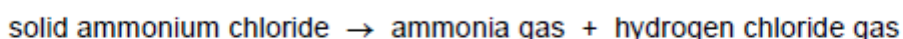
- 13 6.90 g of an ammonium salt is heated with an excess of aqueous sodium hydroxide. The volume of ammonia produced, measured under room conditions, is 2.51 dm^3 .

Which ammonium salt is used?

- A ammonium carbonate ($M_r = 96.0$)
- B ammonium chloride ($M_r = 53.5$)
- C ammonium nitrate ($M_r = 80.0$)
- D ammonium sulfate ($M_r = 132.1$)

Q# 76/ AS Chemistry/2020/s/TZ 1/Paper 1/Q# 11//www.SmashingScience.org :o)

- 11 A sample of solid ammonium chloride decomposes on heating.



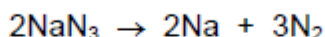
A total of 2.4×10^{21} molecules of gas is formed.

How many hydrogen atoms are present in the gaseous products?

- A 1.2×10^{21}
- B 2.4×10^{21}
- C 4.8×10^{21}
- D 9.6×10^{21}

Q# 77/ AS Chemistry/2020/m/TZ 2/Paper 1/Q# 7//www.SmashingScience.org :o)

- 7 Sodium azide, NaN_3 , decomposes as shown.



Which volume of nitrogen, measured at room temperature and pressure, will be produced by the decomposition of 150 g of sodium azide?

- A 166 dm^3
- B 83 dm^3
- C 55 dm^3
- D 37 dm^3

Q# 78/ AS Chemistry/2019/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

- 2 Diamond is a pure form of carbon. The mass of a diamond can be measured in carats. One carat is 0.200 g of carbon.

Which expression gives the number of carats that contain 6.02×10^{23} carbon atoms?

- A 0.200×12.0
- B $\frac{0.200}{12.0}$
- C $\frac{12.0}{0.200}$
- D $\frac{0.200}{6.02 \times 10^{23}} \times 12.0$

Q# 79/ AS Chemistry/2019/s/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

- 3 A washing powder contains sodium hydrogencarbonate, NaHCO_3 , as one of the ingredients.

In a titration, a solution containing 1.00 g of this washing powder requires 7.15 cm^3 of $0.100 \text{ mol dm}^{-3}$ sulfuric acid for complete reaction. The sodium hydrogencarbonate is the only ingredient that reacts with the acid.

What is the percentage by mass of sodium hydrogencarbonate in the washing powder?

- A 3.0%
- B 6.0%
- C 12.0%
- D 24.0%



Q# 80/ AS Chemistry/2019/s/TZ 1/Paper 1/Q# 12//www.SmashingScience.org :o)

12 1.15 g of a metallic element needs 300 cm^3 of oxygen for complete reaction, under room conditions, to form an oxide which contains O^{2-} ions.

What could be the identity of this metallic element?

- A calcium
- B magnesium
- C potassium
- D sodium

Q# 81/ AS Chemistry/2019/m/TZ 2/Paper 1/Q# 2//www.SmashingScience.org :o)

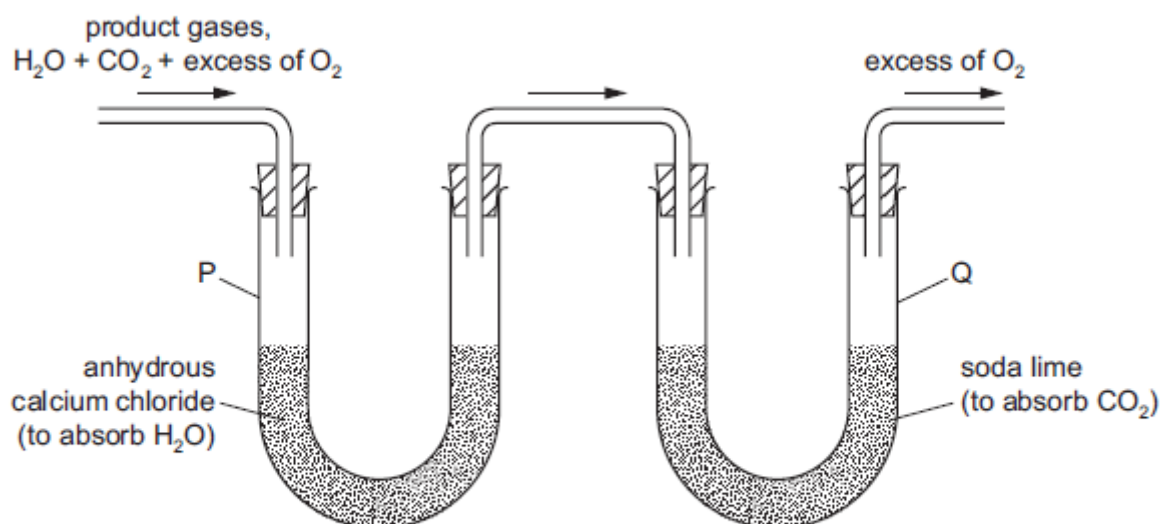
2 A 3.7 g sample of copper(II) carbonate is added to 25 cm^3 of 2.0 mol dm^{-3} hydrochloric acid.

Which volume of gas is produced under room conditions?

- A 0.60 dm^3
- B 0.72 dm^3
- C 1.20 dm^3
- D 2.40 dm^3

Q# 82/ AS Chemistry/2018/w/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

3 A sample of the hydrocarbon C_6H_{12} is completely burned in dry oxygen and the product gases are collected as shown.



The increases in mass of the collecting vessels P and Q are M_P and M_Q , respectively.

What is the ratio M_P / M_Q ?

- A 0.41
- B 0.82
- C 1.2
- D 2.4

Q# 83/ AS Chemistry/2018/s/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

3 Which fuel would produce the largest mass of CO_2 when 10 kg of the fuel undergo complete combustion?

- A biodiesel, $\text{C}_{17}\text{H}_{34}\text{O}_2$
- B ethanol, $\text{C}_2\text{H}_6\text{O}$
- C octane, C_8H_{18}
- D propane, C_3H_8



Q# 84/ AS Chemistry/2018/m/TZ 2/Paper 1/Q# 5//www.SmashingScience.org :o)

5 Which mass of solid residue is obtained from the thermal decomposition of 4.10 g of anhydrous calcium nitrate?

- A 0.70 g B 1.00 g C 1.40 g D 2.25 g

Q# 85/ AS Chemistry/2018/m/TZ 2/Paper 1/Q# 31//www.SmashingScience.org :o)

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

31 Compound Q contains 40% carbon by mass.

What could Q be?

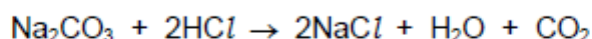
- 1 glucose, $C_6H_{12}O_6$
- 2 starch, $(C_6H_{10}O_5)_n$
- 3 sucrose, $C_{12}H_{22}O_{11}$

Q# 86/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 32//

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

32 A student makes sodium chloride by reacting together 0.025 mol of sodium carbonate with an excess of 0.2 mol dm^{-3} hydrochloric acid.



Which statements about the quantities of substance are correct?

- 1 600 cm^3 of carbon dioxide are produced at room temperature and pressure.
- 2 250 cm^3 of the hydrochloric acid are needed to exactly neutralise the sodium carbonate.
- 3 1.46 g of sodium chloride are produced.

Q# 87/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 16//

16 Which fertiliser contains the greatest percentage of nitrogen by mass?

- A ammonium nitrate, NH_4NO_3
- B ammonium sulfate, $(NH_4)_2SO_4$
- C diammonium hydrogen phosphate, $(NH_4)_2HPO_4$
- D urea, $CO(NH_2)_2$

Q# 88/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 1//

1 Which formula represents the empirical formula of a compound?

- A C_2H_4O B $C_2H_4O_2$ C C_6H_{12} D H_2O_2



Q# 89/ AS Chemistry/2017/s/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

- 3 A sports medal has a total surface area of 150 cm^2 . It was evenly coated with silver by electrolysis. Its mass increased by 0.216 g .

How many atoms of silver were deposited per cm^2 on the surface of the medal?

- A 8.0×10^{18} B 1.8×10^{19} C 8.7×10^{20} D 1.2×10^{21}

Q# 90/ AS Chemistry/2017/s/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

- 2 The mass spectrum of a sample of lithium shows that it contains two isotopes, ${}^6\text{Li}$ and ${}^7\text{Li}$.

The isotopic abundances are shown in the table.

isotope	isotopic abundance
${}^6\text{Li}$	7.42%
${}^7\text{Li}$	92.58%

What is the relative atomic mass of this sample of lithium, given to three significant figures?

- A 6.07 B 6.50 C 6.90 D 6.93

Q# 91/ AS Chemistry/2017/m/TZ 2/Paper 1/Q# 2//www.SmashingScience.org :o)

- 2 Compounds J and K each contain 40% carbon by mass.

What could J and K be?

	J	K
A	a hexose, $\text{C}_6\text{H}_{12}\text{O}_6$	starch, $(\text{C}_6\text{H}_{10}\text{O}_5)_n$
B	a pentose, $\text{C}_5\text{H}_{10}\text{O}_5$	a hexose, $\text{C}_6\text{H}_{12}\text{O}_6$
C	a pentose, $\text{C}_5\text{H}_{10}\text{O}_5$	sucrose, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
D	starch, $(\text{C}_6\text{H}_{10}\text{O}_5)_n$	sucrose, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$

Q# 92/ AS Chemistry/2016/w/TZ 1/Paper 1/Q# 12//www.SmashingScience.org :o)

- 12 1.15 g of a metallic element needs 300 cm^3 of oxygen for complete reaction, at 298 K and 1 atm pressure, to form an oxide which contains O^{2-} ions.

What could be the identity of this metallic element?

- A calcium
B magnesium
C potassium
D sodium

Q# 93/ AS Chemistry/2016/s/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

- 3 Tetraethyl lead, $\text{Pb}(\text{C}_2\text{H}_5)_4$, has been used as a petrol additive.

What is the percentage by mass of carbon in tetraethyl lead?

- A 10.2 B 14.9 C 29.7 D 32.0



Q# 94/ AS Chemistry/2015/w/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

3 Use of the Data Booklet is relevant to this question.

The compound S_2O_7 is hydrolysed by water to produce sulfuric acid and oxygen only.

Which volume of oxygen, measured at room temperature and pressure, is evolved when 0.352g of S_2O_7 is hydrolysed?

- A 12 cm^3 B 24 cm^3 C 48 cm^3 D 96 cm^3

Q# 95/ AS Chemistry/2014/w/TZ 1/Paper 1/Q# 6//www.SmashingScience.org :o)

6 Aluminium carbide, Al_4C_3 , reacts readily with aqueous sodium hydroxide. The two products of the reaction are $NaAlO_2$ and a hydrocarbon. Water molecules are also involved as reactants.

What is the formula of the hydrocarbon?

- A CH_4 B C_2H_6 C C_3H_8 D C_6H_{12}

Q# 96/ AS Chemistry/2013/w/TZ 1/Paper 1/Q# 8//www.SmashingScience.org :o)

8 Use of the Data Booklet is relevant to this question.

The approximate percentage composition of the atmosphere on four different planets is given in the table below.

The density of a gas may be defined as the mass of 1 dm^3 of the gas measured at s.t.p.

Which mixture of gases has the greatest density?

	planet	major gases / % by number of molecules
A	Jupiter	H_2 89.8, He 10.2
B	Neptune	H_2 80.0, He 19.0, CH_4 1.0
C	Saturn	H_2 96.3, He 3.25, CH_4 0.45
D	Uranus	H_2 82.5, He 15.2, CH_4 2.3

Q# 97/ AS Chemistry/2013/w/TZ 1/Paper 1/Q# 10//www.SmashingScience.org :o)

10 Use of the Data Booklet is relevant to this question.

Which sodium compound contains 74.2 % by mass of sodium?

- A sodium carbonate
B sodium chloride
C sodium hydroxide
D sodium oxide



17 Use of the Data Booklet is relevant to this question.

1.15 g of a metallic element reacts with 300 cm³ of oxygen at 298 K and 1 atm pressure, to form an oxide which contains O²⁻ ions.

What could be the identity of the metal?

- A calcium
- B magnesium
- C potassium
- D sodium

14 Use of the Data Booklet is relevant to this question.

The reaction between aluminium powder and anhydrous barium nitrate is used as the propellant in some fireworks. The metal oxides and nitrogen are the only products.

Which volume of nitrogen, measured under room conditions, is produced when 0.783 g of anhydrous barium nitrate reacts with an excess of aluminium?

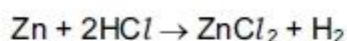
- A 46.8 cm³ B 72.0 cm³ C 93.6 cm³ D 144 cm³

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

33 Use of the Data Booklet is relevant to this question.

Zinc reacts with hydrochloric acid according to the following equation.



Which statements are correct?

[All volumes are measured at room conditions.]

- 1 A 3.27 g sample of zinc reacts with an excess of hydrochloric acid to give 0.050 mol of zinc chloride.
- 2 A 6.54 g sample of zinc reacts completely with exactly 100 cm³ of 1.00 mol dm⁻³ hydrochloric acid.
- 3 A 13.08 g sample of zinc reacts with an excess of hydrochloric acid to give 9.60 dm³ of hydrogen.



Q# 101/ AS Chemistry/2010/w/TZ 1/Paper 1/Q# 5//www.SmashingScience.org :o)

5 Use of the Data Booklet is relevant to this question.

Nickel makes up 20 % of the total mass of a coin. The coin has a mass of 10.0g.

How many nickel atoms are in the coin?

- A 2.05×10^{22} B 4.30×10^{22} C 1.03×10^{23} D 1.20×10^{24}

Q# 102/ AS Chemistry/2010/w/TZ 1/Paper 1/Q# 12//www.SmashingScience.org :o)

12 Camphor is a white solid which was used to make the early plastic celluloid. Camphor contains the same percentage by mass of hydrogen and oxygen.

What is the molecular formula of camphor?

- A $C_{10}H_6O_6$ B $C_{10}H_8O$ C $C_{10}H_{16}O$ D $C_{10}H_{10}O_2$

Q# 103/ AS Chemistry/2010/s/TZ 1/Paper 1/Q# 9//www.SmashingScience.org :o)

9 Which mass of gas would occupy a volume of 3 dm^3 at 25°C and 1 atmosphere pressure? [1 mol of gas occupies 24 dm^3 at 25°C and 1 atmosphere pressure.]

- A 3.2g O_2 gas
B 5.6g N_2 gas
C 8.0g SO_2 gas
D 11.0g CO_2 gas

Q# 104/ AS Chemistry/2010/s/TZ 1/Paper 1/Q# 8//www.SmashingScience.org :o)

8 Use of the Data Booklet is relevant to this question.

2.920 g of a Group II metal, X, reacts with an excess of chlorine to form 5.287 g of a compound with formula XC_l_2 .

What is metal X?

- A barium
B calcium
C magnesium
D strontium

Q# 105/ AS Chemistry/2009/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 0.200 mol of a hydrocarbon undergo complete combustion to give 35.2 g of carbon dioxide and 14.4 g of water as the only products.

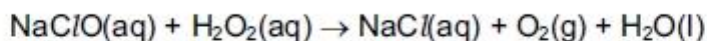
What is the molecular formula of the hydrocarbon?

- A C_2H_4 B C_2H_6 C C_4H_4 D C_4H_8



Q# 106/ AS Chemistry/2009/s/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

- 2 A household bleach contains sodium chlorate(I), NaClO , as its active ingredient. The concentration of NaClO in the bleach can be determined by reacting a known amount with aqueous hydrogen peroxide, H_2O_2 .



When 25.0 cm^3 of bleach is treated with an excess of aqueous H_2O_2 , 0.0350 mol of oxygen gas is given off.

What is the concentration of NaClO in the bleach?

- A $8.75 \times 10^{-4} \text{ mol dm}^{-3}$
B $0.700 \text{ mol dm}^{-3}$
C $0.875 \text{ mol dm}^{-3}$
D 1.40 mol dm^{-3}

Q# 107/ AS Chemistry/2009/s/TZ 1/Paper 1/Q# 1//www.SmashingScience.org :o)

- 1 Use of the Data Booklet is relevant to this question.

In leaded petrol there is an additive composed of lead, carbon and hydrogen only. This compound contains 29.7 % carbon and 6.19 % hydrogen by mass.

What is the value of x in the empirical formula PbC_8H_x ?

- A 5 B 6 C 16 D 20

Mark Scheme

Q# 65/ AS Chemistry/2022/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 | C

Q# 66/ AS Chemistry/2022/w/TZ 1/Paper 1/Q# 1//www.SmashingScience.org :o)

1 | A

Q# 67/ AS Chemistry/2022/s/TZ 1/Paper 1/Q# 4//www.SmashingScience.org :o)

4 | D

Q# 68/ AS Chemistry/2022/s/TZ 1/Paper 1/Q# 16//www.SmashingScience.org :o)

16 | C

Q# 69/ AS Chemistry/2022/m/TZ 2/Paper 1/Q# 3//www.SmashingScience.org :o)

3 | C

Q# 70/ AS Chemistry/2022/m/TZ 2/Paper 1/Q# 14//www.SmashingScience.org :o)

14 | D

Q# 71/ AS Chemistry/2021/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 | C

Q# 72/ AS Chemistry/2021/m/TZ 2/Paper 1/Q# 4//www.SmashingScience.org :o)

4 | B

Q# 73/ AS Chemistry/2021/m/TZ 2/Paper 1/Q# 3//www.SmashingScience.org :o)

3 | A

Q# 74/ AS Chemistry/2020/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 | B

Q# 75/ AS Chemistry/2020/s/TZ 1/Paper 1/Q# 13//www.SmashingScience.org :o)

13 | D

Q# 76/ AS Chemistry/2020/s/TZ 1/Paper 1/Q# 11//www.SmashingScience.org :o)

11 | C

Q# 77/ AS Chemistry/2020/m/TZ 2/Paper 1/Q# 7//www.SmashingScience.org :o)

7 | B

Q# 78/ AS Chemistry/2019/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

2 | C

Q# 79/ AS Chemistry/2019/s/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

3 | C



Q# 80/ AS Chemistry/2019/s/TZ 1/Paper 1/Q#
12//www.SmashingScience.org :o)

12 | D

Q# 81/ AS Chemistry/2019/m/TZ 2/Paper 1/Q#
2//www.SmashingScience.org :o)

2 | A

Q# 82/ AS Chemistry/2018/w/TZ 1/Paper 1/Q#
3//www.SmashingScience.org :o)

3 | A

Q# 83/ AS Chemistry/2018/s/TZ 1/Paper 1/Q#
3//www.SmashingScience.org :o)

3 | C

Q# 84/ AS Chemistry/2018/m/TZ 2/Paper 1/Q#
5//www.SmashingScience.org :o)

5 | C

Q# 85/ AS Chemistry/2018/m/TZ 2/Paper 1/Q#
31//www.SmashingScience.org :o)

31 | D

Q# 86/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 32//

32 | B

Q# 87/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 16//

16 | D

Q# 88/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 1//

1 | A

Q# 89/ AS Chemistry/2017/s/TZ 1/Paper 1/Q#
3//www.SmashingScience.org :o)

3 | A

Q# 90/ AS Chemistry/2017/s/TZ 1/Paper 1/Q#
2//www.SmashingScience.org :o)

2 | D

Q# 91/ AS Chemistry/2017/m/TZ 2/Paper 1/Q#
2//www.SmashingScience.org :o)

2 | B

Q# 92/ AS Chemistry/2016/w/TZ 1/Paper 1/Q#
12//www.SmashingScience.org :o)

12 | D

Q# 93/ AS Chemistry/2016/s/TZ 1/Paper 1/Q#
3//www.SmashingScience.org :o)

3 | C

Q# 94/ AS Chemistry/2015/w/TZ 1/Paper 1/Q#
3//www.SmashingScience.org :o)

3 | B

Q# 95/ AS Chemistry/2014/w/TZ 1/Paper 1/Q#
6//www.SmashingScience.org :o)

6 | A

Q# 96/ AS Chemistry/2013/w/TZ 1/Paper 1/Q#
8//www.SmashingScience.org :o)

8 | D

Q# 97/ AS Chemistry/2013/w/TZ 1/Paper 1/Q#
10//www.SmashingScience.org :o)

10 | D

Q# 98/ AS Chemistry/2012/w/TZ 1/Paper 1/Q#
17//www.SmashingScience.org :o)

17 | D

Q# 99/ AS Chemistry/2012/s/TZ 1/Paper 1/Q#
14//www.SmashingScience.org :o)

14 | B

Q# 100/ AS Chemistry/2011/s/TZ 1/Paper 1/Q#
33//www.SmashingScience.org :o)

33 | D

Q# 101/ AS Chemistry/2010/w/TZ 1/Paper 1/Q#
5//www.SmashingScience.org :o)

5 | A

Q# 102/ AS Chemistry/2010/w/TZ 1/Paper 1/Q#
12//www.SmashingScience.org :o)

12 | C

Q# 103/ AS Chemistry/2010/s/TZ 1/Paper 1/Q#
9//www.SmashingScience.org :o)

9 | C

Q# 104/ AS Chemistry/2010/s/TZ 1/Paper 1/Q#
8//www.SmashingScience.org :o)

8 | D

Q# 105/ AS Chemistry/2009/w/TZ 1/Paper 1/Q#
2//www.SmashingScience.org :o)

2 | D

Q# 106/ AS Chemistry/2009/s/TZ 1/Paper 1/Q#
2//www.SmashingScience.org :o)

2 | D

Q# 107/ AS Chemistry/2009/s/TZ 1/Paper 1/Q#
1//www.SmashingScience.org :o)

1 | D

