

ALyl Chem 6 EQ P1 22w to 09s Paper 1 Electrochemistry 50marks

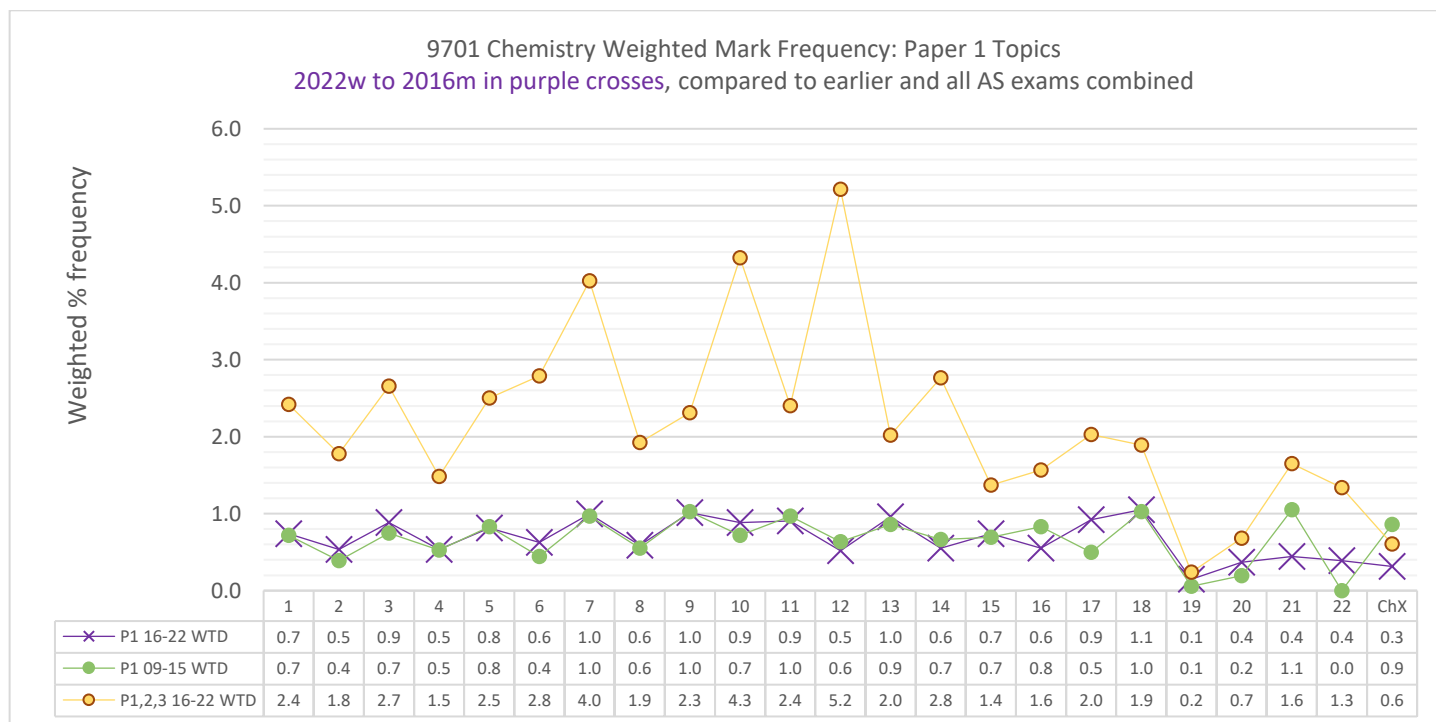
As you start and work through this worksheet you can tick off your progress to show yourself how much you have done, and what you need to do next. The first task is just to read the first question and should take you less than one minutes to complete.

Paper 1 Topic 6

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
	1	5	13	20	25	38	50
	1	6	16	25	31	47	63



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".

1. To complete these questions, as important as your answer, is checking your answer against the mark scheme.
2. 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.
3. 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.
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.

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.

6 Electrochemistry

6.1 Redox processes: electron transfer and changes in oxidation number (oxidation state)

Learning outcomes

Candidates should be able to:

- 1 calculate oxidation numbers of elements in compounds and ions
- 2 use changes in oxidation numbers to help balance chemical equations
- 3 explain and use the terms redox, oxidation, reduction and disproportionation in terms of electron transfer and changes in oxidation number
- 4 explain and use the terms oxidising agent and reducing agent
- 5 use a Roman numeral to indicate the magnitude of the oxidation number of an element

Q# 306/ AS Chemistry/2022/w/TZ 1/Paper 1/Q# 12//www.SmashingScience.org :o)

- 12 Sodium dichromate(VI), $\text{Na}_2\text{Cr}_2\text{O}_7$, reacts with hydrogen peroxide, H_2O_2 , producing Cr^{3+} ions, water and oxygen.

What is the correctly balanced ionic equation for this reaction?

- A $\text{Cr}_2\text{O}_7^{2-} + 2\text{H}^+ + \text{H}_2\text{O}_2 \rightarrow 2\text{Cr}^{3+} + 2\text{H}_2\text{O} + 4\text{O}_2$
B $\text{Cr}_2\text{O}_7^{2-} + 8\text{H}^+ + 3\text{H}_2\text{O}_2 \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O} + 3\text{O}_2$
C $\text{Cr}_2\text{O}_7^{2-} + 8\text{H}^+ + 6\text{H}_2\text{O}_2 \rightarrow 2\text{Cr}^{3+} + 10\text{H}_2\text{O} + 6\text{O}_2$
D $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 3\text{H}_2\text{O}_2 \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O} + 3\text{O}_2$

Q# 307/ AS Chemistry/2022/w/TZ 1/Paper 1/Q# 11//www.SmashingScience.org :o)

- 11 Ammonium ions are converted into nitrate ions by bacteria.

What is the change in the oxidation number of nitrogen?

- A -6 B +6 C +8 D +9

Q# 308/ AS Chemistry/2022/s/TZ 1/Paper 1/Q# 17//www.SmashingScience.org :o)

- 17 Solid sodium iodide reacts with concentrated sulfuric acid to form more than one product that contains sulfur.

What is the lowest oxidation number of sulfur in these products?

- A -2 B 0 C +4 D +6

Q# 309/ AS Chemistry/2022/s/TZ 1/Paper 1/Q# 12//www.SmashingScience.org :o)

- 12 In the treatment of domestic water supplies, chlorine is added to water to kill bacteria. Some ClO^- ions are formed.

What is the change in oxidation number of chlorine when forming the ClO^- ion from aqueous chlorine?

- A -1 B 0 C +1 D +2

Q# 310/ AS Chemistry/2022/s/TZ 1/Paper 1/Q# 11//www.SmashingScience.org :o)

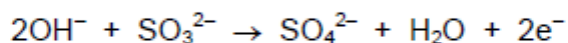
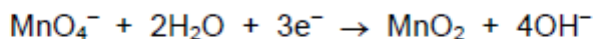
- 11 A student reacts 4 mol of ammonia with oxygen to produce an oxide of nitrogen and water only. Each nitrogen atom increases its oxidation state by 5 in the reaction.

How many moles of oxygen gas react with 4 mol of ammonia in this reaction?

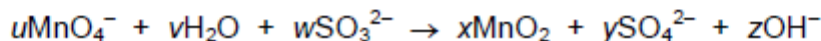
- A 4 mol B 5 mol C 7 mol D 10 mol



10 Two half-equations are shown.



The equation for the reaction between manganate(VII) ions and sulfite ions is shown.



Which statements are correct?

- 1 $u = x = z$
- 2 Manganese is reduced to oxidation state +4.
- 3 Sulfur is oxidised from oxidation state +4 to +6.

A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

Q# 312/ AS Chemistry/2021/w/TZ 1/Paper 1/Q# 9//www.SmashingScience.org :o)

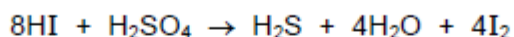
- 9 Zinc atoms can be oxidised to Zn^{2+} ions by dichromate(VI) ions in acid solution. Chromium is reduced to Cr^{3+} in this reaction.

Which equation is correct?

- A $\text{Cr}_2\text{O}_7^{2-} + \text{Zn} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + \text{Zn}^{2+} + 7\text{H}_2\text{O}$
- B $\text{Cr}_2\text{O}_7^{2-} + \text{Zn} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{Zn}^{2+} + 7\text{H}_2\text{O}$
- C $\text{Cr}_2\text{O}_7^{2-} + 3\text{Zn} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{Zn}^{2+} + 7\text{H}_2\text{O}$
- D $2\text{Cr}_2\text{O}_7^{2-} + 3\text{Zn} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{Zn}^{2+} + 7\text{H}_2\text{O}$

Q# 313/ AS Chemistry/2021/s/TZ 1/Paper 1/Q# 9//www.SmashingScience.org :o)

- 9 When hydrogen iodide is reacted with concentrated sulfuric acid, several reactions occur, including:

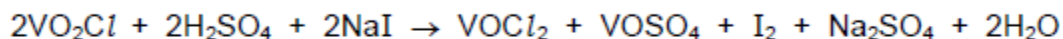


Which row gives the change in oxidation number of iodine and of sulfur in this reaction?

	change in oxidation number of iodine	change in oxidation number of sulfur
A	-1	+6
B	-1	+8
C	+1	-6
D	+1	-8



8 VO_2Cl reacts with NaI under acidic conditions.



The oxidation state of Cl is -1 in VO_2Cl and in VOCl_2 .

Which row about this reaction is correct?

	vanadium	iodine
A	is oxidised	is oxidised
B	is oxidised	is reduced
C	is reduced	is oxidised
D	is reduced	is reduced

9 The first stage in the chloride process for the manufacture of titanium consists of the following reaction.



What is reduced in this reaction?

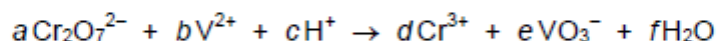
- A carbon
- B chlorine
- C oxygen
- D titanium

8 In which reaction does the greatest change in the oxidation number of sulfur occur?

- A $\text{S(s)} + \text{O}_2\text{(g)} \rightarrow \text{SO}_2\text{(g)}$
- B $\text{SO}_2\text{(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightleftharpoons \text{SO}_3\text{(g)}$
- C $\text{SO}_3\text{(g)} + \text{H}_2\text{SO}_4\text{(l)} \rightarrow \text{H}_2\text{S}_2\text{O}_7\text{(l)}$
- D $\text{H}_2\text{S}_2\text{O}_7\text{(l)} + \text{H}_2\text{O(l)} \rightarrow 2\text{H}_2\text{SO}_4\text{(l)}$

8 In this question you should use changes in oxidation numbers to balance a chemical equation.

Acidified potassium dichromate(VI) solution can oxidise a solution of V^{2+} ions. The equation for this reaction is shown.



What is the ratio $a : b$ in the correctly balanced equation?

- A 1 : 1
- B 1 : 2
- C 2 : 1
- D 4 : 1



Q# 318/ AS Chemistry/2020/s/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

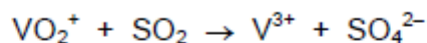
2 Cobalt can form the positive ion $\text{Co}(\text{NH}_3)_4\text{Cl}_2^+$.

What is the oxidation number of cobalt in this ion?

- A +1 B +2 C +3 D +6

Q# 319/ AS Chemistry/2020/m/TZ 2/Paper 1/Q# 5//www.SmashingScience.org :o)

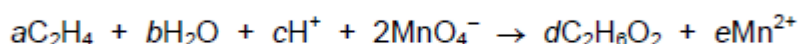
5 In the redox reaction shown, how do the oxidation states of vanadium and sulfur change?



	vanadium		sulfur	
	from	to	from	to
A	+1	+3	0	-2
B	+1	+3	+4	+6
C	+5	+3	0	-2
D	+5	+3	+4	+6

Q# 320/ AS Chemistry/2020/m/TZ 2/Paper 1/Q# 10//www.SmashingScience.org :o)

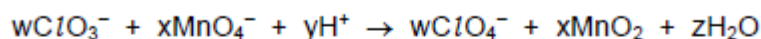
10 When the equation is correctly balanced, what is the value of c?



- A 3 B 4 C 5 D 6

Q# 321/ AS Chemistry/2019/w/TZ 1/Paper 1/Q# 9//www.SmashingScience.org :o)

9 In the chemical equation, w, x, y and z are all whole numbers.



When the equation is balanced, what are w, x and y?

	w	x	y
A	1	1	2
B	2	2	2
C	2	3	8
D	3	2	2

Q# 322/ AS Chemistry/2019/w/TZ 1/Paper 1/Q# 6//www.SmashingScience.org :o)

6 What is the oxidation number of sulfur in each species?

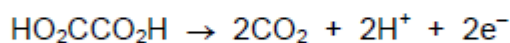
	H_2S	SO_2	H_2SO_3
A	-2	+4	+4
B	-2	+4	+6
C	+2	-4	+4
D	+2	-4	+6



Q# 323/ AS Chemistry/2019/s/TZ 1/Paper 1/Q# 9//www.SmashingScience.org :o)

- 9 Ethanedioic acid, $\text{HO}_2\text{CCO}_2\text{H}$, can be oxidised by KMnO_4 in dilute sulfuric acid. The products of this reaction are carbon dioxide, water, potassium sulfate and manganese(II) sulfate.

In this reaction each ethanedioic acid molecule loses two electrons as it is oxidised. A half-equation for this process is shown.



How many water molecules are produced when five ethanedioic acid molecules are oxidised by KMnO_4 in dilute sulfuric acid?

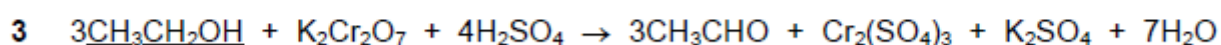
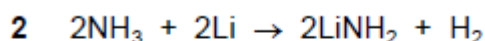
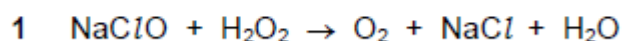
- A 5 B 8 C 10 D 16

Q# 324/ AS Chemistry/2019/m/TZ 2/Paper 1/Q# 33//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

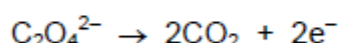
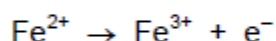
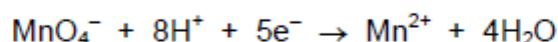
- 33 In which reactions is the underlined element or compound reduced?



Q# 325/ AS Chemistry/2019/m/TZ 2/Paper 1/Q# 10//www.SmashingScience.org :o)

- 10 Acidified potassium manganate(VII) reacts with iron(II) ethanedioate, FeC_2O_4 .

The reactions taking place are shown.



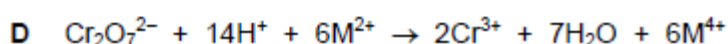
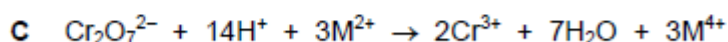
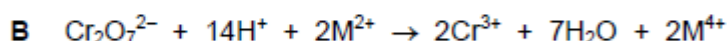
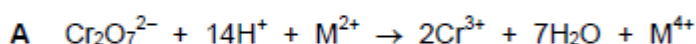
How many moles of iron(II) ethanedioate react with **one** mole of potassium manganate(VII)?

- A 0.60 B 1.67 C 2.50 D 5.00

Q# 326/ AS Chemistry/2018/w/TZ 1/Paper 1/Q# 8//www.SmashingScience.org :o)

- 8 A transition metal ion, M^{2+} , reacts with acidified dichromate(VI) ions to form M^{4+} ions, Cr^{3+} ions, and H_2O .

Which equation correctly represents this reaction?



- 7 Nitric acid is known to take part in the oxidation of atmospheric sulfur dioxide. One possible reaction is shown.



Which row shows the correct changes in oxidation numbers of nitrogen and sulfur?

	nitrogen	sulfur
A	-3	+3
B	-2	+2
C	-2	+3
D	-1	+2

- 14 Chlorine reacts with **cold** aqueous sodium hydroxide to produce sodium chloride, water and compound X.

Chlorine reacts with **hot** aqueous sodium hydroxide to produce sodium chloride, water and compound Y.

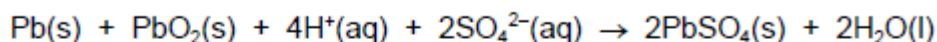
What are the oxidation states of chlorine in compound X and compound Y?

	X	Y
A	-1	-5
B	-1	+5
C	+1	-5
D	+1	+5

- 10 Which reaction is **not** a redox reaction?

- A $\text{Mg} + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2$
 B $2\text{Mg}(\text{NO}_3)_2 \rightarrow 2\text{MgO} + 4\text{NO}_2 + \text{O}_2$
 C $\text{SO}_2 + \text{NO}_2 \rightarrow \text{SO}_3 + \text{NO}$
 D $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$

- 6 One of the reactions in a lead/acid cell is shown.



Which statement about this reaction is correct?

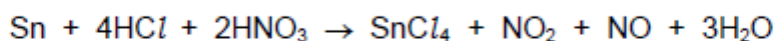
- A Lead is both oxidised and reduced.
 B Lead is neither oxidised nor reduced.
 C Lead is oxidised only.
 D Lead is reduced only.



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 One way of recovering tin from old printed circuit boards is to dissolve it in a mixture of concentrated hydrochloric acid and concentrated nitric acid. The tin dissolves because it reacts with the mixture of these concentrated acids.

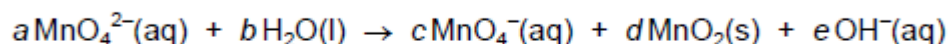


Which statements about this reaction are correct?

- 1 Nitrogen is present in three different oxidation states in the reactants and products.
- 2 The oxidation state of tin increases from 0 to +4.
- 3 The oxidation state of chlorine remains the same.

Q# 332/ AS Chemistry/2017/s/TZ 1/Paper 1/Q# 9//www.SmashingScience.org :o)

- 9 When K_2MnO_4 is dissolved in water, the following reaction occurs.



What are the values of a and c in the balanced chemical equation?

	a	c
A	2	1
B	3	2
C	4	3
D	5	4

Q# 333/ AS Chemistry/2017/s/TZ 1/Paper 1/Q# 17//www.SmashingScience.org :o)

- 17 When concentrated sulfuric acid reacts with sodium iodide the products include sulfur, iodine, hydrogen sulfide and sulfur dioxide.

Which statement is correct?

- A Hydrogen sulfide is the product of a reduction reaction.
- B Iodide ions are stronger oxidising agents than sulfate ions.
- C Sulfur atoms from the sulfuric acid are both oxidised and reduced.
- D Sulfur atoms from the sulfuric acid are oxidised to make sulfur dioxide.



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

36 Sodium chloride and sodium iodide react with concentrated sulfuric acid.

Which statements are correct?

- 1 Sodium chloride is not oxidised by concentrated sulfuric acid.
- 2 No colour change is seen when concentrated sulfuric acid is added to sodium chloride.
- 3 Sodium iodide is oxidised by concentrated sulfuric acid.

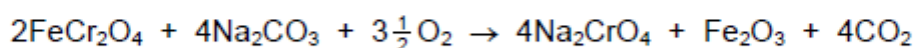
The responses **A** to **D** should be selected on the basis of

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 Which of these statements are always correct?

- 1 The sum of the oxidation numbers of all the atoms in a compound is zero.
- 2 The oxidation number of sodium in a salt is positive.
- 3 The oxidation number of chlorine in a compound is negative.

9 Sodium chromate(VI), Na_2CrO_4 , is manufactured by heating chromite, FeCr_2O_4 , with sodium carbonate in an oxidising atmosphere. Chromite contains $\text{Cr}_2\text{O}_4^{2-}$ ions.



What happens in this reaction?

- A Chromium and iron are the only elements oxidised.
- B Chromium, iron and carbon are oxidised.
- C Only chromium is oxidised.
- D Only iron is oxidised.



- 3 The reaction between acidified dichromate(VI) ions, $\text{Cr}_2\text{O}_7^{2-}$, and aqueous Fe^{2+} ions results in the dichromate(VI) ions being reduced to Cr^{3+} ions.

What is the correct equation for this reaction?

- A $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + \text{Fe}^{3+} + 7\text{H}_2\text{O}$
 B $\text{Cr}_2\text{O}_7^{2-} + 2\text{Fe}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 2\text{Fe}^{3+} + 7\text{H}_2\text{O}$
 C $\text{Cr}_2\text{O}_7^{2-} + 3\text{Fe}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{Fe}^{3+} + 7\text{H}_2\text{O}$
 D $\text{Cr}_2\text{O}_7^{2-} + 6\text{Fe}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 6\text{Fe}^{3+} + 7\text{H}_2\text{O}$

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

- 33 Bromine reacts with water.



Which oxidation states of bromine are present in the equilibrium mixture?

- 1 +3
 2 0
 3 -1

- 1 Which compound contains two different elements with identical oxidation states?

- A HClO B $\text{Mg}(\text{OH})_2$ C Na_2SO_4 D NH_4Cl

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 The salt NaClO_3 is used as a non-selective weedkiller.

On careful heating, this reaction occurs: $4\text{NaClO}_3 \rightarrow \text{NaCl} + 3\text{NaClO}_4$.

On strong heating this reaction occurs: $\text{NaClO}_4 \rightarrow \text{NaCl} + 2\text{O}_2$.

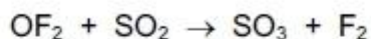
The overall reaction is $2\text{NaClO}_3 \rightarrow 2\text{NaCl} + 3\text{O}_2$.

What do these equations show?

- 1 NaClO_3 can behave as an oxidising agent.
- 2 NaClO_3 can behave as a reducing agent.
- 3 The oxidation numbers of chlorine in the three compounds shown are +6, +8 and -1.

Q# 341/ AS Chemistry/2015/s/TZ 1/Paper 1/Q# 4//www.SmashingScience.org :o)

- 4 In oxygen difluoride, OF_2 , fluorine has an oxidation number of -1. OF_2 will react with sulfur dioxide according to the following equation.



What is oxidised and what is reduced in this reaction?

	fluorine	oxygen in OF_2	sulfur
A	oxidised	oxidised	reduced
B	oxidised	reduced	oxidised
C	reduced	oxidised	reduced
D	reduced	reduced	oxidised

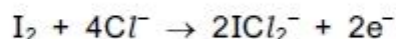
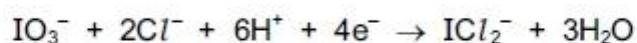
Q# 342/ AS Chemistry/2014/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

- 2 In which reaction does hydrogen behave as an oxidising agent?

- A $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
B $\text{C}_2\text{H}_4 + \text{H}_2 \rightarrow \text{C}_2\text{H}_6$
C $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
D $2\text{Na} + \text{H}_2 \rightarrow 2\text{NaH}$

Q# 343/ AS Chemistry/2013/w/TZ 1/Paper 1/Q# 3//www.SmashingScience.org :o)

- 3 The following half reactions occur when potassium iodate(V), KIO_3 , in hydrochloric acid solution oxidises iodine to ICl_2^- .

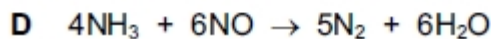
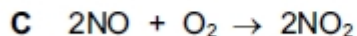
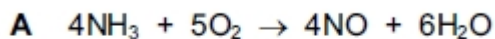


What is the ratio of IO_3^- to I_2 in the balanced chemical equation for the overall reaction?

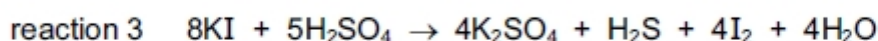
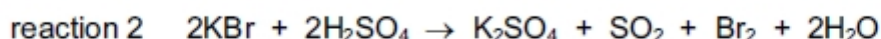
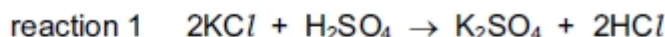
- A 1:1 B 1:2 C 1:4 D 2:1



2 In which reaction does a single nitrogen atom have the greatest change in oxidation number?



16 Solid potassium halides react with concentrated sulfuric acid, according to the following equations.



What is the largest **change** in the oxidation number of sulfur in each of these reactions?

	reaction 1	reaction 2	reaction 3
A	0	0	4
B	0	2	4
C	0	2	8
D	0	4	8

11 A solution of Sn^{2+} ions will reduce an acidified solution of MnO_4^- ions to Mn^{2+} ions. The Sn^{2+} ions are oxidised to Sn^{4+} ions in this reaction.

How many moles of Mn^{2+} ions are formed when a solution containing 9.5 g of SnCl_2 (M_r : 190) is added to an excess of acidified KMnO_4 solution?

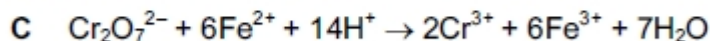
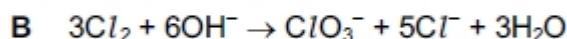
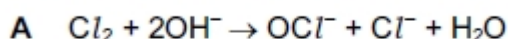
A 0.010

B 0.020

C 0.050

D 0.125

1 In which reaction does an element undergo the largest change in oxidation state?



Q# 348/ AS Chemistry/2012/s/TZ 1/Paper 1/Q# 10//www.SmashingScience.org :o)

- 10 The oxide of titanium, TiO_2 , is used as a 'whitener' in toothpaste. It is obtained from the ore iron(II) titanate, FeTiO_3 .

What is the change, if any, in the oxidation number (oxidation state) of titanium in the reaction $\text{FeTiO}_3 \rightarrow \text{TiO}_2$?

- A It is oxidised from +3 to +4.
- B It is reduced from +3 to +2.
- C It is reduced from +6 to +4.
- D There is no change in the oxidation number.

Q# 349/ AS Chemistry/2011/w/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

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

Lead(IV) chloride will oxidise bromide ions to bromine. The Pb^{4+} ions are reduced to Pb^{2+} ions in this reaction.

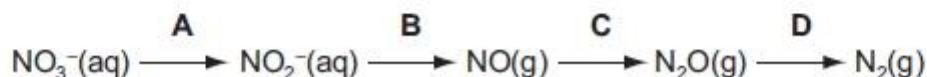
If 6.980 g of lead(IV) chloride is added to an excess of sodium bromide solution, what mass of bromine would be produced?

- A 0.799g B 1.598g C 3.196g D 6.392g

Q# 350/ AS Chemistry/2011/s/TZ 1/Paper 1/Q# 2//www.SmashingScience.org :o)

- 2 In flooded soils, like those used for rice cultivation, the oxygen content is low. In such soils, anaerobic bacteria cause the loss of nitrogen from the soil as shown in the following sequence.

In which step is the change in oxidation number (oxidation state) of nitrogen different to the changes in the other steps?



Q# 351/ AS Chemistry/2010/w/TZ 1/Paper 1/Q# 4//www.SmashingScience.org :o)

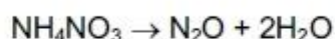
- 4 Sulfur dioxide, SO_2 , is added to wines to prevent oxidation of ethanol by air. To determine the amount of SO_2 , a sample of wine is titrated with iodine, I_2 . In this reaction, one mole of SO_2 is oxidised by one mole of I_2 .

What is the change in oxidation number of sulfur in this reaction?

- A +2 to +4 B +2 to +6 C +4 to +5 D +4 to +6

Q# 352/ AS Chemistry/2010/s/TZ 1/Paper 1/Q# 6//www.SmashingScience.org :o)

- 6 Ammonium nitrate, NH_4NO_3 , can decompose explosively when heated.



What are the changes in the oxidation numbers of the two nitrogen atoms in NH_4NO_3 when this reaction proceeds?

- A -2, -4 B +2, +6 C +4, -6 D +4, -4



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 Sodium hydrosulfide, NaSH, is used to remove hair from animal hides.

Which statements about the SH⁻ ion are correct?

- 1 It contains 18 electrons.
- 2 Three lone pairs of electrons surround the sulfur atom.
- 3 Sulfur has an oxidation state of +2.

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 Which reactions are redox reactions?

- 1 $\text{CaBr}_2 + 2\text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{Br}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$
- 2 $\text{CaBr}_2 + 2\text{H}_3\text{PO}_4 \rightarrow \text{Ca}(\text{H}_2\text{PO}_4)_2 + 2\text{HBr}$
- 3 $\text{CaBr}_2 + 2\text{AgNO}_3 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{AgBr}$

7 Which conversion involves a reduction of chromium?

- A $\text{CrO}_4^{2-} \rightarrow \text{CrO}_3$
- B $\text{CrO}_4^{2-} \rightarrow \text{Cr}_2\text{O}_7^{2-}$
- C $\text{CrO}_2\text{Cl}_2 \rightarrow \text{CrO}_4^{2-}$
- D $\text{CrO}_2\text{Cl}_2 \rightarrow \text{Cr}_2\text{O}_3$

Mark Scheme ALVl Chem 6 EQ P1 22w to 09s Paper 1 Electrochemistry 50marks

12//www.SmashingScience.org :o)

12 | B

11//www.SmashingScience.org :o)

11 | C

17//www.SmashingScience.org :o)

17 | A

12//www.SmashingScience.org :o)

12 | C



Q# 310/ AS Chemistry/2022/s/TZ 1/Paper 1/Q#

11//www.SmashingScience.org :o)

11 | B

Q# 311/ AS Chemistry/2022/m/TZ 2/Paper 1/Q#

10//www.SmashingScience.org :o)

10 | A

Q# 312/ AS Chemistry/2021/w/TZ 1/Paper 1/Q#

9//www.SmashingScience.org :o)

9 | C

Q# 313/ AS Chemistry/2021/s/TZ 1/Paper 1/Q#

9//www.SmashingScience.org :o)

9 | D

Q# 314/ AS Chemistry/2021/m/TZ 2/Paper 1/Q#

8//www.SmashingScience.org :o)

8 | C

Q# 315/ AS Chemistry/2020/w/TZ 1/Paper 1/Q#

9//www.SmashingScience.org :o)

9 | B

Q# 316/ AS Chemistry/2020/w/TZ 1/Paper 1/Q#

8//www.SmashingScience.org :o)

8 | A

Q# 317/ AS Chemistry/2020/s/TZ 1/Paper 1/Q#

8//www.SmashingScience.org :o)

8 | B

Q# 318/ AS Chemistry/2020/s/TZ 1/Paper 1/Q#

2//www.SmashingScience.org :o)

2 | C

Q# 319/ AS Chemistry/2020/m/TZ 2/Paper 1/Q#

5//www.SmashingScience.org :o)

5 | D

Q# 320/ AS Chemistry/2020/m/TZ 2/Paper 1/Q#

10//www.SmashingScience.org :o)

10 | D

Q# 321/ AS Chemistry/2019/w/TZ 1/Paper 1/Q#

9//www.SmashingScience.org :o)

9 | D

Q# 322/ AS Chemistry/2019/w/TZ 1/Paper 1/Q#

6//www.SmashingScience.org :o)

6 | A

Q# 323/ AS Chemistry/2019/s/TZ 1/Paper 1/Q#

9//www.SmashingScience.org :o)

9 | B

Q# 324/ AS Chemistry/2019/m/TZ 2/Paper 1/Q#

33//www.SmashingScience.org :o)

33 | D

Q# 325/ AS Chemistry/2019/m/TZ 2/Paper 1/Q#

10//www.SmashingScience.org :o)

10 | B

Q# 326/ AS Chemistry/2018/w/TZ 1/Paper 1/Q#

8//www.SmashingScience.org :o)

8 | C

Q# 327/ AS Chemistry/2018/w/TZ 1/Paper 1/Q#

7//www.SmashingScience.org :o)

7 | B

Q# 328/ AS Chemistry/2018/s/TZ 1/Paper 1/Q#

14//www.SmashingScience.org :o)

14 | D

Q# 329/ AS Chemistry/2018/m/TZ 2/Paper 1/Q#

10//www.SmashingScience.org :o)

10 | D

Q# 330/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 6//

6 | A

Q# 331/ AS Chemistry/2017/w/TZ 1/Paper 1/Q# 33//

33 | A

Q# 332/ AS Chemistry/2017/s/TZ 1/Paper 1/Q#

9//www.SmashingScience.org :o)

9 | B

Q# 333/ AS Chemistry/2017/s/TZ 1/Paper 1/Q#

17//www.SmashingScience.org :o)

17 | A

Q# 334/ AS Chemistry/2017/m/TZ 2/Paper 1/Q#

36//www.SmashingScience.org :o)

36 | A

Q# 335/ AS Chemistry/2017/m/TZ 2/Paper 1/Q#

33//www.SmashingScience.org :o)

33 | B

Q# 336/ AS Chemistry/2016/w/TZ 1/Paper 1/Q#

9//www.SmashingScience.org :o)

9 | A

Q# 337/ AS Chemistry/2016/w/TZ 1/Paper 1/Q#

3//www.SmashingScience.org :o)

3 | D

Q# 338/ AS Chemistry/2016/s/TZ 1/Paper 1/Q#

33//www.SmashingScience.org :o)

33 | C

Q# 339/ AS Chemistry/2016/m/TZ 2/Paper 1/Q#

1//www.SmashingScience.org :o)

1 | A

Q# 340/ AS Chemistry/2015/w/TZ 1/Paper 1/Q#

33//www.SmashingScience.org :o)

33 | B

Q# 341/ AS Chemistry/2015/s/TZ 1/Paper 1/Q#

4//www.SmashingScience.org :o)

4 | B

Q# 342/ AS Chemistry/2014/w/TZ 1/Paper 1/Q#

2//www.SmashingScience.org :o)

2 | D

Q# 343/ AS Chemistry/2013/w/TZ 1/Paper 1/Q#

3//www.SmashingScience.org :o)

3 | B



Q# 344/ AS Chemistry/2013/w/TZ 1/Paper 1/Q#
2//www.SmashingScience.org :o)

2 **A**

Q# 345/ AS Chemistry/2013/w/TZ 1/Paper 1/Q#
16//www.SmashingScience.org :o)

16 **C**

Q# 346/ AS Chemistry/2013/s/TZ 1/Paper 1/Q#
11//www.SmashingScience.org :o)

11 **B**

Q# 347/ AS Chemistry/2012/w/TZ 1/Paper 1/Q#
1//www.SmashingScience.org :o)

1 **B**

Q# 348/ AS Chemistry/2012/s/TZ 1/Paper 1/Q#
10//www.SmashingScience.org :o)

10 **D**

Q# 349/ AS Chemistry/2011/w/TZ 1/Paper 1/Q#
2//www.SmashingScience.org :o)

2 **C**

Q# 350/ AS Chemistry/2011/s/TZ 1/Paper 1/Q#
2//www.SmashingScience.org :o)

2 **A**

Q# 351/ AS Chemistry/2010/w/TZ 1/Paper 1/Q#
4//www.SmashingScience.org :o)

4 **D**

Q# 352/ AS Chemistry/2010/s/TZ 1/Paper 1/Q#
6//www.SmashingScience.org :o)

6 **D**

Q# 353/ AS Chemistry/2010/s/TZ 1/Paper 1/Q#
33//www.SmashingScience.org :o)

33 **B**

Q# 354/ AS Chemistry/2010/s/TZ 1/Paper 1/Q#
32//www.SmashingScience.org :o)

32 **D**

Q# 355/ AS Chemistry/2009/w/TZ 1/Paper 1/Q#
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7 **D**

