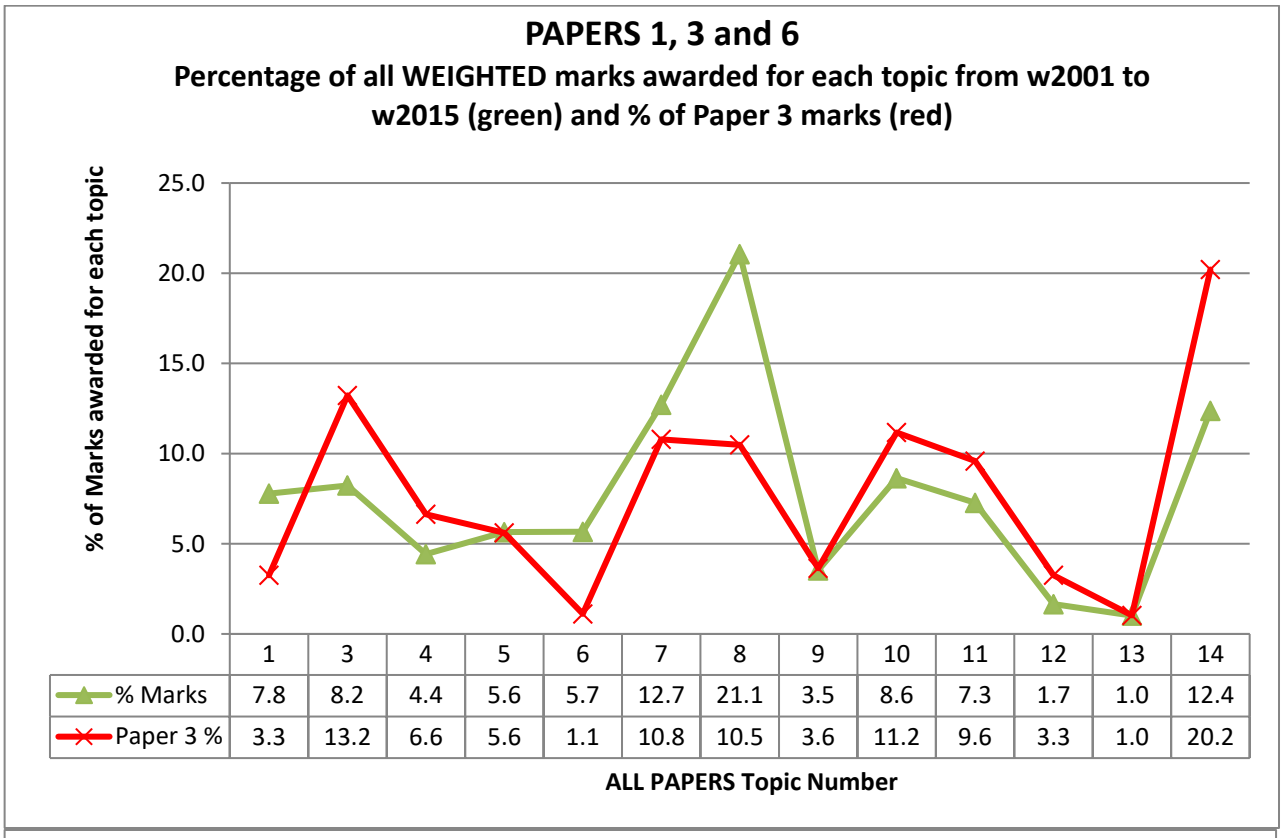
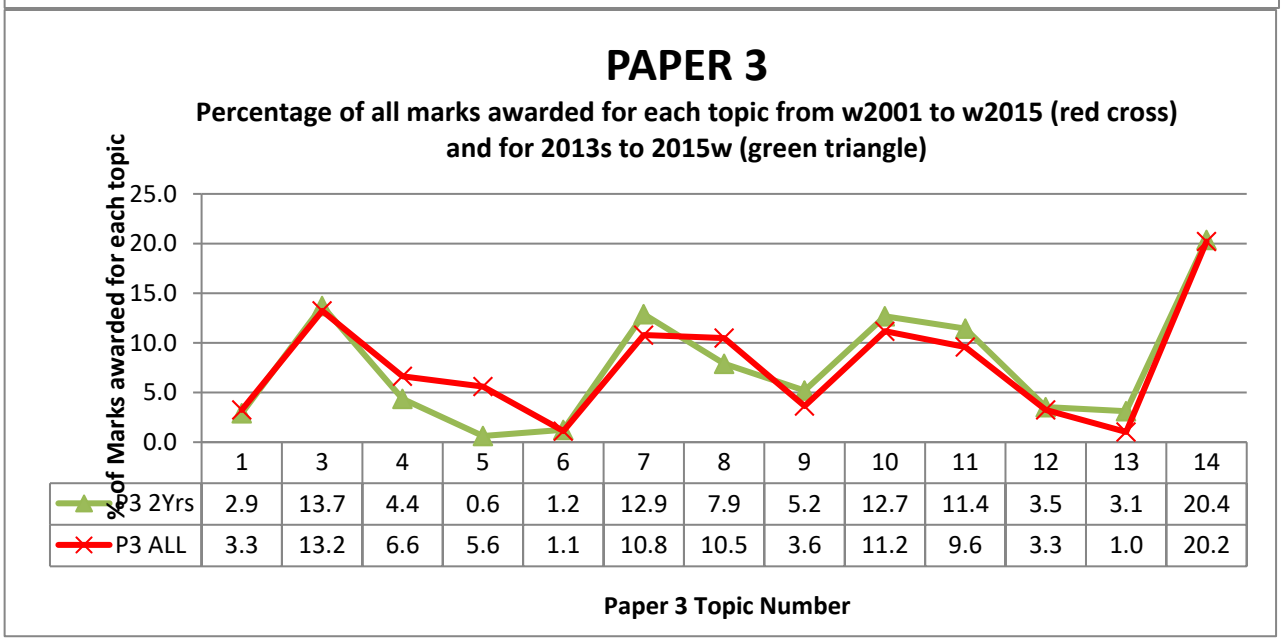
iG Chem 5 EQ P3 15w to 10s 4Students NEW





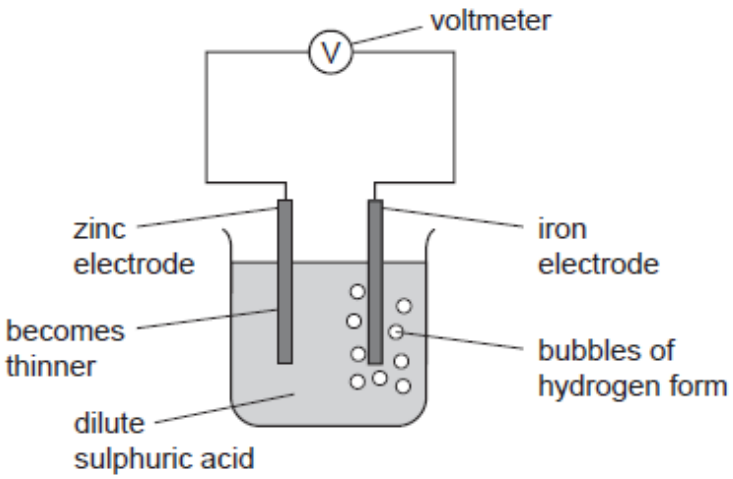
	Total	Chem 1	Chem 3	Chem 4	Chem 5	Chem 6	Chem 7	Chem 8	Chem 9	Chem 10	Chem 11	Chem 12	Chem 13	Chem 14
Total Marks	2320	74	312	155	81	26	256	246	85	296	231	76	24	474
% of Marks	2336	3.2	13.4	6.6	3.5	1.1	11.0	10.5	3.6	12.7	9.9	3.3	1.0	20.3
# of Questions		19	59	39	18	6	47	54	19	58	48	14	5	80
Average marks per Q		**3.9**	**5.3**	**4.0**	**4.5**	**4.3**	**5.4**	**4.6**	**4.5**	**5.1**	**4.8**	**5.4**	**4.8**	**5.9**

5. Electricity and chemistry

Core	Supplement
• Define electrolysis as the breakdown of an ionic compound, molten or in aqueous solution, by the passage of electricity • Describe the electrode products and the observations made during the electrolysis of: – molten lead(II) bromide – concentrated hydrochloric acid – concentrated aqueous sodium chloride – dilute sulfuric acid between inert electrodes (platinum or carbon) • State the general principle that metals or hydrogen are formed at the negative electrode (cathode), and that non-metals (other than hydrogen) are formed at the positive electrode (anode)	• Relate the products of electrolysis to the electrolyte and electrodes used, exemplified by the specific examples in the Core together with aqueous copper(II) sulfate using carbon electrodes and using copper electrodes (as used in the refining of copper) • Describe electrolysis in terms of the ions present and reactions at the electrodes in the examples given
• Predict the products of the electrolysis of a specified binary compound in the molten state • Describe the electroplating of metals • Outline the uses of electroplating • Describe the reasons for the use of copper and (steel-cored) aluminium in cables, and why plastics and ceramics are used as insulators	• Predict the products of electrolysis of a specified halide in dilute or concentrated aqueous solution • Construct ionic half-equations for reactions at the cathode • Describe the transfer of charge during electrolysis to include: – the movement of electrons in the metallic conductor – the removal or addition of electrons from the external circuit at the electrodes – the movement of ions in the electrolyte • Describe the production of electrical energy from simple cells, i.e. two electrodes in an electrolyte. (This should be linked with the reactivity series in section 10.2 and redox in section 7.4.) • Describe, in outline, the manufacture of: – aluminium from pure aluminium oxide in molten cryolite (refer to section 10.3) – chlorine, hydrogen and sodium hydroxide from concentrated aqueous sodium chloride (Starting materials and essential conditions should be given but not technical details or diagrams.)

(c) Cell reactions are both exothermic and redox. They produce electrical energy as well as heat energy.

(i) The diagram shows a simple cell.



Which substance in this cell is the reductant and which ion is the oxidant?

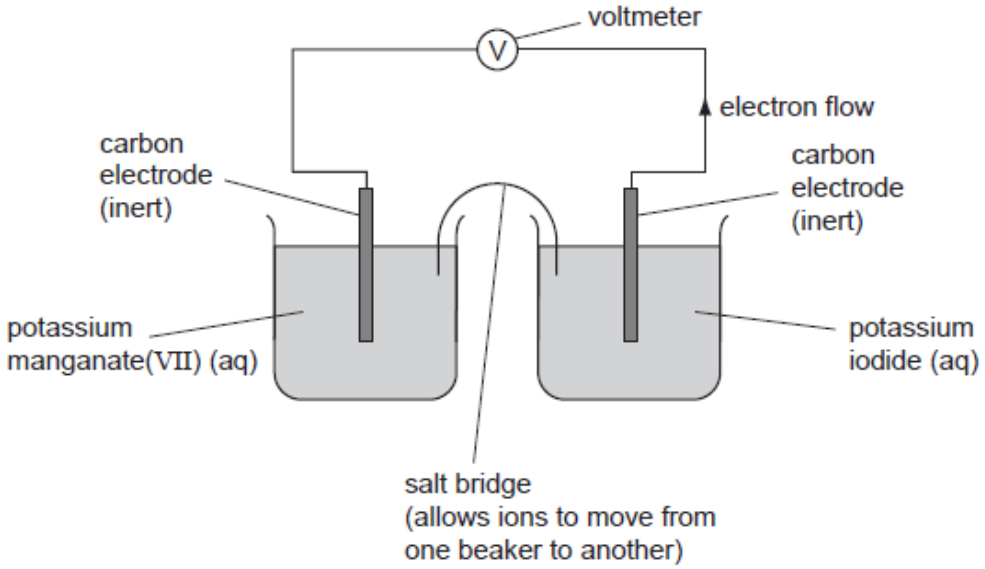
reductant .....

oxidant ..... [2]

(ii) How could the voltage of this cell be increased?

..... [1]

(d) Cells can be set up with inert electrodes and the electrolytes as oxidant and reductant.



The potassium manganate(VII) is the oxidant and the potassium iodide is the reductant.

(i) Describe the colour change that would be observed in the left hand beaker.

..... [2]

(ii) Write an ionic equation for the reaction in the right hand beaker.

..... [2]

Q# 133/ iGCSE Chemistry/2005/w/Paper 3/ Q5

(c) The major ore of strontium is its carbonate, $SrCO_3$. Strontium is extracted by the electrolysis of its molten chloride.

(ii) The electrolysis of molten strontium chloride produces strontium metal and chlorine. Write ionic equations for the reactions at the electrodes.

negative electrode (cathode) .....

positive electrode (anode) ..... [2]

(iii) One of the products of the electrolysis of concentrated aqueous strontium chloride is chlorine. Name the other two.

..... [2]

Q# 135/ iGCSE Chemistry/2004/s/Paper 3/ Q5

(b) Aqueous copper(II) sulphate solution can be electrolysed using carbon electrodes. The ions present in the solution are as follows.

$Cu^{2+}(aq)$, $SO_4^{2-}(aq)$, $H^+(aq)$, $OH^-(aq)$

(i) Write an ionic equation for the reaction at the negative electrode (cathode).

..... [1]

(ii) A colourless gas was given off at the positive electrode (anode) and the solution changes from blue to colourless.

Explain these observations.

.....

..... [2]

(c) Aqueous copper(II) sulphate can be electrolysed using copper electrodes. The reaction at the negative electrode is the same but the positive electrode becomes smaller and the solution remains blue.

(i) Write a word equation for the reaction at the positive electrode.

..... [1]

(ii) Explain why the colour of the solution does not change.

.....

..... [2]

(iii) What is the large scale use of this electrolysis?

..... [1]

Q# 136/ 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.

(b) All three metals can be obtained by the electrolysis of a molten halide. The electrolysis of the aqueous halides does not produce the metal.

(i) Complete the equation for the reduction of lanthanum ions at the negative electrode (cathode).

$$La^{3+} + \text{.....} \rightarrow \text{.....}$$

(ii) Name the **three** products formed by the electrolysis of aqueous caesium bromide.

.....

.....[4]

Q# 137/ iGCSE Chemistry/2003/s/Paper 3/

1 No one knows where iron was first isolated. It appeared in China, the Middle East and in Africa. It was obtained by reducing iron ore with charcoal.

(e) One of the methods used to prevent iron or steel from rusting is to electroplate it with another metal, such as tin. Complete the following.

The anode is made of ..... .

The cathode is made of ..... .

The electrolyte is a solution of ..... .

[3]

Q# 138/ iGCSE Chemistry/2002/w/Paper 3/ Q4

(b) Copper is refined by the electrolysis of aqueous copper(II) sulphate using copper electrodes. Describe the change that occurs at the electrodes.

(i) cathode (pure copper) .....

.....[1]

(ii) anode (impure copper) .....

.....[1]

(iii) Write an ionic equation for the reaction at the cathode.

.....[1]

(iv) If carbon electrodes are used, a colourless gas is given off at the anode and the electrolyte changes from a blue to a colourless solution.

The colourless gas is ..... .

The solution changes into ..... . [2]

(c) Electrolysis and cells both involve chemical reactions and electricity.

What is the essential difference between them?

.....

.....[2]

Q# 140/ iGCSE Chemistry/2002/s/Paper 3/

3 A major food retailer in the UK is going to distribute sandwiches using hydrogen-powered vehicles.

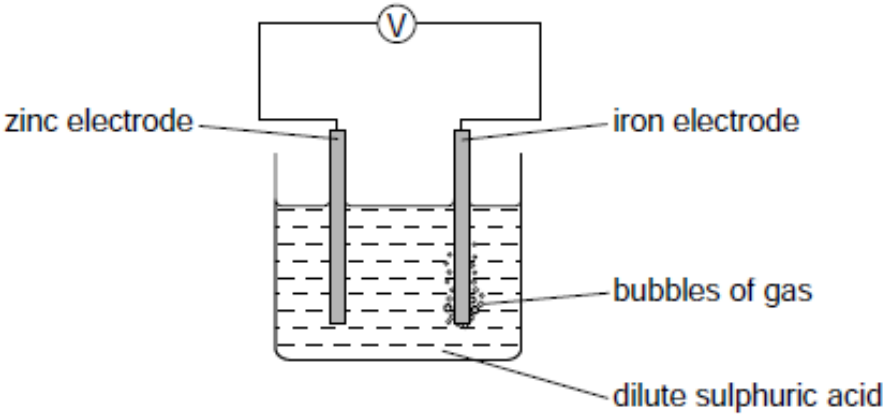
(c) Outline how hydrogen is manufactured from water.

.....

.....[2]

Q# 141/ iGCSE Chemistry/2001/w/Paper 3/ Q4

(e) The diagram below represents a simple cell.



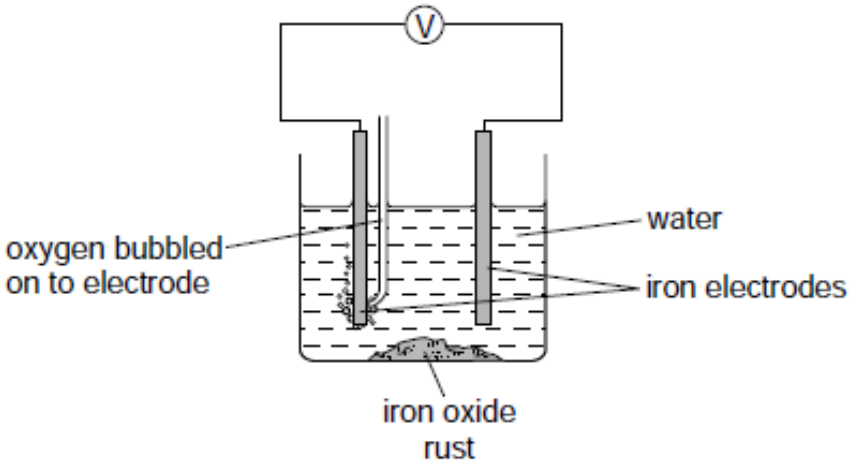
(i) Write an ionic equation for the reaction that occurs at the zinc electrode.

.....[1]

(ii) How could the voltage of the cell be increased?

.....[1]

(f) A different type of cell is drawn below.



(i) The pH of the solution increases. Give the name of the ion formed.

.....[1]

(ii) Complete the equation that represents the formation of this ion.

O_2 + ... H_2O + ... → ..... [2]

Mark Scheme

Q# 131/ iGCSE Chemistry/2006/s/Paper 3/ Q6

(c) (i) reductant zinc **[1]**
oxidant hydrogen (ions) **[1]**

(ii) magnesium instead of zinc **or** increase concentration of acid
or copper instead of iron **[1]**

(iii) sacrificial protection **or** stop iron/steel rusting **[1]**
or galvanising

(d) (i) pink **or** purple **[1]**
to colourless **or** decolourised **[1]**
NOT red **NOT** clear

(ii) $2I^- - 2e = I_2$ **[2]**
unbalanced **ONLY** [1]

Q# 133/ iGCSE Chemistry/2005/w/Paper 3/ Q5(c)

(ii) $Sr^{2+} + 2e = Sr$ **[1]**
$2Cl^- - 2e = Cl_2$ **[1]**
or $2Cl^- = Cl_2 + 2e$

(iii) hydrogen **[1]** and strontium hydroxide **[1]** **[2]**

Q# 135/ iGCSE Chemistry/2004/s/Paper 3/ Q5

(b) (i) $Cu^{2+} + 2e = Cu$ **[1]**

(ii) gas is oxygen **[1]**

(copper(II) sulphate) changes to sulphuric acid **[1]**
or copper ions removed from solution

(c) (i) copper atoms - electrons = copper ions **[1]**
accept correct symbol equation

(ii) concentration of copper ions does not change **or** **[1]**
amount **or** number of copper ions does not change

copper ions are removed and then replaced **[1]**
or copper is transferred from anode to cathode

(iii) refining copper **or** plating (core) **[1]**
or extraction of boulder copper

Q# 136/ iGCSE Chemistry/2003/s/Paper 3/ Q5

(b) (i) $La^{3+} + 3e- = La$ [1]
(ii) hydrogen [1]
bromine NOT Bromide [1]
caesium hydroxide [1]
ignore any comments about electrodes

Q# 137/ iGCSE Chemistry/2003/s/Paper 3/ QiGCSE Chemistry/201

(e) anode tin NOT impure time [1]
cathode iron or steel [1]
tin salt **or** tin ions as electrolyte [1]
NOT oxide or hydroxide or carbonate

Q# 138/ iGCSE Chemistry/2002/w/Paper 3/ Q4

(b) (i) **copper deposited or** mass increases [1]

(ii) copper goes into solution **or** mass decreases [1]

(iii) $Cu^{2+} + 2e^- \Longrightarrow Cu$ [1]

(iv) oxygen [1]
sulphuric acid accept hydrogen sulphate [1]

(c) (ii) cells produce electricity **or** exothermic **or** change chemical energy into electrical energy [1]

electrolysis uses it **or** endothermic **or** change electrical energy into chemical energy [1]

Q# 140/ iGCSE Chemistry/2002/s/Paper 3/ Q3

(c) (steam) and alkane [1]
heat or catalyst or details of chemistry – forms carbon monoxide/dioxide and (hydrogen) [1]

OR electrolysis [1]
brine or acidified water
or hydrogen forms at cathode [1]

OR carbon/coke [1]
heat or details of chemistry – forms carbon monoxide/dioxide and (hydrogen) [1]

Q# 141/ iGCSE Chemistry/2001/w/Paper 3/ Q4

(e) (i) $Zn - 2e \Rightarrow Zn^{2+}$ [1]

(ii) Higher reactivity metal instead of Zn
or lower instead of iron or bigger difference in reactivity or increase concentration of acid [1]

(f) (i) hydroxide [1]

(ii) $O_2 + 2H_2O + 4e \Rightarrow 4OH^-$ [2]
unbalanced only [1]
$O_2 + 2H_2O + 2Fe \rightarrow 2Fe(OH)_2$ [2]