



Mark

Junior Lyceum Programme

FORM 4 CHEMISTRY TIME: 1h 30min

Question	1	2	3	4	5	6	7	Global Mark
Max. Mark	10	16	15	11	8	20	20	100
Mark								

DO NOT WRITE ABOVE THIS LINE

Name: _____

Class: _____

Useful data: $1F = 96500C$; 1 mole of any gas at s.t.p. = $22.4dm^3$

Below is a copy of the periodic table.

PERIODIC TABLE

1		2																		3		4		5		6		7		0							
																		1 H 1																		4 He 2	
7 Li 3		9 Be 4																		11 B 5		12 C 6		14 N 7		16 O 8		19 F 9		20 Ne 10							
23 Na 11		24 Mg 12																		27 Al 13		28 Si 14		31 P 15		32 S 16		35.5 Cl 17		40 Ar 18							
39 K 19		40 Ca 20		45 Sc 21		48 Ti 22		51 V 23		52 Cr 24		55 Mn 25		56 Fe 26		59 Co 27		59 Ni 28		63.5 Cu 29		65 Zn 30		70 Ga 31		73 Ge 32		75 As 33		79 Se 34		80 Br 35		84 Kr 36			
85 Rb 37		88 Sr 38		89 Y 39		91 Zr 40		93 Nb 41		96 Mo 42		99 Tc 43		101 Ru 44		103 Rh 45		106 Pd 46		108 Ag 47		112 Cd 48		115 In 49		119 Sn 50		122 Sb 51		128 Te 52		127 I 53		131 Xe 54			
133 Cs 55		137 Ba 56		139 La 57		178 Hf 72		181 Ta 73		184 W 74		186 Re 75		190 Os 76		192 Ir 77		195 Pt 78		197 Au 79		201 Hg 80		204 Tl 81		207 Pb 82		209 Bi 83		210 Po 84		210 At 85		222 Rn 86			

Key

a	relative atomic mass
\mathbf{X}	symbol
b	atomic number

Section A: Answer ALL questions in this section, using the spaces provided.

This section carries 60 marks.

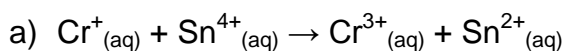
1. Use the periodic table provided to give the names of:

	Description	Name of element
1.	An alkali earth metal.	
2.	A halogen.	
3.	A non-metal with 4 electrons in its outer shell.	
4.	A metal in period 3.	
5.	A noble gas.	
6.	A metal which forms coloured compounds in which it has a charge of +2 or +3.	
7.	An element with the electron configuration of 2,8,2.	
8.	A yellow-green gas.	
9.	A metalloid.	
10.	A yellow solid that does not conduct electricity but burns in air to give an acidic oxide.	

(10 marks)

(Total: 10 marks)

2. For each of the following reactions state which substance has been oxidised and which has been reduced. Hence identify the oxidizing and reducing agents.

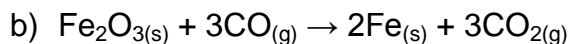


Substance oxidised: _____

Substance reduced: _____

Oxidising agent: _____

Reducing agent: _____

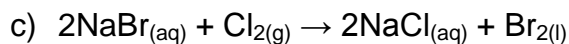


Substance oxidised: _____

Substance reduced: _____

Oxidising agent: _____

Reducing agent: _____

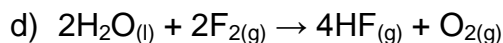


Substance oxidised: _____

Substance reduced: _____

Oxidising agent: _____

Reducing agent: _____



Substance oxidised: _____

Substance reduced: _____

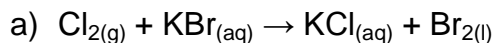
Oxidising agent: _____

Reducing agent: _____

(16 marks)

(Total: 16 marks)

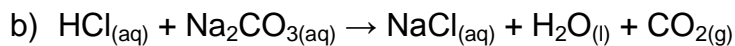
3. Balance each of the following reactions and then for each one write the ionic equation omitting spectator ions and the type of reaction taking place.



Balanced equation: _____

Ionic equation: _____

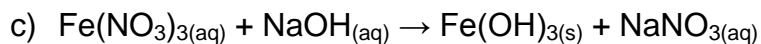
Type of reaction: _____



Balanced equation: _____

Ionic equation: _____

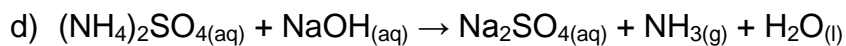
Type of reaction: _____



Balanced equation: _____

Ionic equation: _____

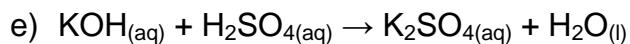
Type of reaction: _____



Balanced equation: _____

Ionic equation: _____

Type of reaction: _____



Balanced equation: _____

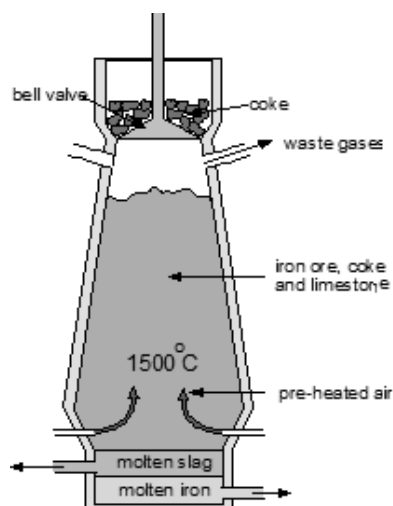
Ionic equation: _____

Type of reaction: _____

(15 marks)

(Total: 15 marks)

4. The diagram below illustrates an important industrial process.



a) What is this industrial plant called?

(1 mark)

b) Name 2 waste gases that are given off from this industrial plant.

(2 marks)

c) Write an important condition that is necessary for the reactions in this industrial process to occur rapidly.

(1 mark)

d) What is the iron ore called?

(1 mark)

e) (i) The most important part of this process is the extraction of iron from its ore by the reduction of iron (III) oxide to iron by carbon monoxide. Write a balanced chemical equation (including state symbols) for the reaction taking place.

(2 marks)

(ii) Carbon monoxide is not one of the raw materials for this industrial process. From which two raw materials is carbon monoxide produced?

(2 marks)

f) The limestone that is introduced in the blast furnace eventually decomposes to form calcium oxide and carbon dioxide. Write a balanced chemical equation (including state symbols) for the reaction taking place.

(2 marks)

(Total: 11 marks)

5. This question is about the electrolysis of concentrated sodium chloride solution.

a) i) Write the ionic half equation taking place at the cathode.

(2 marks)

ii) How would you test for the gas produced at the cathode?

(1 mark)

b) i) Write the ionic half equation taking place at the anode.

(2 marks)

ii) How would you test for the gas produced at the anode?

(1 mark)

c) i) After electrolysis of brine takes place what ions will be left in solution?

(1 mark)

ii) Give one important use for the solution left behind in electrolysis cell.

(1 mark)

(Total: 8 marks)

Section B: Answer BOTH the questions in this section on the separate sheets provided. This section carries 40 marks.

6. a) Two solutions of copper (II) sulfate were electrolysed for half an hour. One of the solutions was electrolysed using a carbon anode while the other was electrolysed with a copper anode. In both cases a copper cathode was used.

- i) Name the products at each electrode for the two copper (II) sulfate solutions and give an explanation for the reactions taking place at the electrodes. (Your answer must include ionic half equations for any mentioned reactions).
- ii) What changes, if any, occur at the electrodes and in the two copper (II) sulfate solutions.
- iii) Name two industrial applications of electrolysis.

(15 marks)

- b) A current of 10A is passed through a solution of silver nitrate for 15 minutes. What mass of silver will be deposited?

(5 marks)

(Total: 20 marks)

7. This question is about the group 1 metals of the periodic table, lithium, sodium, potassium and rubidium.

- a) What are the group 1 metals called? (1 mark)

- b) i) What happens to the size of the group 1 elements on going down the group? Why? (2 marks)

- ii) Which has the largest radius, a sodium atom or a sodium ion? Why? (2 marks)

- c) i) Sodium and potassium both react with cold water. Write down two observations of the reaction of these two metals with water to show that they have similar properties.

(2 marks)

- ii) Why do all group 1 metals have similar properties? (1 mark)

- iii) Write down 1 difference between the reaction of sodium and potassium with water and explain how the reactivity of group 1 metals changes on going down the group.

(2 marks)

iv) Why do you think the reactivity of the group 1 metals changes in this way?

(1 mark)

v) Write two balanced equations (including state symbols) to represent the reactions of sodium and potassium with water.

(6 marks)

d) Mention 3 other properties, apart from reactivity and atom size, that all group 1 metals have in common.

(3 marks)

(Total: 20 marks)