GOZO COLLEGE
SECONDARY SCHOOL

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YEAR 10   **CHEMISTRY**   **TIME: 1h 30min**

Name: _____   **Class:** _____

Useful Data: A copy of the Periodic Table is printed below.
Relative atomic mass may be taken as: Cu = 63.5
1 Faraday = 96, 500C
Q = It

Instructions to Candidates
⇒ Answer ALL questions in Section A. This section carries 60 marks.
⇒ Answer TWO questions from Section B. This section carries 40 marks.
⇒ You may use a calculator.

PERIODIC TABLE

Item Number	1	2	3	4	5	6	7	8	9	10	Total
Marks											

85% of Theory paper	15% Practical	100% final score

Section A: Answer all questions on the paper. This section carries 60 marks.

1. a) Lithium, sodium and potassium are members of Group 1 of the Periodic Table. What is name given to this group of elements?

_____ (1)

b) These metals show the usual physical properties as the other metals. But they also show unusual physical properties which can be considered as exceptions. Name two of these properties.

_____ (2)

c) When these metals are exposed to air, an oxide layer is formed. Write down the reaction of sodium with oxygen.

_____ (2)

d) How are these metals stored so as to prevent them from reacting with oxygen?

_____ (1)

e) Rubidium is also in Group 1. Is rubidium more or less reactive than sodium? Explain why.

_____

_____

_____

_____ (3)

2. Barium and calcium belong to Group 2 of the Periodic Table.

a) What name is given to this group of elements?

_____ (1)

b) The apparatus shown can be used to compare the reactivity of each element with water. A gas is produced in each case and is collected in the gas syringe. The plunger moves out as the syringe is filled with this gas.

Write an equation to show how barium reacts with water.

gas syringe
conical flask
reaction mixture
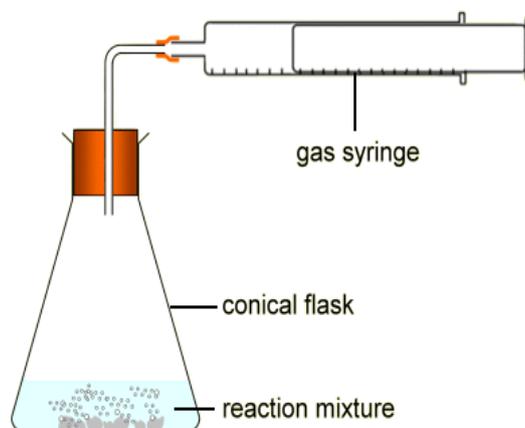
_____ (2)

c) After 1 minute, the plunger in the barium experiment had moved further away than that in the calcium experiment.
   i) Explain why this result is to be expected from the position of calcium and barium in the Periodic table.

   _____ (1)

   ii) Predict how the reactivity of magnesium would compare with that of barium and calcium.

   _____ (1)

d) Write a chemical equation for the reaction between magnesium and hydrochloric acid. State symbols are not required.

   _____ (2)

e) The block of transition metals lies between groups 2 and 3 of the Periodic Table. Name two <u>characteristic</u> properties unique to the metals in this block.

   _____
   _____ (2)

3. a) State the colour and the physical state at room temperature and pressure of the following halogens: (3)

	chlorine	bromine	iodine
state			
colour			

b) Fluorine and astatine are also in group 7. Predict their physical state at room temperature.
   fluorine: _____   astatine _____ (2)

c) Chlorine reacts with hydrogen to form an acidic gas. Write a balanced equation.

   _____ (2)

d) Sodium reacts with astatine to form a crystalline solid.

   i) The name of the compound formed is _____

   ii) The type of bonding present in this compound is _____ (2)

4. By referring to the Periodic Table provided give:
   a) the name of the lightest noble gas. _____
   b) the ion of the element which has a proton number of 47. _____
   c) the element which has the following electronic configuration: 2, 8, 5 _____
   d) the symbol of the element which has 79 protons in the nucleus of its atom._____
   e) the number of the first period which contains the transition metals _____
   f) the symbol of an element which has 4 electron shells and 3 electrons in its outermost shell _____   (6)

5. Molten lead (II) bromide can be electrolysed in a suitable apparatus using inert electrodes.
   a) What is meant by electrolysis?

   _____

   _____ (2)

   b) Write down the formulae of the ions present in the liquid.

   _____ (2)

   c) What is <u>seen</u> at each of the electrodes:

    i) at the anode _____

    ii) at the cathode _____ (2)

   d) Write ionic equations for the reaction at each electrode.

   at the anode: _____

   at the cathode: _____(4)

   e) Explain why lead (II) bromide had to be molten so as to be electrolysed.

   _____

   _____ (2)

6. A solution of copper (II) sulfate was electrolysed using copper electrodes. A current of 4 amperes was allowed to pass for 5 minutes. During this time, copper was deposited on the cathode.
   a) Write an equation for the reaction taking place at the cathode.

   _____ (2)

   b) How many Faradays are needed to produce one mole of copper atoms?

   _____ (1)

c) Calculate the quantity of electricity that flowed through the solution.

_____

_____ (2)

d) Calculate the mass of copper deposited.

_____

_____

_____ (3)

7. A strip of zinc is placed into a solution of copper (II) sulfate.
a) What is seen after some time?

_____ (1)

b) Why does this happen?

_____ (1)

c) Write an ionic equation for this reaction.

_____

_____ (2)

d) In another experiment, a crucible labelled A contained magnesium mixed with zinc oxide, while a crucible labelled B contained zinc mixed with magnesium oxide. Both of them were heated with a Bunsen burner. In which crucible (A or B) would there be a reaction? _____ (1)

e) Write a chemical equation for the reaction.

_____ (2)

Section B. **Answer any TWO questions from this section. Each question carries 20 marks. Write your answers on the foolscaps provided.**

8. a) Describe briefly a simple experiment to demonstrate the following trends going down the groups of the Periodic Table.

   i) In group 1, the element potassium is more reactive than sodium. (5)
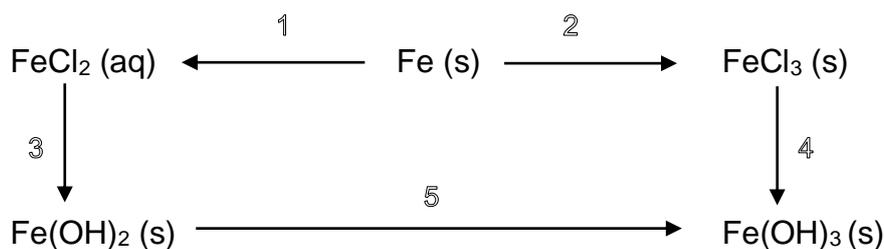   ii) In group 7, the element bromine is less reactive than chlorine. (5)

   Include in your answer the name of the reagent/ s involved, the observations and an equation for the reaction.

b) The electrolysis of brine (concentrated sodium chloride solution), produces two gases. Draw a labelled diagram of a simple electrolytic cell to show how this electrolysis can be carried out. (2)

c) Write down:

    i)   the formulae of all the ions in solution. (2)

    ii)   the name of the ion which is discharged at each electrode and the reason why it is selectively discharged. (4)

    iii)   the ionic half equation at the anode. (2)

9. The following is a reaction scheme involving the metal iron and its compounds.

$$FeCl_2 \text{ (aq)} \xleftarrow{\quad 1 \quad} Fe \text{ (s)} \xrightarrow{\quad 2 \quad} FeCl_3 \text{ (s)}$$

$FeCl_2$ (aq) — 3 ↓ — $Fe(OH)_2$ (s)

$FeCl_3$ (s) — 4 ↓ — $Fe(OH)_3$ (s)

$Fe(OH)_2 \text{ (s)} \xrightarrow{\quad 5 \quad} Fe(OH)_3 \text{ (s)}$

a) Name the <u>chemicals</u> needed to bring about the changes in reactions 1 to 5. (5)

b) Write down: i) the balanced chemical equations for reactions 1 and 2. (4)

              ii) the ionic equation for reaction 4 (omitting the spectator ions) (2)

              iii) the ionic equation for reaction 5 (in terms of electrons) (2)

c) In industry, iron is extracted in the Blast Furnace. Write down any two raw materials needed besides the iron ore. (2)

d) Write down the chemical equation which shows the conversion from iron ore into iron. (2)

e) What is the main impurity in the iron produced? (1)

f) Apart from iron, another material with limited use is produced. What is it called? (1)

g) Name any one method used to prevent iron from rusting. (1)

10.   a) i) Dilute sulfuric acid is to be electrolysed using a Hofmann voltameter. Draw a fully labelled diagram showing clearly which electrode is the anode and which is the cathode, the gases produced and their relative volumes at each electrode. (4)

    ii) Write down the equations showing how the two gases are produced at each electrode. (4)

    iii) Why is this experiment also called the electrolysis of water? (1)

  b) i) What is a metalloid? (2)

    ii) List (without explaining), the trends taking place across a period, as regards the following: valency, reactivity and type of oxide formed. (6)

    iii) By referring to atomic structure, explain what happens to the atomic radius across a period. (3)