JUNIOR LYCEUM AND SECONDARY SCHOOL
ANNUAL EXAMINATIONS 2009

Directorate for Quality and Standards in Education
Educational Assessment Unit

FORM 5 **CHEMISTRY** **TIME: 1h 45min**

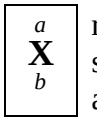
Name: _____ **Class: _____**

Useful Data: A copy of the Periodic Table is printed below.
Relative atomic mass may be taken as: H=1 C=12 N=14 O=16 Na=23 Al=27 S=32
One mole of any gas occupies 22.4 dm^3 at standard temperature and pressure
State symbols are expected to be included in all chemical equations.

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



relative atomic mass
symbol
atomic number

Marks Grid [For Examiners use only]

Question N°.	**Section A**						**Section B**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Max Mark	12	10	10	8	10	10	20	20	20	**Theory Total**
Actual Mark										

85% of Theory Paper	15% Practical	**100% Final Score**

Section A: Answer **ALL** questions in this section, using the space provided. This section carries 60 marks.

1a. Draw a dot/cross diagram, showing only the **outer** electron shells, to show the bonding in a **molecule** of hydrogen chloride.

[2]

b. Draw dot/cross diagrams, showing **all** electron shells, to show the electronic structure and charge of:

(i) the **metal ion** in sodium iodide.

[1½]

(ii) the **non-metal ion** in potassium chloride.

[1½]

c. (i) Name the test that can be used to identify the **cations** in potassium chloride and sodium iodide.

_____

(ii) Give the result/observation for each salt.

_____ **[3]**

d. (i) Name the reagent(s) that can be used to identify/distinguish the **anions** in solutions of potassium chloride and sodium iodide.

_____

(ii) Give the observation for each salt.

_____

_____ **[4]**

2. The following equation represents a system in dynamic equilibrium.

$$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)} \qquad \Delta H = -$$

a.(i) What would be the effect of increasing the temperature on the **rate**/**attainment** of equilibrium?

_____

(ii) Explain your answer to question a.(i) in terms of particle collisions.

_____

_____ **[3]**

b.(i) What would be the effect of increasing the temperature on the equilibrium position?

_____

(ii) Explain your answer to question b.(i) in terms of Le Chatelier's principle.

_____

_____ **[3]**

c.(i) What would be the effect of increasing the pressure on the **rate/attainment** of equilibrium?

_____

(ii) Give a reason for your answer to question c.(i).

_____

(iii) Would an increase of pressure have any effect on the equilibrium position?

_____

(iv) Give an explanation for your answer to question c.(iii).

_____ **[4]**

3. Magnesium and Calcium are both found in Group 2 of the Periodic Table and there similarities in properties.

a. State **one** similarity in their **physical** properties.

_____ **[1]**

b. Magnesium and calcium can be shown to be chemically similar by reacting both metals with the same reagent.

(i) State the **name** of **one** reagent with which both magnesium and calcium react.

_____

(ii) What would you **observe** during the reactions that shows that both metals have similar chemical properties?

_____

(iii) Write a balanced equation for the reaction that takes place between **one** of the metals and the reagent you named in question b.(i).

_____ **[4]**

c. Hardness of water is caused by soluble compounds of magnesium and calcium. Limestone is a form of calcium carbonate. Water from limestone districts is usually temporary hard.

(i) State the **name** of the compound formed by the action of rain water on limestone and is responsible for making water **temporary** hard.

_____

(ii) Write an equation to show the formation of temporary hardness by the action of rain water on limestone.

_____

(iii) State the name of **one** compound that causes **permanent** hardness**.**

_____

(iv) State **one** method that removes **both types** of hardness of water.

_____ **[5]**

4 a. Unless protected, objects made of iron quickly rust.

(i) Which **two** substances **must** be present for iron to rust?

_____

(ii) State **one** method used to prevent rusting.

_____ **[3]**

b. An iron nail is placed in copper (II) sulfate solution. Due to its position in the Activity Series, iron displaces copper.

(i) State **one** thing that would be **seen** after several hours.

_____

(ii) Write an ionic equation, omitting spectator ions, for this reaction.

_____

(iii) State whether the iron metal is oxidised or reduced, giving a reason for your answer.

_____ **[5]**

5. Sodium hydroxide solution is frequently used in the chemistry laboratory.

a. Give the name of **one** indicator that can be added to sodium hydroxide solution and state the colour it would give.

indicator: _____ colour: _____ **[2]**

b. Sodium hydroxide solution can be used to prepare salts by reaction with a dilute acid.

(i) Calculate the molar concentration of sodium hydroxide solution where 2.0g of sodium hydroxide was dissolved in 250cm^3 solution.

_____

_____

(ii) What is the name of the **practical method** that is used to react sodium hydroxide solution with dilute acid? _____ **[3]**

c. Sodium hydroxide solution is used in Qualitative analysis to identify or distinguish between solutions containing Cu^{2+}, Fe^{2+}, and Fe^{3+}.

(i) Select **one** of these ions and state the colour of the precipitate that would be given with sodium hydroxide solution. Ion selected _____ colour of precipitate _____

(ii) Write an **ionic** equation to show the formation of this precipitate.

_____ **[3]**

d. Sodium hydroxide can be used to prepare ammonia gas by reacting it with an ammonium salt. Write a balanced equation for **one** example of this general type of reaction.

_____ **[2]**

6. a. Give the **name** of the process by which diesel (gasoline) is obtained from crude

_____

b. The word equation below represents the process by which ethene is obtained from diesel in industry.

Diesel → octane + ethene

(i) Write the formula equation for this process.

_____

(ii) Name this process _____ **[3]**

c. In the laboratory, ethene can be obtained from ethanol.

(i) Give the name of this type of reaction. _____

(ii) Give the **name** of a reagent that reacts with ethanol to produce ethene and state **one** important condition for this reaction to occur.

_____

_____ **[3]**

d. Describe a chemical test for ethene and give an equation for the reaction.

(i) test: _____

(ii) equation: _____ **[3]**

Section B: Answer any **TWO** questions from this section on the separate sheets provi
Each question carries 20 marks.

7. Ammonia and sulfuric acid are two very important chemicals used in industry.

   a. (i) Give an equation for the industrial manufacture of ammonia gas and state the optimum (actual) conditions used in the process.
   (ii) Explain why a catalyst is necessary. **[7]**

   b. Sulfuric acid is manufactured from sulfur.

   (i) Write down two equations to show how sulfur is first converted to sulfur dioxide, and how sulfur dioxide is in turn converted to sulfur trioxide.
   (ii) Give a reason why sulfur trioxide cannot be dissolved directly in water and briefly describe how sulfur trioxide is converted to concentrated sulfuric acid. (equations are not required) **[6]**

   c. Ammonia and sulfuric acid are used to make fertilizers.

   (i) Write an equation for the reaction between ammonia and sulfuric acid to produce ammonium sulfate.
   (ii) State one way how fertilisers help in the growth of healthy plants. **[3]**

   d. Show by means of calculations that urea $CO(NH_2)_2$ has a higher percentage by mass of nitrogen than ammonium sulfate $(NH_4)_2SO_4$. **[4]**

8. a. Describe the industrial electrolysis of brine (concentrated sodium chloride solution) using a membrane cell. In your answer include a **labelled outline diagram** of the membrane cell, name the **three** products and give equations for the electrode reactions. **[12]**

   b. State **one large scale** use for each of the three products. **[3]**

   c. Another important industrial application of electrolysis is the extraction of aluminium.

   (i) Write the ionic half equation for the discharge of aluminium ions and use it to calculate the number of Faradays required to deposit 1kg of the metal.
   (ii) Give **one** large scale use of aluminium and state the property on which this use depends. **[5]**

9. The following statements refer to the chemistry of carbon and its compounds.

   a. Methane burns harmlessly in a plentiful supply of air to form two gases but if the air supply is limited, then a poisonous gas or a black solid is produced.

      (i) Explain the difference between these two combustion reactions.
      (ii) State what would be **seen** in each case and **name** the products described in the statement.
      (iii) Write an equation for burning methane in a plentiful supply of air. **[10]**

   b. There is only one hydrocarbon with the molecular formula C_2H_6 but there are two isomers with the molecular formula C_4H_{10}.
      (i) Give the name and structural formula for C_2H_6.
      (ii) Give the name for C_4H_{10} and the structural formulae for its two isomers. **[5]**

   c. Carbon exists in two forms – diamond and graphite, which have different physical properties.
      What are these two different forms called?
      Describe **two** physical differences between them. **[5]**

_____ End of Exam Paper _____