

JUNIOR LYCEUMS ANNUAL EXAMINATIONS 2001

Educational Assessment Unit - Education Division

FORM 5

CHEMISTRY

TIME : 1hr 45min

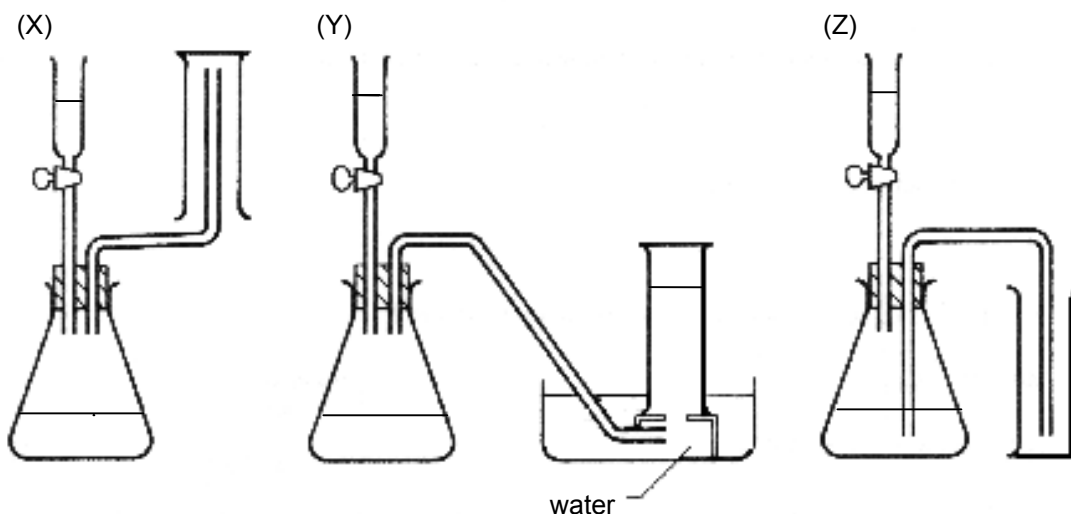
Name: _____

Class: _____

Useful Data: A copy of the Periodic Table is provided with this paper.
 One mole of any gas occupies 22.4dm^3 at standard temperature and pressure.
 Relative atomic mass may be taken as: Zinc Zn = 65
 Standard temperature and pressure = 0°C and 760mm Hg

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

1. The three sets of apparatus, X, Y and Z, shown below were set up by students to prepare and collect gases.



- a) Complete the table below for the preparation and collection of a gas using apparatus (X) and apparatus (Y).
 The gas prepared by each method **must be different**.

Apparatus	Name of gas to be prepared	Names of reagents to be used in preparation	Physical property on which the method of collection depends
X			
Y			

(8 marks)

1. b) (i) Name a gas that can be collected by the method shown in apparatus (Z).

_____.

(ii) On the diagram, circle the fault in the set up of apparatus (Z). (2 marks)

2. Give the name of the process which occurs when:

a) solid iodine is obtained from iodine vapour _____.

b) liquid water is obtained from water vapour _____.

c) a liquid becomes a vapour without bubbling _____.

(3 marks)

3. a) Magnesium oxide is an ionic compound. Draw diagrams, showing ALL electron shells, to represent the magnesium and oxide ions.

(4 marks)

b) Draw a dot/cross diagram, showing OUTER electrons only, to show the bonding in a molecule of water.

(3 marks)

4. a) For each of the following aqueous solutions state whether the pH is 7, less than 7, or greater than 7.

- (i) lime water _____.
- (ii) vinegar _____.
- (iii) common salt _____.
- b) Wasp stings are alkaline
- (i) Which of the above substances could be used to ease the pain?
_____.
- (ii) What type of reaction occurs to ease the pain? _____.
- (5 marks)

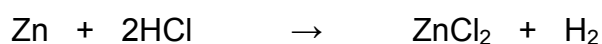
5. This question concerns the following elements -
magnesium, sodium, iron, aluminium, bromine, argon.
Select the element which:
- a) forms coloured ions _____
- b) exists as a liquid at room temperature _____
- c) does not tend to form compounds _____
- d) reacts vigorously with cold water _____
- e) forms an amphoteric oxide _____
- (5 marks)

6. Complete the table below, which shows the products formed when some substance are electrolysed under certain conditions.

Electrolyte and Condition	Cathode product	Anode product
_____sodium chloride using graphite electrodes	sodium	chlorine
dilute sulphuric acid using platinum electrodes	_____	_____
aqueous copper (II) sulphate using _____ electrodes	copper deposited	anode corrodes (goes into solution)

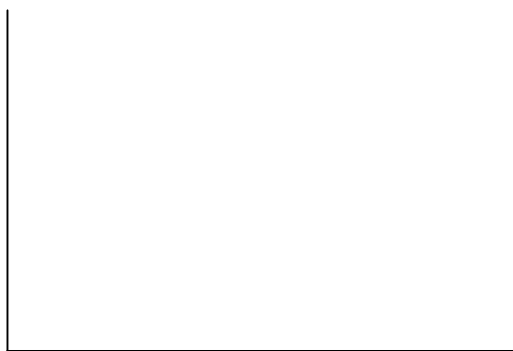
(4 marks)

7. Excess of dilute hydrochloric acid was added to zinc metal which reacted according to the following equation



The volume of hydrogen liberated was recorded at fixed time intervals.

- a) (i) Name this type of reaction _____ (1 mark)
(ii) Give an ionic equation for this reaction.
_____ (2 marks)
- b) (i) Give the name of a suitable piece of apparatus for measuring the volume of hydrogen evolved. _____ (1 mark)
(ii) Label the axes below and sketch the curve you would expect to obtain if the results of this experiment were plotted on a graph. (2 marks)



- c) If 0.26g of zinc are used in this experiment, calculate the volume of hydrogen, in cm^3 , that would be liberated at stp. (3 marks)
- d) If this experiment was carried out under laboratory conditions (temperature 21°C and a pressure of 760mm Hg). Calculate the volume that the hydrogen gas would occupy under these conditions. (2 marks)

8. Describe one test, in each case, to distinguish between:

- a) the cation (positive ion) in NaCl and KCl

test _____

result with NaCl _____

result with KCl _____

- b) the anion (negative ion) in solutions of NaBr and NaI

test _____

result with NaBr _____

result with NaI _____

- c) the cation (positive ion) in solutions of FeCl₂ and FeCl₃

test _____

result with FeCl₂ _____

result with FeCl₃ _____

(9 marks)

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9. a) Give the **name** and **formula** of the main **organic product** obtained when each of the following procedures is carried out.

- (i) a mixture of methane and chlorine is exposed to ultraviolet light.

name _____ formula _____.

- (ii) a mixture of ethene and steam is passed over phosphoric acid catalyst at high temperature and pressure.

name _____ formula _____.

- (iii) a mixture of propene and hydrogen is passed over a hot metal catalyst.

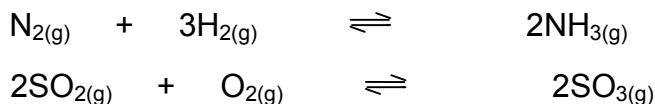
name _____ formula _____.

(6 marks)

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

10. (a) Describe a reaction which could be investigated in the laboratory which is a *reversible chemical change*. (4 marks)

- (b) The equations below represent the catalysed reactions in the Haber process and Contact process respectively.



Both of these processes involve 'chemical dynamic equilibrium'. In both cases the forward reaction is exothermic.

Choose **ONE** of these processes. Then-

- Use Le Chatelier's principle to explain the 'theoretical conditions' of pressure, temperature and concentration, that would favour the forward reaction.
(12 marks)
- State the optimum (actual) conditions used in the process, including the name of any catalyst used. (4 marks)

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11. Petroleum is the main source of fuels and many organic chemicals, however crude oil has to be refined in order to obtain these useful products.
- What type of organic compounds are present in crude oil and why is it necessary to refine the crude oil to obtain the products? (2 marks)
 - The two main processes used in refining are fractionation (fractional distillation) and cracking. Describe the principles involved in these two processes and indicate clearly why fractionation is a physical process while cracking is a chemical process. (10 marks)
 - Name **two** substances obtained as a result of fractionation, giving a use of each substance.
 - Name **one** substance obtained as a result of cracking, which is a different type of organic compound to those obtained in c(i). Give one use of this substance. (6 marks)
 - Crude oil contains small amounts of sulphur. Suggest a problem that may arise if sulphur is not removed from fuels. (2 marks)

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12. Explain each of the following statements, giving equations where appropriate.
- A solution of hydrogen chloride in water affects pH indicator and reacts with a carbonate, while hydrogen chloride dissolved in methyl benzene does not show these properties. (6 marks)
 - The process used to extract aluminium from aluminium oxide is much more expensive than the process used to extract iron from iron oxide. (8 marks)
 - Water flowing through limestone dissolves a substance which produces a solid coating on the inside of kettles or hot water pipes. (6 marks)
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