

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 2 3051/2

Tuesday **6 JUNE 2006** 1.50 – 3.20 P.M.

Additional materials:
Periodic Table

<h2 style="margin: 0;">MINISTRY OF EDUCATION NATIONAL EXAMINATIONS</h2>

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the space provided on this page.

Answer ALL questions on this paper in the spaces provided.

Read each question carefully and make sure you know what you have been asked to do before starting your answer.

The instruction NAME . . . requires an answer in words not chemical symbols.

Show ALL working when answering numerical questions.

The number of marks is given in brackets [] at the end of each question or part question.

FOR EXAMINER'S USE	
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TOTAL	

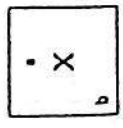
This question paper consists of 16 printed pages and 4 blank pages.

The Periodic Table of the Elements

		Group																																																																																													
I	II	III	IV	V	VI	VII	0																																																																																								
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1	11 B Boron 5	12 C Carbon 6	13 Al Aluminum 13	14 N Nitrogen 7	15 O Oxygen 8	16 F Fluorine 9	17 Ne Neon 10	18 Ar Argon 18	19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	55 Cs Cesium 55	56 Ba Barium 56	57 La Lanthanum 57	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86	87 Fr Francium 87	88 Ra Radium 88	89 Ac Actinium 89	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number



Key

1. Carbon dioxide is produced when coal and propane are used as fuels. Sulphur dioxide is made when sulphur or sulphur-containing compounds are burned.

(a) Define the term fuel.

_____ [1]

(b) (i) Name an environmental problem caused by the production of carbon dioxide.

_____ [1]

(ii) Give ONE practical consequence of this problem.

_____ [1]

(iii) Name an environmental problem caused by the production of sulphur dioxide.

_____ [1]

(iv) State TWO effects this pollutant can have on the environment.

1 _____

2 _____ [2]

(c) (i) Name the TWO products of the complete combustion of propane.

1 _____

2 _____ [2]

(ii) Name the product formed when $\text{SO}_2(\text{g})$ reacts with oxygen in the presence of a catalyst.

_____ [1]

- (d) Suggest a method of energy production that does not depend on the burning of fossil fuels.

[1]

Total marks [10]

2. This question is about the Periodic Table.

(a) Name the element found in Group II, Period 4. _____

(b) (i) Name the element which has a proton number of 50.

(ii) State the number of neutrons in one atom of this element.

(iii) State whether this element is a solid, a liquid or a gas at r.t.p.

(c) State TWO possible valencies of the element with atomic number 26.

(d) Modern Bahamian pennies are made of zinc alloyed with a less reactive metal.

State the atomic number of this less reactive metal.

(e) Name the first member of the halogen family. _____

(f) Name the element with the same atomic mass as argon.

[8]

(g) Draw a Lewis diagram (using outer electrons only) of the oxygen molecule.

[2]

Total marks [10]

3. The list illustrates a number of human activities that could affect the quality of well water on an island and/or the sea water around an island.

a car wash	insect pest control
changing oil in a car's engine	use of fertilisers
home construction	untreated sewage

- (a) Name one waste material that could affect the quality of the well water or sea water produced by the

(i) fluids of the car's engine;

(ii) large cultivation of vegetables.

_____ [2]

(iii) Explain why a car wash could be bad for the environment.

_____ [2]

(iv) Name the organisms which would most likely feed on the waste materials that enter the water.

_____ [1]

(b) A large scale farming operation uses a fertilizer with the formula 10-30-20.

(i) State what the 30 in this formula represents.

(ii) State the percentage of non-nutrients in the formula.

(iii) Explain how the use of excess fertilizer might affect marine life.

_____ [4]

(c) State the name given to unwanted and harmful materials released into the environment.

_____ [1]

Total marks [10]

4. The attractive blue flame in a gas stove indicates that it runs mainly on natural gas, which consists mostly of methane.

(a) (i) Compare the relative amounts of oxygen and methane that must be used to produce the blue flame.

_____ [1]

(ii) Name a dangerous product which may be formed if the flame is yellow.

_____ [1]

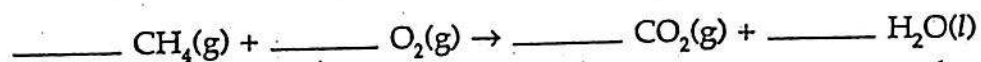
(iii) Suggest, with a reason, which flame, blue or yellow, will give more heat.

_____ [2]

(iv) Natural gas also contains significant amounts of ethane. Write the molecular formula of ethane.

_____ [1]

(b) The burning of methane in a gas stove is shown as an unbalanced equation.



(i) Fill in the blank spaces to balance the equation. [2]

(ii) Name the type of chemical reaction taking place.

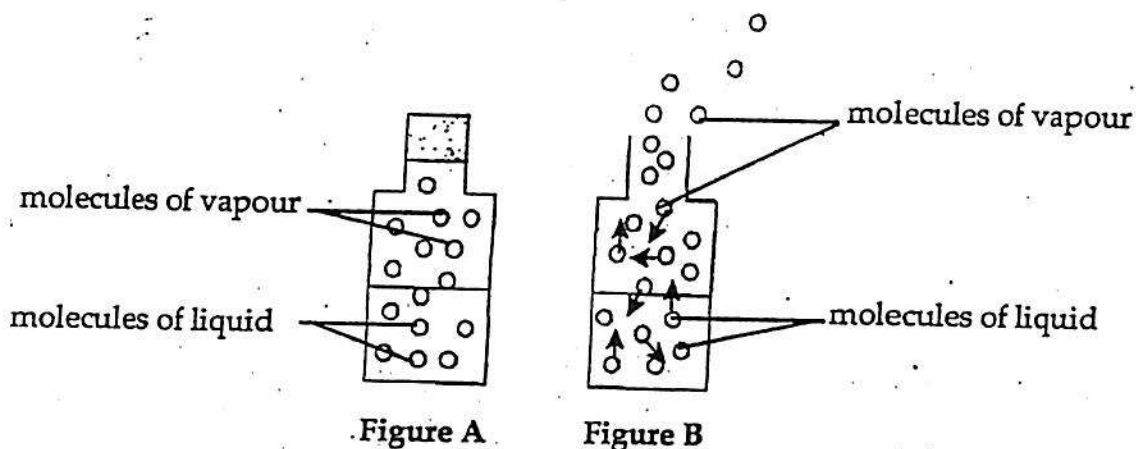
_____ [1]

(iii) Calculate the volume of carbon dioxide, measured at r.t.p., which would be produced from burning 2 moles of methane.

[2]

Total marks [10]

5. The diagrams show containers with phases of water. Each container is a system involving both liquid water and water vapour.



- (a) State which container will absorb energy from its surroundings. Explain your answer.

[2]

- (b) For each activity, explain the observation by referring to the change of state and the loss or gain of energy.

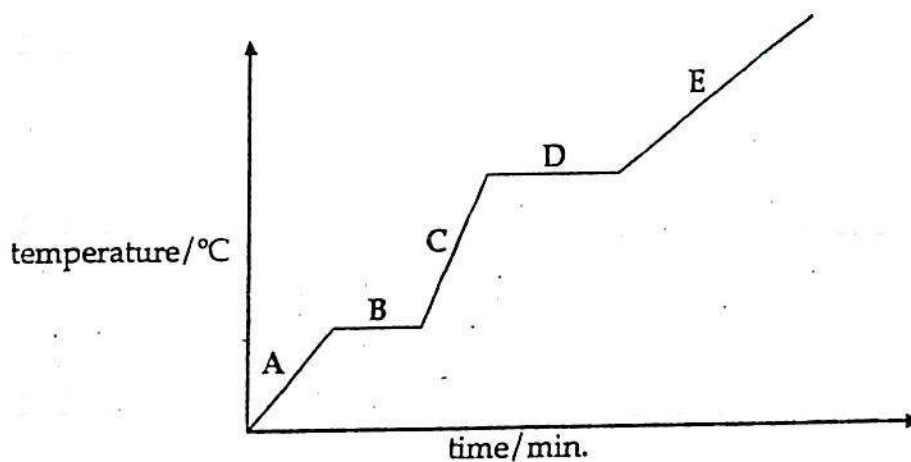
- (i) Rubbing alcohol (a liquid) placed on the back of a hand produces a cooling sensation.

[2]

- (ii) Crushed dry ice (solid carbon dioxide) placed in a balloon using a funnel causes the balloon to inflate.

[2]

The graph shows changes in temperature over time as $\text{H}_2\text{O}(\text{s})$ is heated.



(c) (i) State the temperature that would be recorded at B and D.

B _____

D _____

[2]

(ii) Explain why the temperature remains steady in part B of the graph.

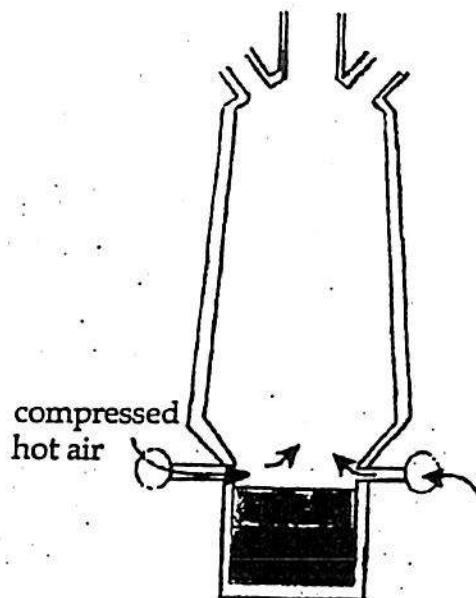
_____ [1]

(iii) Explain why the temperature remains steady in part D of the graph.

_____ [1]

Total marks [10]

6. The diagram is a simplified version of a common industrial process.



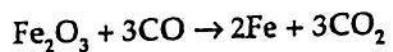
- (a) On the diagram use arrows and labels to indicate the location
- (i) where the exhaust gases are forced out;
 - (ii) where the raw materials are added;
 - (iii) where the liquid iron is collected and removed;
 - (iv) where the slag is removed. [4]

(b) (i) State the name of this process.
_____ [1]

(ii) Name the ore containing iron(III) oxide that is commonly used in this process.
_____ [1]

(iii) Name ONE other raw material (excluding the ore and the hot air) needed to complete this industrial process.
_____ [1]

- (c) (i) In the reaction



Name the substance which is reduced.

_____ [1]

- (ii) Compare the volume of carbon monoxide used with the volume of carbon dioxide produced in this reaction.

_____ [1]

- (iii) State how much iron would be produced from one ton of iron(III) oxide based on this reaction. [A_r: Fe, 56; O, 16]

_____ [1]

Total marks [10]

7. Magnesium sulphate crystals, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}(\text{s})$, can be made by adding excess magnesium oxide (insoluble in water) to dilute sulphuric acid. The mixture is heated.

(a) (i) Name the type of reaction that converts magnesium oxide to magnesium sulphate.

(ii) Give one reason why it is necessary to use excess magnesium oxide.

(iii) State how the excess magnesium oxide can be removed.

_____ [3]

(b) Consider the reaction

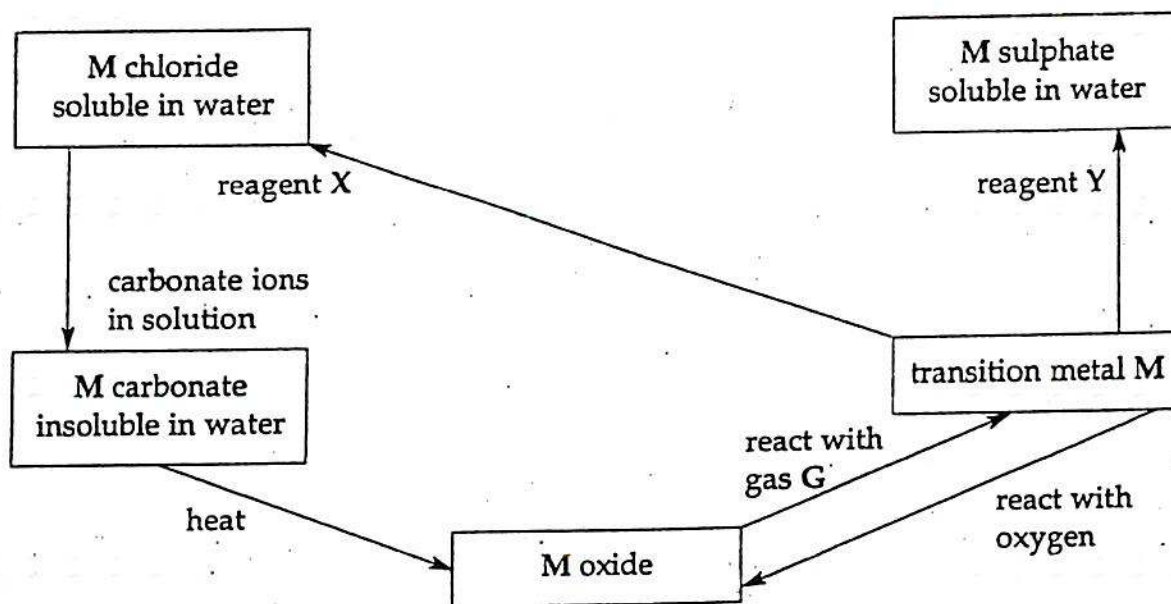


State TWO changes you would expect to see when a piece of magnesium ribbon is added to a green solution of iron(II) sulphate.

Change 1 _____

Change 2 _____ [2]

(c) The diagram shows some reactions of a transition metal M and its compounds.



(i) Suggest the names of the chemicals that can be used to convert metal M into

M chloride _____

M sulphate _____ [2]

(ii) Sodium hydrogencarbonate solution contains carbonate ions. Explain how you would obtain a sample of M carbonate powder, starting from M chloride crystals.

_____ [2]

(iii) If M oxide is heated and gas G is passed over it, metal M is obtained.

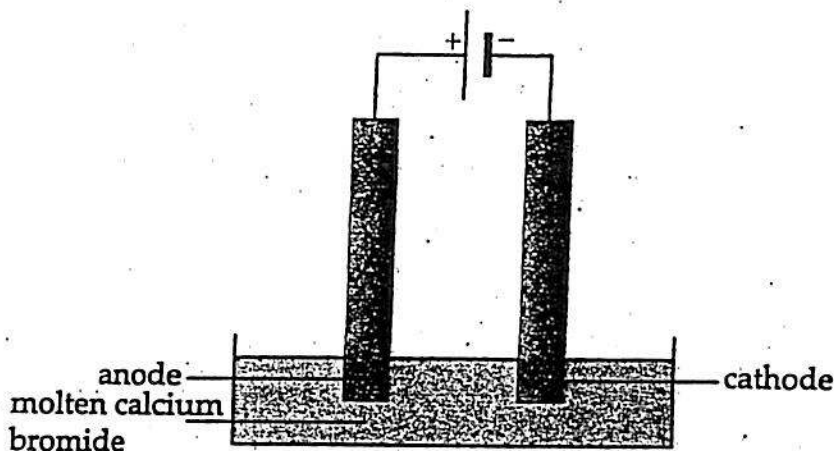
Name gas G.

_____ [1]

Total marks [10]

8. Electrochemistry is the study of the effect of passing an electric current through substances in solution or in a liquid state.

Calcium bromide can be electrolyzed in either its molten or aqueous form.



- (a) State one ion that is present in an aqueous solution of calcium bromide but NOT present when calcium bromide is molten.
_____ [1]
- (b) (i) Write in symbolic form the ions present in molten calcium bromide.
_____ and _____ [2]
- (ii) What type of compound can be an electrolyte?
_____ [1]
- (c) (i) An electrolysis apparatus has two electrodes.
Name the electrode at which calcium metal will be deposited when molten calcium bromide is used as an electrolyte.
_____ [1]
- (ii) State whether the formation of the calcium is an oxidation or reduction process.
_____ [1]

(d) (i) Name an electrolyte containing silver.
_____ [1]

(ii) Name a metal, used in the automotive industry, that can be deposited onto another metal by electrolysis.
_____ [1]

(e) Galvanizing can be done by either hot dipping in the molten metal or by electrolyzing. Name the metal used and a reason for galvanizing.

metal _____ [1]

reason _____

_____ [1]

Total marks [10]