School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 2 3051/2

Thursday **22 MAY 2008** 1.50 – 3.20 P.M.

No additional materials required

MINISTRY OF EDUCATION
NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION 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 spaces provided above.

Answer **ALL** the questions on this paper.

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

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

Show **ALL** your working when answering numerical questions. Lines are provided on the question paper for your answers. You should write your answers on these lines only.

The mark for each part-question is given in brackets [ ].

A copy of the Periodic Table is printed on page 2.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

This question paper consists of 14 printed pages and 2 blank pages.

The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H Hydrogen 1										4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

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

Key: a X b — a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

1. This question is about the elements found in the Periodic Table.

(a) Name the element located at Period 4, Group II. _____ [1]

(b) Name the element with the symbol Os. _____ [1]

(c) State the number of alkaline earth metals. _____ [1]

(d) Write the symbol for the most reactive halogen. _____ [1]

(e) Name a metal found in Period 3 that forms an amphoteric oxide. _____ [1]

(f) State the number of neutrons in a titanium-48 atom. _____ [1]

(g) Name the atom with electronic configuration: 2,8,6. _____ [1]

(h) Name the transition element with the lowest atomic number. _____ [1]

(i) Draw a diagram to show how the carbon dioxide molecule is bonded together. (Use the outer electrons only.) [2]

Total marks [10]

2 Magnesium ions can be precipitated from sea water as magnesium hydroxide, $Mg(OH)_2$. The magnesium hydroxide is converted to magnesium chloride by reaction with hydrochloric acid. Magnesium metal is then obtained by electrolysis of molten magnesium chloride.

(a) (i) Balance the equation for the conversion of magnesium hydroxide to magnesium chloride.

$$\_\_ Mg(OH)_2 + \_\_ HCl \longrightarrow \_\_ MgCl_2 + \_\_ H_2O \quad [2]$$

Equations **A** and **B** show reactions taking place when magnesium and chlorine are formed by electrolysis.

A $Mg^{+2} + 2e^- \longrightarrow Mg$

B $2Cl^- \longrightarrow Cl_2 + 2e^-$

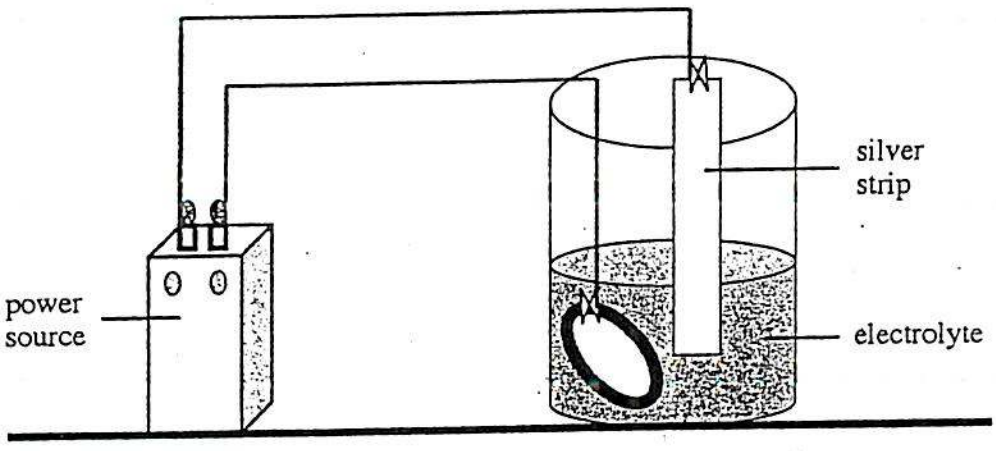
(ii) Identify which of the reactions **A** or **B** is a reduction reaction.

_____ [1]

(iii) Name the product formed at the negative terminal (cathode).

_____ [1]

(b) The drawing shows the process of electroplating a steel bracelet with silver.



(i) Give the name and sign (+ or –) of the electrode that is the steel bracelet.

_____ [1]

(ii) Give the name and sign (+ or –) of the electrode that is the silver strip.

_____ [1]

(iii) **On the diagram,** draw arrows to show the pathway of electrons. [1]

(iv) Name the particles in the solution which carry the electric current.

_____ [1]

(v) Suggest the name of a chemical that can be used as the electrolyte.

_____ [1]

(vi) State how the rate of corrosion of the steel will be affected by electroplating it with silver.

_____ [1]

Total marks [10]

3. Plastics are made from petroleum. They are chemically and biologically inert. Old bottles can be recycled and used to make a variety of products such as plastic boxes, trash cans etc.

(a) Using the information given above, explain why plastic recycling is important to the environment.

_____

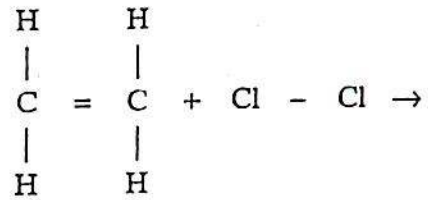
_____ [2]

(b) Ethene, made from petroleum, can be used as a monomer in making plastic.

(i) Name one polymer made from ethene.

_____ [1]

(ii) Ethene will react with chlorine. Complete the equation by drawing the structural formula of the product.



[1]

ethene chlorine

(iii) Explain how electrons hold the two carbon atoms together in the ethene molecule.

_____

_____ [1]

(iv) Classify the type of reaction between ethene and chlorine.

_____ [1]

(v) Name the type of organic molecules that will undergo this type of reaction.

_____ [1]

(c) Esters are common in plants and are responsible for some distinctive fragrances in fruits. The scent and flavour of an ester varies depending upon the alcohol and the organic acid that are reacted to form it.

Fill in the blanks to complete the table.

alcohol	organic acid	ester	fragrance
	butanoic acid	ethylbutanoate	pineapple
pentanol		pentylethanoate	banana
methanol	butanoic acid		apple

[3]

Total marks [10]

4. A list of oxides is shown.

aluminum oxide	**carbon monoxide**	**sulphur dioxide**
calcium oxide	**carbon dioxide**	**water**

Answer the questions using the oxides from the list.

(a) Name **two** acidic oxides.

1 _____

2 _____ [2]

(b) Name the oxide that is produced when methane burns in a limited supply of oxygen.

_____ [1]

(c) Name the oxide which reacts with water in the atmosphere to form acid rain.

_____ [1]

(d) The formula for aluminum oxide is Al_2O_3.

Calculate the relative molecular mass for aluminum oxide.

[3]

(e) Calcium oxide reacts with water to produce calcium hydroxide.

Name the products of the reaction between calcium hydroxide and hydrochloric acid.

_____

_____ [2]

(f) Name the type of reaction which occurs between calcium hydroxide and hydrochloric acid.

_____ [1]

Total marks [10]

5. A gardener purchased a bag of inorganic fertilizer, with the marking **30-15-20**, on the bag.

(a) (i) Briefly explain what the numbers **30-15-20** represent.

_____ [1]

(ii) State what the letters of the elements in the fertilizer stand for.

_____ [1]

(b) Name one natural organic fertilizer used in The Bahamas.

_____ [1]

(c) Write a word equation for the reaction between nitric acid and ammonia.

[2]

(d) Ammonium sulphate, $(NH_4)_2SO_4$, is another fertilizer.

Calculate the percentage of nitrogen present in ammonium sulphate.

[2]

(e) Name the process by which ammonia is produced from nitrogen and hydrogen.

_____ [1]

(f) The garden is located next to a large pond.

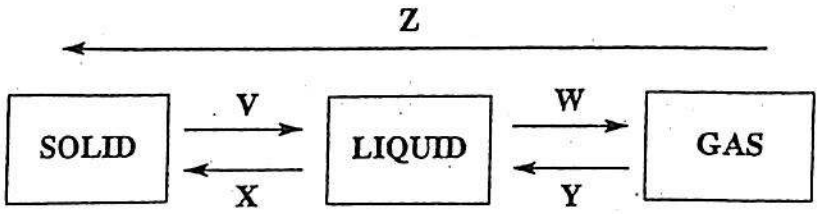
Explain the environmental problem that can be created if fertilizer is washed into the pond.

_____

_____ [2]

Total marks [10]

6. The diagram shows three phases of matter.



Where ⟶ represents heat added and ⟵ represents heat removed.

(a) Name the physical changes occurring at

V _____ X _____

W _____ Y _____

Z _____ [5]

(b) Name a substance that changes directly from a solid to a gas on heating.

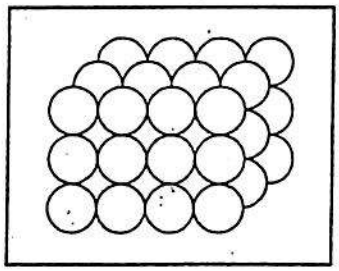
_____ [1]

(c) A process like the conversion of a liquid to a gas absorbs heat energy.

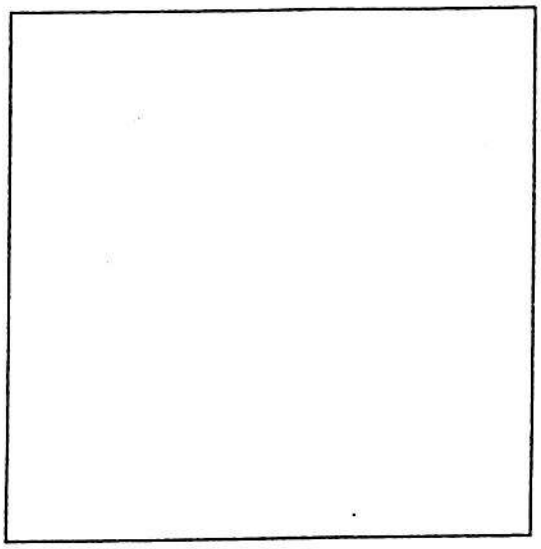
Name this type of energy change.

_____ [1]

(d) The particles in a solid are packed tightly together. The particles are too strongly held together to allow movement from place to place but the particles vibrate about their position in the structure.



(i) Draw in the box the arrangement of particles in a gas.



[2]

(ii) Describe the speed at which these particles will move in the container.

_____

_____ [1]

Total marks [10]

7. Chlorine is a halogen.

(a) (i) Name the naturally occurring crystalline salt crystal that is used as a source of chlorine.

_____ [1]

(ii) State the colour of chlorine gas

_____ [1]

(iii) Name the type of bond formed when a chlorine molecule is made.

_____ [1]

(iv) The electrolysis of brine also produces chlorine and one important alkali. Name the alkali produced.

_____ [1]

(v) Balance the equation

_____ $Cl_{2(aq)}$ + _____ $KBr_{(aq)}$ → _____ $Br_{2(aq)}$ + _____ $KCl_{(aq)}$ [2]

(vi) Name the type of reaction that has occurred to the chlorine in (v).

_____ [1]

(b) (i) State the molar mass of sodium hydroxide, NaOH.

_____ [1]

(ii) State the number of moles contained in 10 g of NaOH.

_____ [1]

(iii) To make a molar solution, the 10 g of sodium hydroxide is dissolved in 250 cm^3 of water. Convert this volume to dm^3.

_____ [1]

Total marks [10]

8. (a) A laboratory technician carries out a series of tests on nickel, copper and two unknown substances, compound **E** and compound **G**.

THE FACTS

– transition metals form coloured compounds.
– compound **E** comes in great quantities from the Island of Inagua.
– compound **G** is found in the shell of the Bahamian conch.
– gas **I** turns lime water milky.
– gas **D** has four atoms.

Study the reactions and identify the substances **A** to **I**.

(i) $Ni(s) + 2HCl(aq) \rightarrow$ green solution **A**$(aq) + H_2(g)$

(ii) copper + sulphuric acid $\xrightarrow{\text{conc.}}$ blue solution **B** + substance **C** + gas **D**

(iii) compound **E**(aq) + silver nitrate $(aq) \rightarrow$ white precipitate **F**

(iv) compound **G**(s) + heat $\rightarrow$ substance **H**(s) + gas **I**

A _____ **F** _____

B _____ **G** _____

C _____ **H** _____

D _____ **I** _____

E _____ [9]

(b) Name the acid formed when gas **D** is bubbled through water.

_____ [1]

Total marks [10]

End]