

School Number	Candidate Number
Surname and Initials	

# CHEMISTRY

PAPER 2 3051/2

Friday 28 MAY 2004 1.50 – 3.20 P.M.

Additional material:  
Periodic Table

## 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.

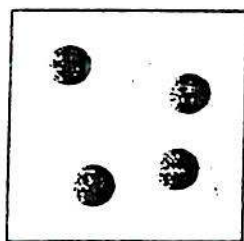
Read each question carefully and make sure you know what you have been asked before starting your answer.

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

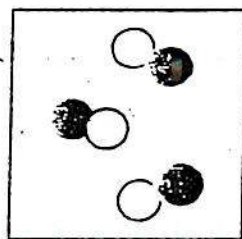
Show ALL your working when answering numerical questions. Lines are provided on the question paper for your answers. You should write your answers on these lines only.

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

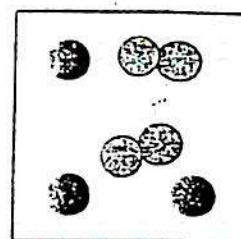
1. The diagram shows the arrangement of atoms in six substances.



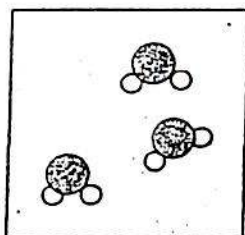
A



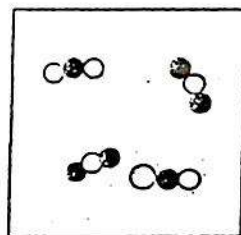
B



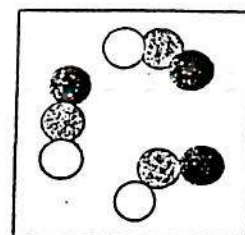
C



D



E



F

(a) From the diagrams choose the letter of the picture that best describes

(i) a pure element; \_\_\_\_\_

(ii) a diatomic compound; \_\_\_\_\_

(iii) a mixture of elements; \_\_\_\_\_

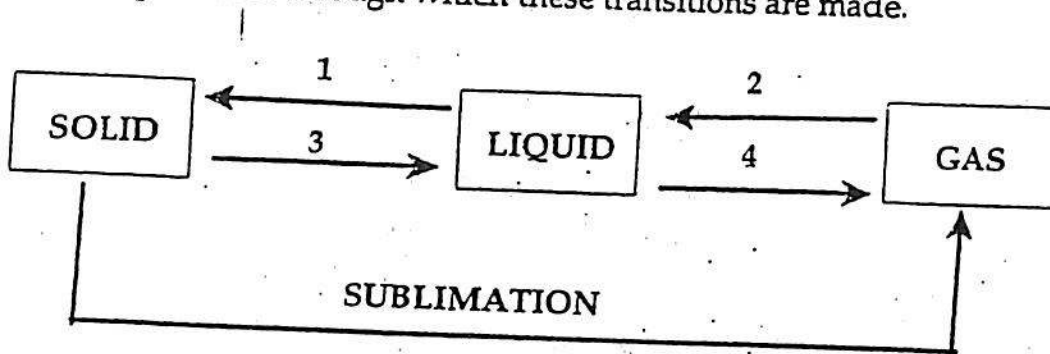
(iv) a mixture of compounds; \_\_\_\_\_

(v) molecules containing three different types of atoms; \_\_\_\_\_

(vi) water. \_\_\_\_\_

[6]

(b) The figure shows how the states of matter can be changed from one form to the other, numbers 1, 2, 3, 4 and sublimation represent the processes through which these transitions are made.



(i) Identify the processes taking place at

1 \_\_\_\_\_

2 \_\_\_\_\_ [2]

(ii) Give the name of one solid that sublimes.

\_\_\_\_\_ [1]

(iii) Describe the spacing and movement of gas particles.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

Total marks [11]

2. Use the terms in the word list to match the statements.

Each term may be used once, more than once or not at all.

WORD LIST

bromine  
chlorine  
gasoline  
graphite  
oxygen

calcium carbonate  
copper(II) sulphate  
iron(II) chloride  
sodium chloride

centrifugation  
chromatography  
distillation

- (a) a process to find out if rose petals contain one colour or a mixture of colours; \_\_\_\_\_
- (b) a brown volatile liquid at room temperature; \_\_\_\_\_
- (c) an ionic compound containing a group I metal; \_\_\_\_\_
- (d) a gas which bleaches moist litmus; \_\_\_\_\_
- (e) a compound of hydrogen; \_\_\_\_\_
- (f) the chemical name of limestone; \_\_\_\_\_
- (g) a non-metal that will conduct electricity; \_\_\_\_\_
- (h) a halogen; \_\_\_\_\_
- (i) blue crystals. \_\_\_\_\_

Total marks [9]

3- This question is about the names and properties of acids and bases.

(a) Name the substance that best matches each description.

- (i) a strong acid present in the stomach; \_\_\_\_\_
- (ii) a base used in indigestion tablets; \_\_\_\_\_
- (iii) an acid found in fruit; \_\_\_\_\_
- (iv) a weak base used as a domestic cleaner. \_\_\_\_\_ [4]

Table shows a list of substances and their pH values.

Substances	rain water	blood	sea water	cabbage juice
pH value	6.5	7.4	8.5	5.0

(b) Name the substance in the list above that is

- (i) most acidic; \_\_\_\_\_
- (ii) most basic; \_\_\_\_\_
- (iii) nearest to neutral. \_\_\_\_\_ [3]

(c) State the colour of litmus paper in cabbage juice.

\_\_\_\_\_ [1]

(d) (i) Name the ion that causes solutions to be basic.

\_\_\_\_\_ [1]

(ii) Explain why fat will dissolve in sodium hydroxide.

\_\_\_\_\_  
\_\_\_\_\_ [1]

Total marks [10]



4. (a) Study the list of solutions found in a chemistry laboratory.

aqueous sodium hydroxide

hydrochloric acid

aqueous ammonia

sulphuric acid

aqueous calcium chloride

nitric acid

(i) Write the names of two solutions which can be mixed to form common salt.

1 \_\_\_\_\_

2 \_\_\_\_\_ [2]

(ii) Solution 1 is placed in a beaker with a few drops of litmus solution. Then solution 2 is slowly added.

State how can you tell when neutralization has occurred.

\_\_\_\_\_

\_\_\_\_\_ [1]

(iii) Explain how crystals of common salt can be obtained using this reaction.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

(b) Aqueous sodium iodide, NaI, was added to aqueous lead nitrate,  $\text{Pb}(\text{NO}_3)_2$ . A yellow precipitate was obtained.

(i) Name the yellow precipitate.

\_\_\_\_\_ [1]

- (ii) Explain how to obtain a pure dry sample of the yellow precipitate from the mixture.

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[2]

- (iii) Write a chemical equation for the reaction, including state symbols.

[2]

Total marks [10]

5. The diagram shows part of the Periodic Table of elements. Each element is represented by a letter that is not its chemical symbol.

Use the letters of the elements to answer the questions.

P		R	T			
		S			U	
Q					V	W

- (a) (i) Give the letter of a metal that is more reactive than element P.  
\_\_\_\_\_ [1]
- (ii) Give the letter of an element that forms a giant covalent molecule.  
\_\_\_\_\_ [1]
- (iii) Give the letters of two elements that will combine to form a covalent compound.  
Element 1 \_\_\_\_\_  
Element 2 \_\_\_\_\_ [2]
- (iv) Write the molecular formula of the compound of the two elements in (iii).  
\_\_\_\_\_ [1]



- (v) Element R forms a compound with hydrogen having the formula  $RH_4$ . Draw a "dot and cross" diagram of the electronic structure of this compound, showing the outer shell electrons only.

[1]

- (b) Chlorine has two stable isotopes, Cl-35 and Cl-37. Gaseous chlorine consists of molecules each containing two atoms of chlorine,  $Cl_2$ .

- (i) Calculate the number of molecules of chlorine in  $1\ 200\ cm^3$  of chlorine gas (the volume of 1 mole of gas =  $24\ 000\ cm^3$ ; the Avogadro number =  $6 \times 10^{23}$ ).

\_\_\_\_\_

\_\_\_\_\_ [2]

- (ii) Calculate the relative molecular mass,  $M_r$ , of each of the three types of chlorine molecules which are contained in this sample of chlorine gas.

type 1 \_\_\_\_\_

type 2 \_\_\_\_\_

type 3 \_\_\_\_\_ [2]

Total marks [10]

6. Fluorine, chlorine, bromine and iodine are halogens.

(a) Complete the table by filling in the blank spaces.

[4]

halogen	colour	melting point/°C	boiling point/°C	state at room temperature
fluorine	yellow	-220	-118	
chlorine		-101	-35	gas
bromine	reddish-brown	-7	+59	
iodine		+114		solid

(b) Predict the boiling point of iodine.

\_\_\_\_\_ [1]

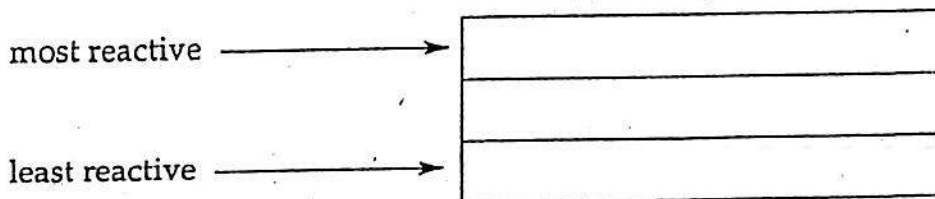
(c) When chlorine is bubbled through a solution of potassium bromide, the solution turns orange-red.

When iodine is mixed with potassium bromide, no colour change occurs.

(i) Write a word equation for the reaction between chlorine and potassium bromide.

\_\_\_\_\_ [2]

(ii) Place the elements bromine, chlorine and iodine in order of reactivity [1]



(d) State a use of chlorine.

\_\_\_\_\_ [1]

(e) In the presence of sunlight, chlorine reacts with methane.

Hydrogen chloride gas, H-Cl, is given off during this reaction.

State the type of bonding in a hydrogen chloride molecule.

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[1]

Total marks [10]

7. Copper is a very useful metal. It is reddish brown in colour and relatively unreactive.

(a) Name one

(i) common use of copper metal;

\_\_\_\_\_

(ii) property that supports its classification as a metal;

\_\_\_\_\_

(iii) product formed when copper reacts with chlorine gas.

\_\_\_\_\_ [3]

(b) Pure copper is more malleable and more ductile than alloys of copper.

Explain the terms

(i) malleable

\_\_\_\_\_

\_\_\_\_\_

(ii) ductile

\_\_\_\_\_

\_\_\_\_\_

(iii) alloy

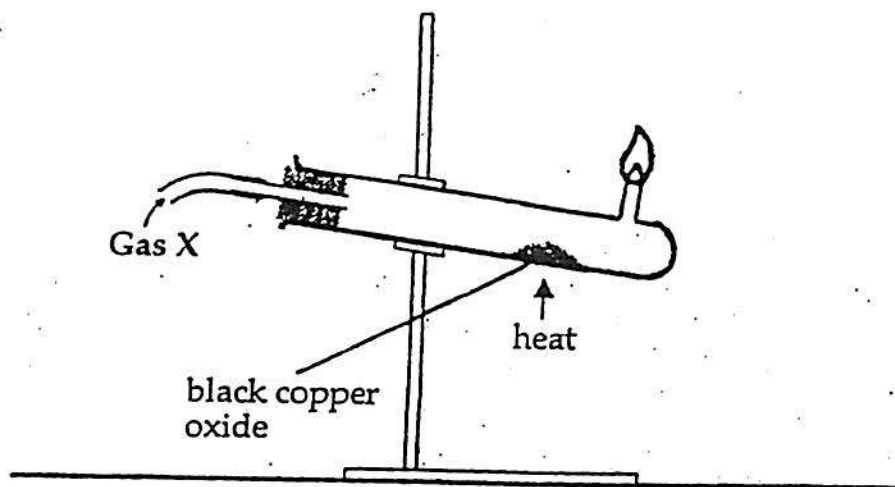
\_\_\_\_\_

\_\_\_\_\_ [3]

(c) State the colour which copper will impart to a flame.

\_\_\_\_\_ [1]

- (d) A gas, X, was passed over heated copper(II) oxide in the apparatus shown.



- (i) Name gas X.

\_\_\_\_\_ [1]

- (ii) State what was seen inside the combustion tube at the end of the experiment.

\_\_\_\_\_

- (iii) Name the type of reaction that occurred.

\_\_\_\_\_ [2]

Total marks [10]

8. The table gives the relative molecular masses of some alkanes.

Alkane	Relative Molecular Mass
methane	16
ethane	
	44
butane	58
pentane	72

- (a) (i) Calculate the relative molecular mass of ethane.

\_\_\_\_\_ [1]

- (ii) Give the name of the third member of the alkane series.

\_\_\_\_\_ [1]

- (b) (i) Draw the structural formulae of the two structural isomers of butane.

[2]

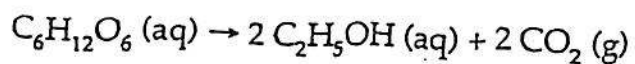
- (ii) Name the two products of the complete combustion of butane.

1 \_\_\_\_\_

2 \_\_\_\_\_ [2]



(c) The equation represents the production of ethanol.



(i) Give the name of an organism needed for the reaction to occur.

\_\_\_\_\_ [1]

(ii) Explain how you will show that the gas produced in the reaction is carbon dioxide.

\_\_\_\_\_  
\_\_\_\_\_ [2]

(iii) State one social or economic effect resulting from the abuse of alcohol.

\_\_\_\_\_ [1]

Total marks [10]

# The Periodic Table of the Elements

		Group																																																																																																					
		I	II	III	IV	V	VI	VII	0																																																																																														
1	Li Lithium	9	40	45	48	51	52	55	56	59	59	64	65	70	72	75	79	80	81	82	84	85	86	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103																																																																
2	Be Beryllium	24	21	22	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103																	
3	B Boron	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103									
4	C Carbon	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103				
5	N Nitrogen	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103					
6	O Oxygen	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103						
7	F Fluorine	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103							
8	Ne Neon	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103								
9	He Helium	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103

71 Lanthanoid series  
93 Actinoid series

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

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