

3051/1

BGCSE

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 1 3051/1

Wednesday **18 MAY 2016** 12:00 NOON–1:15 P.M.

Additional materials:
None

<p>MINISTRY OF EDUCATION NATIONAL EXAMINATIONS</p>
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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.

For each question in this paper, **four** suggested answers A, B, C and D are given.

Circle the letter of the response which you consider to be correct.

Attempt **ALL** the questions. Marks will **NOT** be deducted for wrong answers. Your total score on this test will be the number of correct answers given.

Relative atomic masses are given in the Periodic Table of elements provided on page 2.

The volume of one mole of gas at room temperature and pressure (r.t.p.) is 24 000 cm³ and at standard temperature and pressure (s.t.p.) is 22 400 cm³.

For Examiner's Use	
TOTAL MARKS	

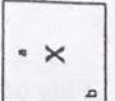
This question paper consists of 14 printed pages and 2 blank pages.

The Periodic Table of the Elements

		Group																										
		II	III	IV	V	VI	VII	0																				
		<table border="0" style="width: 100%; text-align: center;"> <tr> <td style="border: 1px solid black; padding: 5px;">1 H Hydrogen</td> <td colspan="10"></td> <td style="border: 1px solid black; padding: 5px;">4 He Helium</td> </tr> </table>											1 H Hydrogen											4 He Helium	2			
1 H Hydrogen											4 He Helium																	
9 Be Beryllium	4												20 Ne Neon	10														
24 Mg Magnesium	12												16 O Oxygen	8	19 F Fluorine	9												
40 Ca Calcium	20												12 C Carbon	6	14 N Nitrogen	7	15 P Phosphorus	15	17 Cl Chlorine	17								
88 Sr Strontium	38	45 Sc Scandium	48 Ti Titanium	51 V Vanadium	52 Cr Chromium	55 Mn Manganese	56 Fe Iron	59 Co Cobalt	59 Ni Nickel	64 Cu Copper	65 Zn Zinc	70 Ga Gallium	73 Ge Germanium	75 As Arsenic	79 Se Selenium	80 Br Bromine	84 Kr Krypton	36										
137 Ba Barium	56	89 Y Yttrium	91 Zr Zirconium	93 Nb Niobium	96 Mo Molybdenum	101 Ru Ruthenium	103 Rh Rhodium	106 Pd Palladium	108 Ag Silver	112 Cd Cadmium	119 Sn Tin	115 In Indium	122 Sb Antimony	128 Te Tellurium	127 I Iodine	131 Xe Xenon	54											
226 Ra Radium	88	139 La Lanthanum	178 Hf Hafnium	181 Ta Tantalum	184 W Tungsten	186 Re Rhenium	190 Os Osmium	195 Pt Platinum	197 Au Gold	201 Hg Mercury	207 Pb Lead	204 Tl Thallium	209 Bi Bismuth	208 Po Polonium	210 At Astatine	210 Rn Radon	86											
232 Th Thorium	90	140 Ce Cerium	141 Pr Praseodymium	144 Nd Neodymium	150 Sm Samarium	152 Eu Europium	157 Gd Gadolinium	159 Tb Terbium	162 Dy Dysprosium	165 Ho Holmium	167 Er Erbium	169 Tm Thulium	173 Yb Ytterbium	175 Lu Lutetium	103 Lr Lawrencium	102 No Nobelium	101 Md Mendelevium	100 Fm Fermium	99 Es Einsteinium	98 Cf Californium	97 Bk Berkelium	96 Cm Curium	95 Am Americium	94 Pu Plutonium	93 Np Neptunium	92 U Uranium	91 Pa Protactinium	90 Th Thorium

1 Lanthanoid series
3 Actinoid series

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

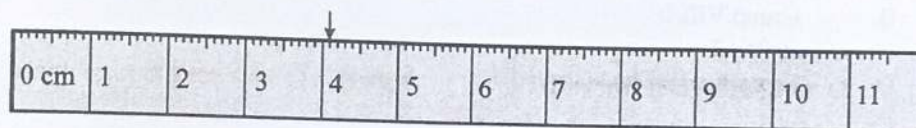


1. What is the name of a group of chemicals that speed up a chemical reaction?

- A catalysts
- B galvanizers
- C oxidising agents
- D reducing agents

2. The diagram represents a scale found on a centimetre rule.

What is the value indicated by the arrow?



- A 0.41 cm
- B 0.42 cm
- C 4.10 cm
- D 4.20 cm

3. The reading on a thermometer indicates the temperature of a boiling liquid is 101°C.

Which liquid could the thermometer have been placed in?

	liquid	purity
A	ethanol	pure
B	methane	pure
C	propane	impure
D	water	impure

4. A sample of water is heated from -10°C to 110°C in a 15 minute period.

How many single states of matter and how many mixed states of matter will the water undergo?

	single states	mixed states
A	2	5
B	2	3
C	3	2
D	2	0

5. How is the number of neutrons determined for any atom?
- A adding the number of protons to the mass number
 - B doubling the atomic number
 - C equals the number of electrons
 - D subtracting the number of protons from the mass number
6. Where on the Periodic Table would the element with the electronic configuration 2, 8, 3 be found?
- A Group II
 - B Group VIII/0
 - C Period 3
 - D Second Period and Group III
7. In the Bohr model of an atom, how many orbits are needed to hold silicon's 14 electrons?
- A 1
 - B 2
 - C 3
 - D 4
8. Carbon dioxide molecules with slightly different masses have been found.
- Which factor accounts for this mass variation?
- A allotropes
 - B isomers
 - C isotopes
 - D states of matter
9. What is the **total number** of electrons found in a water molecule?
- A 2
 - B 8
 - C 10
 - D 18

16. What is the molecular formula of a compound with the structural formula $\text{CH}_3\text{CH}_2\text{CH}_3$?

- A CH
- B $3\text{C}_8\text{H}$
- C C_3H_8
- D $(\text{CH}_3)_2\text{CH}_2$

17. How many moles of oxygen gas are needed to balance the combustion reaction of one mole of butane?



- A $\frac{1}{2}$
- B 5
- C $6\frac{1}{2}$
- D 9

18. What is the molecular formula of a hydrocarbon with an empirical formula of CH_3 and an M_r of 30?

- A CH_3
- B C_2H_6
- C C_3H_8
- D C_4H_{10}

19. Hydrogen bromide gas dissolves in a liquid and ionises to produce hydrogen ions as the only positive ions in a liquid.

Which liquid causes hydrogen bromide gas to ionise?

- A acetone
- B methylbenzene
- C toluene
- D water

20. Which statement about an acid is **true**?

- A forms water with an alkali
- B pH is >7
- C forms negatively charged hydronium ions in water
- D is a non-electrolyte

21. When copper reacts with hot concentrated sulfuric acid it produces copper sulfate.

Which other products are formed?

- A hydrogen gas only
- B water only
- C water and sulfur dioxide gas
- D water and hydrogen gas

22. Which salt remains when a solution of H_2SO_4 is titrated with a solution of $\text{Ca}(\text{OH})_2$?

- A calcium hydroxide
- B calcium oxide
- C calcium sulfate
- D calcium sulfite

23. The table shows the colours that Universal Indicator becomes when added to four different solutions.

Which row in the table correctly matches the colour of the indicator and the solution?

	name of solution	colour of Universal Indicator
A	nitric acid	blue
B	potassium nitrate	green
C	sodium hydroxide	yellow
D	ammonia solution	red

24. Which ion is indicated by a blue-green colour in a firework display?

- A Cu^{2+}
- B Ba^{2+}
- C Na^+
- D Ca^{2+}

Use the list of gases to answer questions 25, 26 and 27. The choices can be used once, more not at all.

- A ammonia
- B hydrogen chloride
- C sulfur dioxide
- D chlorine

Which gas

25. turns moist red litmus blue; A B C D

26. forms dense white fumes with ammonia gas; A B C D

27. turns moist blue litmus red and then bleaches it? A B C D

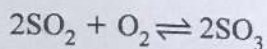
28. What is the name of the process by which electricity is used to bring about a chemical change?

- A corrosion
- B electrolysis
- C oxidation
- D voltage

29. Which change occurs to the ion at the anode during electrolysis?

- A reduction
- B oxidation
- C gains electrons
- D gains mass

30. This reaction is part of the contact process.



What happens if the amount of SO_2 is increased?

- A O_2 increases and SO_3 increases
- B O_2 decreases and SO_3 decreases
- C O_2 increases and SO_3 decreases
- D O_2 decreases and SO_3 increases

The list below contains the names of the four different types of chemical bonds. Use this information to answer questions 10 to 12. The choices may be used once, more than once or not at all.

- A covalent
- B dative
- C ionic
- D metallic

Which type of bond is formed when

10. hydrogen and oxygen bond to form water; A. B C D
11. the lattice structure of NaCl is formed; A. B C D
12. ammonia bonds with a fourth hydrogen to form the ammonium ion? A B C D
13. What is the amount in moles, of NaOH, found in 32 g of NaOH?
- A 0.80 moles
 - B 1.25 moles
 - C 40 moles
 - D 1 280 moles
14. What is the relative molecular mass of H_2SO_4 ?
- A 3
 - B 7
 - C 48
 - D 98
15. Which element can be found in the form of a diamond?
- A carbon
 - B krypton
 - C potassium
 - D silver

31. What is a change in concentration of either a reactant or product over a period of time called?

- A reaction rate
- B reactant concentration
- C product concentration
- D state change

32. Zinc is less reactive than magnesium.

What is the reactivity relationship between zinc and magnesium?

- A Magnesium can displace zinc ions from zinc compounds.
- B Zinc can displace magnesium from magnesium compounds.
- C Magnesium is lower than zinc in the reactivity series.
- D Zinc is a stronger reducing agent than magnesium.

33. Which of these statements does **not** describe what happens during a redox oxidation?

- A a decrease in oxidation number
- B a loss of protons
- C a gain of oxygen
- D a loss of hydrogen by a covalent molecule

Use the table to answer questions 34 and 35.

The table shows the products formed at the anode and the cathode during electrolysis.

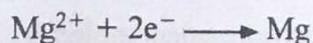
	compound electrolysed	product at carbon anode	product at carbon cathode
A	molten lead bromide	bromine	lead
B	potassium nitrate solution	oxygen	hydrogen
C	concentrated sodium chloride solution	oxygen	hydrogen
D	copper sulfate solution	oxygen	copper

Which row in the table shows an

34. incorrect product at one of the electrodes; A B C D

35. electrolysed compound which did not produce hydroxide ions? A B C D

36. Magnesium metal is made by the electrolysis of molten $MgCl_2$. One of the half-reactions is shown.



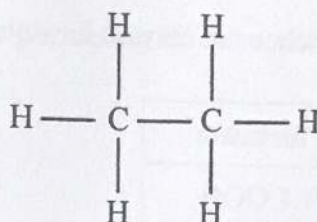
Which statement about the electrolysis of molten $MgCl_2$ is correct?

- A magnesium is made at the cathode.
- B magnesium ions are oxidised.
- C chloride ions are reduced at the anode.
- D chloride ions gain electrons during the process.

37. Which pollution problem can be caused by the ammonia, NH_3 , produced by burning fossil fuels?

- A acid rain
- B eutrophication
- C global warming
- D depletion of the ozone layer

38. The diagram shows the structural formula of ethane.



The electronic configuration of C is 2, 4 and H is 1.

How many covalently bonded electrons surround each carbon atom in the above structure?

- A 2
B 4
C 6
D 8
39. What is the correct order of the following hydrocarbons in terms of increasing boiling points?
- propane C_3H_8 methane CH_4 and ethane C_2H_6
- A methane, propane, ethane
B ethane, methane, propane
C methane, ethane, propane
D ethane, propane, methane
40. Which name is given to a series of compounds that differ from each other by a fixed repeating unit?
- A heterogeneous series
B homologous series
C homogeneous series
D hydrocarbon series

Questions 44 and 45 are about the refining of petroleum.

44. Which method is used to obtain lubricating oil from crude oil?

- A centrifugation
- B chromatography
- C filtration
- D fractional distillation

45. Lubricating oils undergoes additional processing to obtain larger amounts of the more valuable hydrocarbons.

What is the name of this process?

- A cracking
- B esterification
- C hydrolysis
- D polymerisation

46. Which compound is an unsaturated hydrocarbon?

- A ethane
- B ethene
- C ethanoic acid
- D ethyl methanoate

47. Blanco Bleach is a Bahamian company.

Which element is needed in large quantities by Blanco to make bleach?

- A bromine
- B chlorine
- C fluorine
- D iodine

48. Carbon dioxide emissions have steadily increased since the start of the industrial age. As a result, the carbon dioxide in the Earth's air has increased by approximately 20%.

What are the effects of this change?

- A acid rain
- B global warming
- C both of the above
- D none of the above

49. Which ore is aluminum metal extracted from?

- A aragonite
- B bauxite
- C galena
- D haematite

50. Iron is extracted from its ore using a blast furnace.

Which form of iron is extracted from the blast furnace?

- A impure pig iron
- B pure liquid iron
- C solid iron nuggets
- D stainless steel iron

PAPER 2

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41. Dilute acetic acid, commonly known as vinegar, is the second smallest carboxylic acid.

Which choice correctly matches the correct formula and name for this acid?

	acid name	formula
A	ethanoic	CH_3COOH
B	hydrochloric	HCl
C	methanoic	CHOOH
D	methanoic	CHO_2H

42. Which pair shows two elements which are liquids at room temperature and pressure?

- A bromine and mercury
- B chlorine and water
- C fluorine and silver
- D oxygen and zinc

43. Which element in the Periodic Table has an allotrope that is capable of conducting electricity?

- A carbon
- B chlorine
- C oxygen
- D sulfur

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 2 3051/2

Wednesday **18 MAY 2016** 1:30 P.M.–3:00 P.M.

Additional materials:
None

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 to do 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.

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

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

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

The Periodic Table of the Elements

		Group																																																							
		II		III	IV	V	VI	VII	0																																																
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px;"> 1 H Hydrogen 1 </div> </div>																																																							
9	Be Beryllium 4	11	B Boron 5	12	C Carbon 6	13	Al Aluminum 13	14	N Nitrogen 7	15	P Phosphorus 15	16	O Oxygen 8	17	F Fluorine 9	18	Ne Neon 10	20	Ar Argon 18																																						
24	Mg Magnesium 12	27	Al Aluminum 13	28	Si Silicon 14	29	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																																						
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	57	Co Cobalt 27	58	Ni Nickel 28	59	Cu Copper 29	60	Zn Zinc 30	63	Ga Gallium 31	64	Cu Copper 29	65	Zn Zinc 30	66	Ni Nickel 28	67	Co Cobalt 27	68	Ni Nickel 28	69	Cu Copper 29	70	Zn Zinc 30	71	Ga Gallium 31	72	Ge Germanium 32	73	As Arsenic 33	74	Se Selenium 34	75	Br Bromine 35	76	Kr Krypton 36								
88	Sr Strontium 38	89	Y Yttrium 39	91	Zr Zirconium 40	93	Nb Niobium 41	96	Mo Molybdenum 42	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	137	Ba Barium 56	139	La Lanthanum 57	141	Pr Praseodymium 59	144	Nd Neodymium 60	150	Sm Samarium 62	152	Eu Europium 63	157	Gd Gadolinium 64	162	Dy Dysprosium 66	165	Ho Holmium 67	167	Er Erbium 68	169	Tm Thulium 69	173	Yb Ytterbium 70	175	Lu Lutetium 71
226	Ra Radium 88	227	Ac Actinium 89	181	Ta Tantalum 73	186	Re Rhenium 75	192	Os Osmium 76	195	Pt Platinum 78	197	Au Gold 79	201	Hg Mercury 80	204	Tl Thallium 81	207	Pb Lead 82	209	Bi Bismuth 83	210	Po Polonium 84	210	At Astatine 85	210	Rn Radon 86																														

I Lanthanoid series

II Actinoid series

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

140	Ce Cerium 58	141	Pr Praseodymium 59	144	Nd Neodymium 60	150	Sm Samarium 62	152	Eu Europium 63	157	Gd Gadolinium 64	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	232	Pa Protactinium 91	238	U Uranium 92	238	Np Neptunium 93	238	Pu Plutonium 94	238	Am Americium 95	238	Cm Curium 96	238	Bk Berkelium 97	238	Cf Californium 98	238	Es Einsteinium 99	238	Fm Fermium 100	238	Md Mendelevium 101	238	No Nobelium 102	238	Lr Lawrencium 103

1. This question is about the Periodic Table.

(a) What is the Periodic Table?

_____ [1]

(b) State how the Modern Periodic Table is arranged.

_____ [1]

(c) Name the least reactive group of elements in the Periodic Table.

_____ [1]

(d) Name the series of elements to which Mn belongs.

_____ [1]

(e) Name the element that is in Period 3 Group II.

_____ [1]

(f) Name the element that has cation X^{3+} and electronic configuration 2,8.

_____ [1]

(g) State the name of the element with the symbol Sb.

_____ [1]

(h) State the charge on one ion of sodium.

_____ [1]

(i) Name the grey/purple solid halogen.

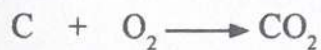
_____ [1]

(j) Name a non-metal that occupies 78% of the air.

_____ [1]

TOTAL MARKS [10]

- (c) Aluminium can be extracted by electrolysis from its ore, Bauxite. During the electrolysis oxygen is produced. The anode reacts with this oxygen, as shown in the equation.



- (i) State the oxidation number of each carbon in the following.

C _____

CO₂ _____

[1]

- (ii) State which element is oxidised and which is reduced in the equation.

oxidised _____

reduced _____

[1]

- (iii) State why aluminium cannot be extracted from its ore by reduction with carbon.

_____ [1]

- (d) Iron is extracted from its ore by a reaction with carbon.

State the name of the ore.

_____ [1]

TOTAL MARKS [10]