3051/1 **BGCSE**

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 1 3051/1

Monday 21 MAY 2012 12.00 – 1.15 P.M.

No additional materials required

MINISTRY OF EDUCATION
NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION FOR 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.

The volume of one mole of gas at room temperature and pressure (r.t.p.) is 24 000 cm^3 and at standard temperature and pressure (s.t.p.) is 22 400 cm^3.

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

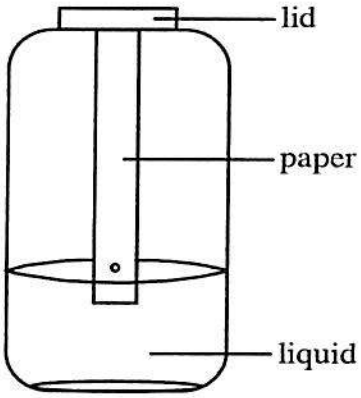
1. Why has the use of large amounts of disposable poly(alkene) packaging been criticized?

A combustion of poly(alkene)s produces dangerous fumes
B large amounts of fossil fuel are burnt during its manufacture
C large amounts of fossil fuel are converted to monomers, such as ethene
D poly(alkene)s degrade to produce toxic materials

2. In which set, A, B, C or D do all the particles have the same electron configuration?

A Br^{-1}, Cl^{-1}, F^{-1}
B Fe^{+2}, Fe^{+3}
C Ne, Na^{1+}, O^{-2}
D N^{-3}, F^{-1}, Ca^{+2}

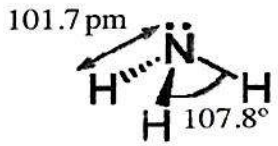
3. What would a chemistry student expect to accomplish by using this apparatus?



A dissolving the filter paper
B decolourising the liquid
C filtering the liquid
D making a chromatogram

4. The diagram shows a model of a molecule of ammonia with its N-H bond length measured in picometre (magnitude 10^{-12}m) and the H-N-H bond angle.

Use the diagram to answer questions 4 to 8.



Which is a correct description of the ammonia molecule?

A covalent compound
B covalent element
C ionic compound
D ionic element

5. What is the empirical formula for the ammonia molecule?

A N_3H_3
B N_3H
C NH_3
D 3HN

6. The length of the N-H bond is 101.7 pm. One picometre is equal to 10^{-12} metres. The diameter of an atom is about 1000 times larger than the bond length.

What is the best unit to use to state the diameter of an atom?

A the metre, m
B the millimetre, 10^{-3} m
C the micrometre, 10^{-6} m
D the nanometre, 10^{-9} m

7. What is the **total** number of electrons found in the ammonia molecule?

A 5
B 8
C 10
D 17

8. What can the lone pair of electrons at the top of the molecule be used to form?

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

9. Sublimation is a physical change. Which change represents sublimation?

A iodine (g) ⟶ iodine (s)
B iodine (g) ⟶ iodine (l)
C iodine (l) ⟶ iodine (g)
D iodine (l) ⟶ iodine (s)

10. What is the SI unit for temperature?

A Celsius
B Centigrade
C Fahrenheit
D Kelvin

11. A mixture of gases contains helium, hydrogen, neon and nitrogen. Which two gases will diffuse quickest?

A He and Ne
B H_2 and N_2
C H_2 and He
D Ne and N_2

12. Where would the atom with an electronic configuration of 2,8,3 be located on the Periodic Table?

A Group 2, Period 3
B Group 2, Period 8
C Group 3, Period 3
D Group 8, Period 3

13. What is the formula of the sulphite radical?

A S
B S^{-2}
C SO_3^{-2}
D SO_3

14. What is the M_r of the compound $(NH_4)_2CO_3$?

A 96
B 78
C 14
D 11

15. A student performed two experiments in the lab.

In the first experiment the student reacted copper(II) oxide with hydrogen to form copper metal and water.

$$CuO + H_2 \rightarrow Cu + H_2O$$

In the second experiment the student reacted zinc metal with copper(II) sulfate to produce zinc sulfate and copper metal.

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$$

Which substances are the **reducing agents** in the two experiments?

A copper(II) oxide and zinc
B copper(II) oxide and copper(II) sulfate
C hydrogen and zinc
D hydrogen and copper(II) sulfate

16. The carbonates of which metals are **NOT** decomposed by gentle heating?

A magnesium and copper
B sodium and potassium
C iron and calcium
D zinc and lead

17. What are the products when magnesium nitrate is heated?

A magnesium metal, nitrogen dioxide and oxygen
B magnesium nitrite and oxygen
C magnesium oxide, nitrogen dioxide and oxygen
D magnesium oxide and nitrogen dioxide

18. Which property describes all reversible reactions that have reached equilibrium?

A the amount of products exceeds the amount of reactants
B the amount of products is equal to the amount of reactants
C the forward reaction rate exceeds the backward reaction rate
D the forward and backward reaction rates are equal

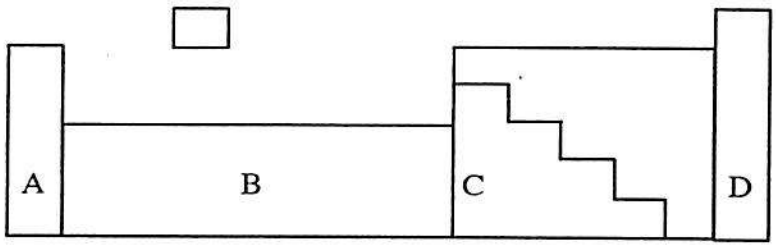
19. Catalytic converters are now attached to the exhausts of cars to decrease air pollution. Which two air pollutants will this device remove from the exhaust gases?

A oxides of nitrogen and carbon monoxide
B hydrocarbons and nitrogen
C oxides of nitrogen and carbon dioxide
D hydrocarbons and carbon dioxide

20. Which statement does **not** explain why metals such as aluminium and iron should be recycled?

A metals do not lose their properties during the recycling process
B recycling of these metals saves money
C recycling reduces the amount of these metals entering landfills
D recycling of these metals decreases the amount of ore used up

Questions 21–24 refer to the diagram which shows partial sections of the Periodic table, the letters used are not the symbols of the elements.



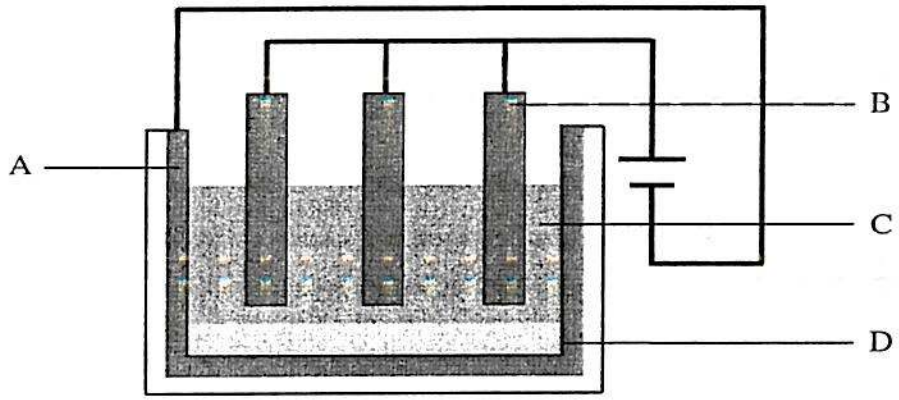
In which section of the Periodic Table would you find

21.	a metal that has a low density;	A	B	C	D
22.	an element that is sonorous;	A	B	C	D
23.	an element that can be a metalloid;	A	B	C	D
24.	elements with full outer shells of electrons?	A	B	C	D

25. Which metal can **not** be extracted using carbon?

A iron
B magnesium
C tin
D zinc

Questions 26–28 refer to the extraction of aluminium.
Aluminium is extracted from aluminium oxide (Al_2O_3) using the electrolysis process.



26. Which process occurs at **A**?

A combustion
B decomposition
C oxidation
D reduction

27. During the electrolysis of aluminium oxide, which substance is initially discharged at the anode and what happens to the carbon electrode?

	substance discharged	**electrode description**
A	aluminium metal	becomes bigger
B	aluminium metal	remains unchanged
C	oxygen gas	remains unchanged
D	oxygen gas	becomes smaller

28. Which mineral is added to the aluminium oxide before it is electrolysed?

A aragonite
B bauxite
C cryolite
D haematite

29. Soaps form lather with water. However, this is a difficult task to do using water from wells in Nassau. What two cations are responsible for the hardness of water?

A Ca^{2+} and Mg^{2+}
B Ca^{2+} and Na^{+}
C Na^{+} and Mg^{2+}
D Na^{+} and K^{+}

30. There are two types of hard water, temporary and permanent. What ions are usually responsible for **permanent** hardness of water?

A Cl^{-} and SO_4^{2-}
B NO_3^{-} and Cl^{-}
C SO_4^{2-} and NO_3^{-}
D SO_3^{2-} and Cl^{-}

31. What is the easiest way to remove temporary hardness from water?

A boiling
B distillation
C ion exchange
D reverse osmosis

32. Rhombic and Monoclinic are two solid structural forms of elemental sulfur. What term best describe these forms of sulfur?

A allotropes
B alloys
C isomers
D isotopes

33. Which molecular formula contains the fewest oxygen atoms?

A carbonic acid
B phosphoric acid
C potassium nitrate
D sulfur dioxide

34. Alkanes and alkenes are groups of important organic chemicals. Which row in the table describes both of them correctly?

	alkanes	**alkenes**
A	unsaturated hydrocarbons with the general formula C_nH_{2n}	unsaturated hydrocarbons with the general formula C_nH_{2n}
B	saturated hydrocarbons with the general formula C_nH_{2n}	unsaturated hydrocarbons with the general formula C_nH_{2n+2}
C	saturated hydrocarbons with the general formula C_nH_{2n+2}	saturated hydrocarbons with the general formula C_nH_{2n}
D	saturated hydrocarbons with the general formula C_nH_{2n+2}	unsaturated hydrocarbons with the general formula C_nH_{2n}

35. Hydrogen gas can be made in a school laboratory by reacting a metal and a dilute acid. Which metal is best suited for this reaction?

A copper
B potassium
C sodium
D zinc

36. **Wet** chlorine gas can be made by reacting manganese(IV) oxide with concentrated hydrochloric acid. Which chemical can be used as a drying agent for **wet** chlorine gas?

A ammonium hydroxide solution
B concentrated nitric acid
C concentrated sulfuric acid
D dilute phosphoric acid

37. Organic chemistry can be described as the study of which element and its compounds?

A carbon
B hydrogen
C nitrogen
D oxygen

38. Which correctly describes the positive tests that identify oxygen and hydrogen gas?

	oxygen	**hydrogen**
A	relights a glowing splint	squeaky pop with glowing splint
B	squeaky pop with glowing splint	squeaky pop with lighted splint
C	relights a glowing splint	squeaky pop with lighted splint
D	puts out a glowing splint	relights a glowing splint

39. When ammonium hydroxide solution is added to an unknown solution a green precipitate is formed. Which ion is present?

A Cu^{2+}
B Fe^{3+}
C Fe^{2+}
D Zn^{2+}

40. The equation shows a reaction to convert lead oxide into lead.

$$PbO(s) + C(s) \rightarrow Pb(l) + CO(g)$$

What is carbon acting as in this reaction?

A a reducing agent
B a redox agent
C an organic agent
D an oxidizing agent

41. Which phrase describes catalysts?

A increase the energy of the reactant particles before they become products
B lower the energy barrier when reactants become products
C slow the rate of a reaction that the catalyst is used in
D usually non-metallic materials that change reactants to products

42. Which chemical concept is used to explain the effect of temperature on rates of reaction?

A atomic theory
B Boyle's Law
C Charles' Law
D kinetic theory

43. Which change in reaction conditions would increase the rate of a chemical reaction?

A decreasing the concentration of the reactants
B decreasing the reaction temperature
C increasing the surface area of the reactants
D removing a catalyst

44. Which pair of processes is exothermic?

A melting and evaporation
B melting and sublimation
C condensation and freezing
D condensation and evaporation

45. A colourless crystalline salt effervesces (fizzes) with dilute hydrochloric acid and gives a golden, yellow flame in a flame test.

What is the name of the unknown salt?

A calcium carbonate
B calcium nitrate
C sodium carbonate
D sodium chloride

46. What is sulfuric acid (H_2SO_4) an example of?

A binary acid
B carboxylic acid
C dibasic acid
D weak acid

47. For an **unknown solution A**, two tests and their results are described.

test 1 Addition of sodium hydroxide gives a **green** precipitate

test 2 Addition of dilute hydrochloric acid followed by a solution of barium chloride produces a **white** precipitate.

What is **Solution A**, according to the data?

A copper(II) chloride
B copper(II) nitrate
C iron(II) sulfate
D iron(III) nitrate

48. The equation represents a neutralization reaction.

$$2NaOH(aq) + H_2SO_4(aq) \longrightarrow Na_2SO_4(aq) + 2H_2O(l)$$

How many moles of sodium hydroxide are required to neutralize 1.5 moles of the sulfuric acid?

A 1.5
B 3.0
C 15.0
D 30.0

49. Which metal does **not** react with hydrochloric acid?

A aluminium
B calcium
C copper
D sodium

50. Cleaning up oil-spills in the ocean is difficult and expensive, so researchers are developing new clean-up technologies and safer transportation methods.

What is the **LEAST** effective method of cleaning up oil spills?

A manufacturing double hulled oil tankers for transporting oil safely
B soaking up of oil with absorbent materials
C use of detergents
D using genetically engineered bacteria to **eat** up the oil

End]