3051/1

BGCSE

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 1 3051/1

Wednesday 20 MAY 2009 12.30 – 1.45 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.

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.

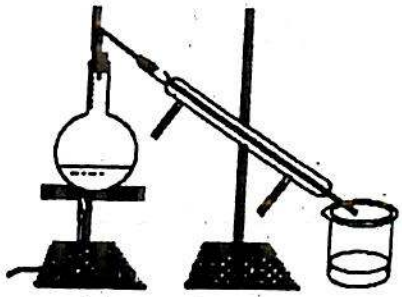
Attempt **ALL** the questions. Marks will **NOT** be deducted for wrong answers. Your total score on this test will be the number of correct answers given.

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 13 printed pages and 3 blank pages.

1. Which mixture is best separated using the apparatus shown?

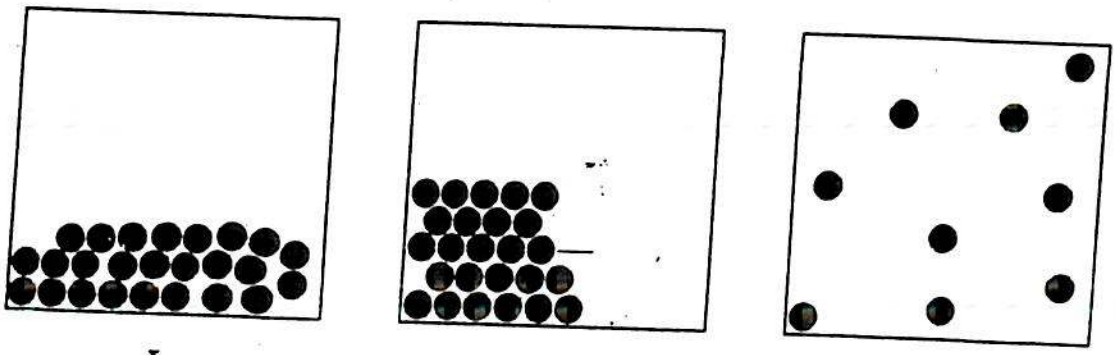


A air
B ethanol and water
C pigments
D salt and sugar

2. Which types of matter are pure substances?

A compounds and elements
B compounds and mixtures
C elements and mixtures
D elements, compounds and mixtures

3. The diagrams show the arrangement of particles in three substances. Which diagram(s) show a state of matter which cannot be easily compressed?



I II III

A I only
B I and II only
C I, II and III
D III only

4. At a given temperature, in which state of matter do particles have the most kinetic energy?

A solid
B liquid
C gas
D water

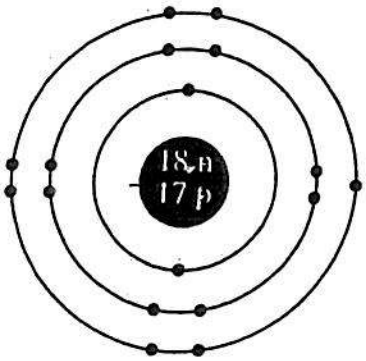
5. What is the phase change represented by the equation CO_2 (g) → CO_2 (s) called?

A boiling
B condensation
C melting
D sublimation

6. An atom is made up of three particles. Which one is the least massive?

A electron
B ion
C neutron
D proton

7. Which element is represented by the atom shown?



A argon
B bromine
C chlorine
D sodium

8. How are the elements in the modern Periodic Table arranged?

A according to decreasing atomic mass
B according to Mendeleev's original model
C according to increasing atomic number
D according to when they were discovered

9. What two elements will have similar chemical properties?

A aluminium and silicon
B calcium and strontium
C fluorine and argon
D oxygen and chlorine

10. Which element is contained in all proteins?

A calcium
B phosphorus
C magnesium
D nitrogen

11. What is the electronic configuration of the sulfide ion, S^{2-}?

A 2,8,8
B 2,8,6
C 2,8,4
D 2,8,2

12. What is the symbol of a cation containing 20 protons and 18 electrons?

A Ca^{2+}
B Cu^{2+}
C Fe^{2+}
D Mg^{2+}

13. Which statement(s) about most covalent compounds is/are true?

I. They are insoluble in water.
II. They conduct electricity.
III. They have low melting points.

A I only
B I and II
C I, II and III
D I and III

14. Which solution will turn phenolphthalein pink?

A carbon dioxide, $CO_{2(aq)}$
B hydrogen bromide, $HBr_{(aq)}$
C lithium hydroxide, $LiOH_{(aq)}$
D nitric acid, $HNO_{3(aq)}$

15. Which substance will produce a salt, water and carbon dioxide when reacted with dilute hydrochloric acid?

A magnesium
B magnesium oxide
C magnesium hydroxide
D magnesium carbonate

16. Which reaction will produce copper(II) sulfate and water as the products?

A copper(II) oxide + sulfuric acid
B copper(II) chloride + sodium sulfate
C copper + sulfuric acid
D copper(II) nitrate + sodium chloride

17. Which row of numbers balances the equation?

$$\_\_\_\ Fe_2O_{3(s)} + \_\_\_\ HC_{l(aq)} \rightarrow \_\_\_\ FeCl_{3(aq)} + \_\_\_\ H_2O_{(l)}$$

A 2, 6, 2, 3
B 1, 6, 2, 3
C 1, 6, 2, 6
D 1, 3, 1, 3

18. What is the molar mass of K_2SO_4? [K = 39, S = 32, O = 16]

A 87 g/mole
B 135 g/mole
C 164 g/mole
D 174 g/mole

19. Which ion would produce an apple-green flame in the flame test?

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

20. Which substance alters the rate of reaction but is chemically unchanged?

A a catalyst.
B an isomer.
C an allotrope.
D amphoteric.

21. Equal masses of two salts, **X** and **Y**, were separately dissolved in equal volumes of water. The initial temperatures of the water and final temperatures of the solutions are shown.

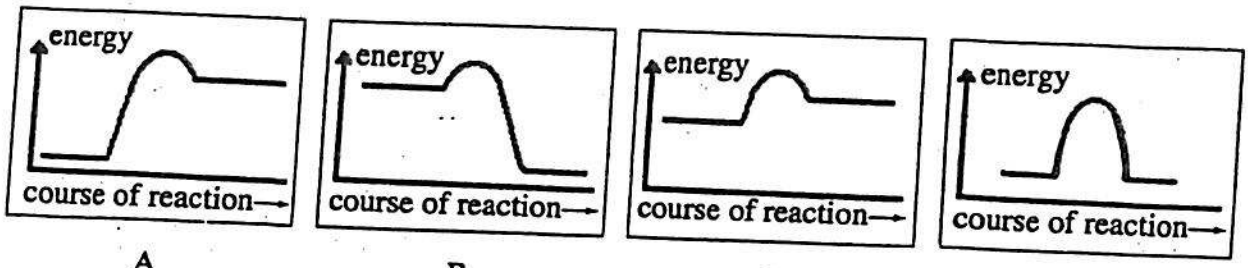
salt	initial temperature of water/°C	final temperature of solution/°C
X	25.1	30.2
Y	27.4	20.9

Which statement about salts **X** and **Y** is true?

A dissolving of both salt **X** and salt **Y** is exothermic
B dissolving of both salt **X** and salt **Y** is endothermic
C dissolving of salt **X** is endothermic and the dissolving of salt **Y** is exothermic
D dissolving of salt **X** is exothermic and the dissolving of salt **Y** is endothermic

Use the diagrams to answer questions 22, 23 and 24.

Each diagram can be used once, more than once or not at all.



A B C D

Which diagram shows

22. the smallest activation energy; A B C D

23. an exothermic reaction; A B C D

24. no net energy change? A B C D

25. Which procedure will increase the solubility of KCl in water?

A increasing the surface area of the solute
B increasing the pressure on the solvent
C raising the temperature of the solvent
D stirring the solute and solvent mixture

26. During electrolysis of molten $CaBr_2$, which of the following is made at the anode?

A bromine
B calcium
C hydrogen
D oxygen

27. What happens to the silver ion, Ag^+, when silver is electroplated onto another metal?

A oxidized at the anode
B oxidized at the cathode
C reduced at the anode
D reduced at the cathode

28. What occurs during this redox reaction?

$$2I^-(aq) + Br_2(l) \rightarrow 2Br^-(aq) + I_2(s)$$

A I^- is oxidized, and its oxidation number increases
B I^- is oxidized, and its oxidation number decreases
C I^- is reduced, and its oxidation number increases
D I^- is reduced, and its oxidation number decreases

29. Which half-reaction correctly represents oxidation?

A $Cr^{3+} + 3e^- \rightarrow Cr_{(s)}$
B $Cr^{3+} + \rightarrow Cr_{(s)} + 3e^-$
C $Cr_{(s)} \rightarrow Cr^{3+} + 3e^-$
D $Cr_{(s)} + 3e^- \rightarrow Cr^{3+}$

30. The halogens are more reactive than other non-metal elements in the Periodic Table because

A the molecules of the elements have the general formula X_2
B each of them is more electronegative than the other elements in the same Period
C they are all gases
D they form covalent compounds

31. Which statement describes all elements in Group II of the Periodic Table?

A they are also members of Period 2 in the Periodic Table
B they are known as the alkaline earth metals
C they have the same atomic mass
D they have a stable electronic configuration

32. Which metal reacts most vigorously with water?

A aluminum
B caesium
C lithium
D magnesium

33. Which transition metal will not react with hydrochloric acid but its oxide and carbonate will?

A copper
B iron
C nickel
D zinc

34. When is a chemical reaction in equilibrium?

A forward and reverse reactions have ceased
B forward and reverse reaction rates are equal
C no reactants remain
D the concentrations of reactants and products are equal

35. When aqueous copper(II) sulfate is electrolysed using pure copper electrodes, what happens to the mass of each electrode?

	anode	cathode
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

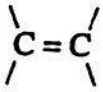
36. What is the empirical formula of the compound whose molecular formula is P_4O_{10}?

A PO
B PO_2
C P_2O_5
D P_8O_{20}

37. Which class of organic compounds has the general formula R–OH, where R is an alkyl group?

A acids
B alcohols
C esters
D ethers

38. What name is given to compounds that contain the functional group shown?



A alkane
B alcohol
C alkene
D ether

39. Which substance functions as the electrolyte in an automobile battery?

A H_2O
B H_2SO_4
C PbO_2
D $PbSO_4$

40. Which of the following is **NOT** an alloy?

A brass
B bronze
C copper
D steel

41. Aluminium is obtained commercially from which ore?

A bauxite
B galena
C haematite
D magnetite

42. Why is carbon monoxide poisonous?

A It lowers the ability of the blood to carry glucose
B It increases the ability of the blood to carry oxygen
C It lowers the ability of the blood to carry oxygen
D It increases the ability of the blood to carry glucose

43. An allotrope of which element protects Earth from ultraviolet radiation?

A carbon
B helium
C oxygen
D sulphur

44. In the reaction $ZnO + X + heat \rightarrow Zn + XO$, which element, represented by X, is used industrially to reduce the ZnO to Zn?

A C
B Cu
C Sn
D Pb

45. Which preservative is used to maintain the appearance of fruits by blocking the natural ripening process after harvesting?

A ethanoic acid
B salt
C sulphur dioxide
D sugar

46. Some factory wastes must be treated with alkali to make them safe before they are disposed of. Which row in the table shows the pH change which should be made?

	pH before treatment	pH after treatment
A	7	11
B	11	7
C	2	7
D	7	2

47. Burning fossil fuel produces a greenhouse gas which contributes to global warming. Which greenhouse gas is produced?

A CO_2
B H_2O
C O_2
D O_3

48. The oceans are the primary source for a compound of which element?

A chlorine
B iron
C magnesium
D potassium

49. What renewable energy source is most easily obtainable all over the world?

A geothermal
B hydro
C solar
D wind

50. What metal is used for galvanizing steel car bodies against rust?

A aluminium
B iron
C tin
D zinc

3051/1

BGCSE

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 1 3051/1

Thursday 20 MAY 2010 12.30 – 1.45 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.

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 †															

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

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

1. Which one of the following metals is too reactive to place safely in dilute nitric acid?

A magnesium
B potassium
C iron
D zinc

2. Which describes an acid that is completely ionised when dissolved in water?

A a weak acid
B an organic acid
C a strong acid
D a dilute acid

3. How many moles of hydrochloric acid are present in 0.25 dm^3 of a 0.1 mol/dm^3 solution?

A 0.25 mol
B 0.40 mol
C 0.025 mol
D 2.5 mol

4. Excess sodium hydroxide was added to a solution of a metal salt. A blue precipitate was formed.

Which metal ion is present in the solution?

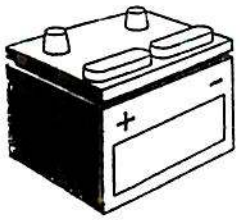
A copper
B iron
C zinc
D aluminium

5. All acids contain the element hydrogen but some special types of acid also contain the element carbon.

Which acids fit this description?

A mineral acids
B organic acids
C strong acids
D ternary acids

6. Why is sulfuric acid used in car batteries?



A it is an electrolyte and is not decomposed by electricity
B it is an electrolyte and is decomposed by electricity
C it is a non-electrolyte and is decomposed by electricity
D it is a non-electrolyte and is not decomposed by electricity

7. Which cations are responsible for the yellow, red and apple-green colours produced in a flame test?

A lithium, calcium and barium
B sodium, potassium and copper
C sodium, calcium and copper
D sodium, calcium and barium

8. What gas is produced when copper metal reacts with concentrated sulfuric acid and what is the test for the gas?

	gas	test result
A	hydrogen	makes a popping sound with a lighted splint
B	carbon dioxide	turns limewater milky
C	sulfur dioxide	turns blue litmus paper red
D	oxygen	relights a glowing splint

9. Which equation correctly shows the ionisation of ethanoic acid?

A $CH_3COOH \rightarrow CH_2COOH^- + H^+$
B $CH_3COOH \rightarrow CH_2COO^- + 2H^+$
C $CH_3COOH \rightarrow CCOOH^- + 3H^+$
D $CH_3COOH \rightarrow CH_3COO^- + H^+$

10. Zinc oxide reacts with both hydrochloric acid and potassium hydroxide.

Which classification best describes the behaviour of zinc oxide?

A neutral oxide
B basic oxide
C acidic oxide
D amphoteric oxide

11. Which substance does not conduct electricity?

A dilute sodium hydroxide
B crude oil
C aqueous copper sulfate solution
D dilute sulfuric acid

12. When concentrated sulfuric acid is added to sucrose a chemical reaction takes place.

What are the correct observations which should be recorded by the chemistry student?

A sucrose turns from white to grey and the container feels hot
B sucrose turns from white to black and the container feels cold
C sucrose turns from white to black and the container feels hot
D sucrose turns from black to white and the container feels cold

13. Which substance is a carbon allotrope in which the atoms form separate layers that can slide past one another?

A chalk
B charcoal
C diamond
D graphite

14. Which statement about a diamond is correct?

A carbon atoms are bonded covalently in hexagonal patterns
B carbon atoms are held together by ionic bonds forming giant molecular structures
C carbon atoms bond ionically to form three-dimensional structures
D carbon atoms bond covalently to form tetrahedral structures

15. Which compound reduces iron ore to molten iron in the blast furnace?

A carbon monoxide
B carbon dioxide
C calcium carbonate
D carbon

The choices A, B, C and D are to be used to answer questions **16 – 19**.

A choice may be used once, more than once, or not at all.

A carbon monoxide
B ethene
C nitrogen
D carbon dioxide

Which gas:

16. contributes to global warming? A B C D

17. is a product of incomplete combustion? A B C D

18. is contained in many fertilizers? A B C D

19. is released by ripening fruit? A B C D

Use the reactions to answer questions **20 – 23**. A choice may be used once, more than once or not at all.

A $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$
B $C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)$
C $C_6H_{12}O_6(aq) \rightarrow 2C_2H_5OH(aq) + 2CO_2(g)$
D $CH_3COOH(l) + C_2H_5OH(l) \rightarrow CH_3COOC_2H_5(l) + H_2O(l)$

Which reaction is categorized as:

20. fermentation? A B C D

21. combustion? A B C D

22. esterification? A B C D

23. addition reaction? A B C D

24. Which hydrocarbon is an alkene?

A C_2H_2
B C_5H_{10}
C C_7H_{12}
D $C_{14}H_{26}$

25. What is a hydrocarbon with the formula C_8H_{18} called?

A octene
B octane
C propene
D propane

26. What would be the result of increased levels of carbon dioxide in the atmosphere?

A smog
B fog
C global warming
D ozone depletion

27. Recycling of materials is a process which occurs in nature as well as in industry.

Which is NOT recycled in nature?

A nitrogen
B carbon
C water
D aluminium

28. What happens when a pure liquid is boiled so that it becomes a vapour?

A an exothermic change takes place
B the speed of movement of the molecules decreases
C the temperature of the vapour is the same as the temperature of the liquid
D the strength of the bonds between molecules is increased

29. Which electron arrangement is that of a halogen?

A 2,2
B 2,8,1
C 2,8,8,2
D 2,7

30. According to Charles' Law, why does a balloon inflated with air become larger as the air in the room becomes noticeably warmer?

A the molecules of a gas gain kinetic energy
B the molecules of a gas collide less frequently
C the molecules of a gas lose kinetic energy
D the individual molecules of a gas get smaller

31. In which compound are the particles held together by ionic bonds?

A SO_3
B CO
C KBr
D C_3H_8

32. Why is copper used in the electrical wiring of cars?

A conducts electricity and is easily obtained from its ores
B has a low melting point and is malleable
C has a low boiling point and is inexpensive
D is very brittle but ductile

33. Which symbols are isotopes of each other?

A C–14 and N–14
B I–131 and I–131
C O–16 and O–18
D Rn–222 and Ra–222

34. Which particles of an atom of helium contribute the most to its mass?

A neutron and electron
B electron and proton
C proton and neutron
D proton

35. What is the correct word equation for the reaction of magnesium with oxygen?

A magnesium + oxygen → magnesium oxide
B magnesium + oxygen → magnesium oxygen
C magnesium + oxygen → magnesium trioxide
D magnesium + oxygen → magnesium dioxide

36. How are elements in the same group in the Periodic Table alike?

A same numbers of electrons in an atom
B same chemical properties
C same melting points
D same relative atomic masses

37. What mass of carbon dioxide is formed when 25 g of calcium carbonate is decomposed by heating?

$$CaCO(s)_3 \rightarrow CaO_{(s)} + CO_{2(g)}$$

(Relative atomic masses, A_r: Ca = 40, C = 12 and O = 16)

A 10 g
B 11 g
C 22 g
D 44 g

38. Which sample of gas contains the largest number of gas particles?

A 10 g of chlorine
B 10 g of fluorine
C 10 g of nitrogen
D 10 g of oxygen

39. Element **X** has an electronic configuration of 2,8,2
Element **Y** has an electronic configuration of 2,8,7
They react to form an ionic compound

What are the formula of the compound and the valency of each ion?

	compound formula	ion **X** valency	ion **Y** valency
A	**XY**	+2	–4
B	**XY**	+4	–4
C	$\mathbf{XY_2}$	+2	–1
D	$\mathbf{X_2Y}$	+1	–2

40. The relative formula mass of anhydrous copper(II) sulfate is 160.

When water was added to 160 g of anhydrous copper sulfate, 250 g of blue crystalline, hydrated copper sulfate formed having the formula $CuSO_4 \cdot XH_2O$.

What is the correct value of X?

A 2
B 5
C 7
D 10

41. In the Contact process, sulfur dioxide reacts with oxygen to give sulfur trioxide.

What are the values of **x**, **y**, and **z** in the equation, respectively?

$$xSO_2\,(g) + yO_2\,(g) \rightarrow zSO_3\,(g)$$

A 1,2,3
B 2,1,2
C 1,2,2
D 2,1,3

[Turn over

Electronegativity is a measure of the relative strength of attraction that an atom has for outside electrons. The value tends to increase with increasing atomic number in a period and has a maximum value of 4.

The table lists some properties of elements in Period 2 of the Periodic Table.

element	atomic number	electronegativity	atomic radius
Li	3	1.0	1.52
Be	4	1.5	1.53
B	5	2.0	0.88
C	6	2.5	0.77
N	7	3.0	0.70
O	8	3.5	0.66
F	9	4.0	0.64

Use the information given in the table to answer question 42.

42. Which statement is true about the elements in Period 2?

A Elements on the left-hand side of the Periodic Table are more electronegative than those on the right-hand side.
B Elements with larger atomic radii are more electronegative.
C Metallic elements have greater numbers of electrons.
D Atoms of electronegative elements are more likely to become negative ions.

43. How are the elements in Period 2 in the modern Periodic Table arranged?

A according to decreasing atomic mass
B according to Mendeleev's original model
C according to increasing atomic number
D according to when they were discovered

44. Which process releases oxygen into the atmosphere?

A burning fossil fuels
B oxidising the surfaces of materials
C respiration in animals
D photosynthesis in sea algae

45. Nitrogen, phosphorus and potassium are three main plant nutrients.

Which fertilizer contains two of these elements?

A ammonium nitrate
B calcium phosphate
C potassium nitrate
D sodium nitrite

46. What name is given to compounds that have the general formula C_nH_{2n}?

A alkanes
B alkenes
C alkanols
D alkanoic acids

47. Which action can reduce environmental pollution?

A adding lead to gasoline to stop engine knock
B measuring the acidity of rainfall
C adding soluble 20-20-20 fertilizer to the soil
D using bio-degradable plastics

48. Sulfur dioxide is returned to the earth as an acid every time it rains.

What is the name of the acid formed?

A sulfuric acid
B sulfurous acid
C aqueous hydrogen sulfide
D thiosulfate solution

49. Hydrogen peroxide easily breaks down to give oxygen gas.

In an experiment, equal volumes of hydrogen peroxide were mixed with equal masses of four catalysts. Effective catalysts have larger rates of gas production.

The table shows the total volume of oxygen released after each reaction had taken place for various lengths of time.

catalyst	volume of O_2 release/cm^3	time/sec
A	10	40
B	8	30
C	4	20
D	2	10

Which catalyst is the most effective?

50. Which change shows nitrogen gas being **REDUCED**?

A $N_2 \rightarrow N_2O$
B $N_2 \rightarrow NO$
C $N_2 \rightarrow NO_2$
D $N_2 \rightarrow NH_3$

End]

3051/1

BGCSE

School Number	Candidate Number

Surname and Initials

CHEMISTRY

PAPER 1 3051/1

Monday 23 MAY 2011 12.30 – 1.45 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.

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 16 printed pages and 4 blank pages.

The Periodic Table of the Elements

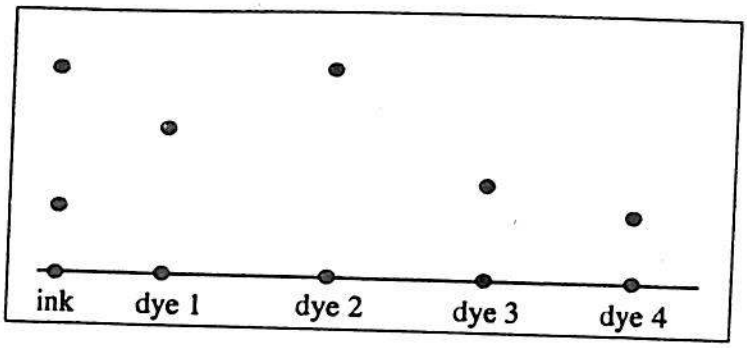
Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H Hydrogen 1										4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 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. A student investigates to find which commercial dyes are present in pen ink. The chromatogram shows the results of the investigation.



Which dyes are present in the ink?

A dye 1 and dye 3
B dye 2 and dye 1
C dye 3 and dye 4
D dye 4 and dye 2

2. How can pure sodium chloride crystals be obtained from a solution containing rock salt?

A distillation followed by decanting
B evaporation followed by filtration
C filtration followed by decanting
D filtration followed by evaporation

3. Which process is the most suitable to separate a mixture of liquids?

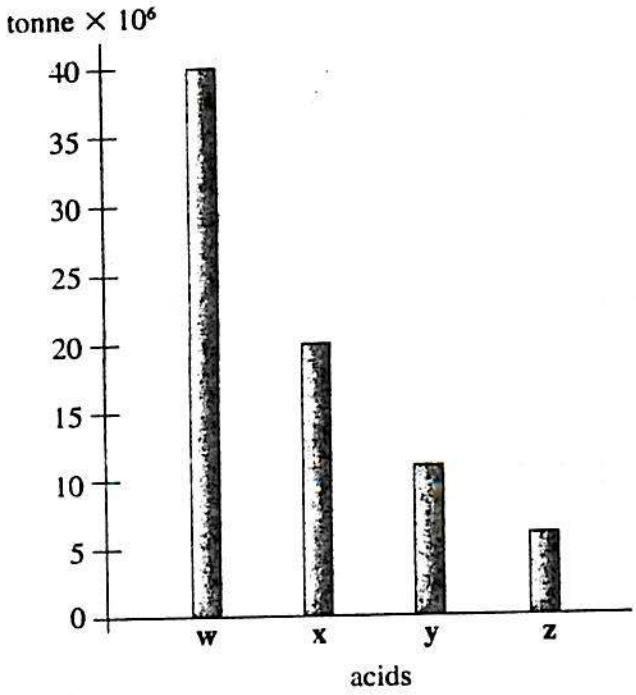
A centrifugation
B decanting
C filtration
D fractional distillation

4. What is the formula of the hydrogencarbonate (bicarbonate) ion?

A CO_3^{2-}
B HCO_3^-
C CO_2^-
D HCO_2^-

The bar graph shows the relative amount of four acids that are produced annually. The letters **w**, **x**, **y** and **z** replace the names of the acids.

Use the bar graph to answer questions **5**, **6** and **7**.



5. Which acid is produced in the largest mass?

A **w**
B **x**
C **y**
D **z**

6. Acid **z** can be produced by the oxidation of ethanol, C_2H_5OH.

What is the name of acid **z**?

A butanoic acid, $C_4H_8O_2$
B ethanoic acid, CH_3COOH
C methanoic acid, $HCOOH$
D phosphoric acid, H_3PO_4

7. What is the total mass of acids **x** and **y** produced annually?

A 60 million tonnes
B 31 million tonnes
C 29 million tonnes
D 18 million tonnes

8. Dilute sodium hydroxide is added to the solution of an unknown ion. The mixture is warmed to produce a gas that turns red litmus paper blue.

What is the unknown ion?

A ammonia, NH_3^+
B ammonium, NH_4^+
C carbonate, CO_3^{-2}
D nitrate, NO_3^-

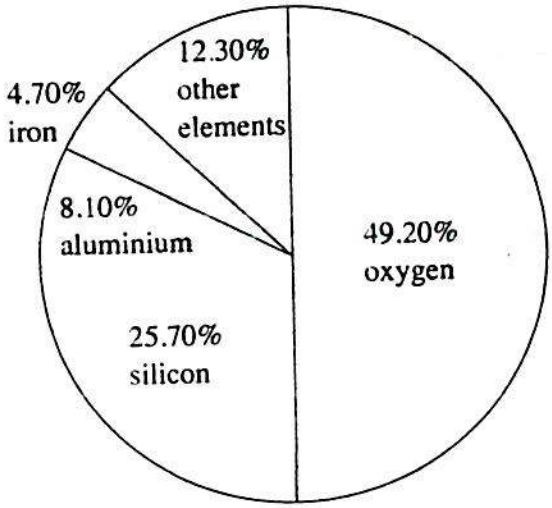
9. A small piece of sodium metal is added to water containing Universal Indicator. The equation shows the reaction that takes place.

$$2H_2O(l) + 2Na(s) \rightarrow 2NaOH(aq) + H_2(g)$$

Which indicator colours would be seen **before** and **after** the reaction?

	before	**after**
A	colourless	red
B	green	blue
C	colourless	blue
D	green	red

10. The chart shows some of the elements present in the earth's crust.



Which row matches the names of the ores from which aluminium and iron are extracted?

	iron ore	**aluminium ore**
A	marble	haematite
B	haematite	bauxite
C	haematite	limestone
D	limestone	bauxite

11. Oxygen exists as diatomic molecules in air. The air contains ozone which is triatomic.

Which term best describes these different forms of the element oxygen?

A allotropes
B isotopes
C isomers
D polymers

12. An iron nail is placed in copper sulphate solution. The equation shows the reaction.

$$Fe\ (s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$$

What is occurring in the equation, in terms of reduction and oxidation?

A copper loses electrons
B iron loses electrons
C copper is oxidized
D iron and copper are reduced

13. Which metal compounds are all soluble in water?

A carbonate
B sulphate
C nitrate
D hydroxide

14. What is the order of reactivity of the metals, from the **MOST** reactive to the **LEAST** reactive?

A calcium, sodium, magnesium and zinc
B sodium, calcium, zinc and magnesium
C sodium, calcium, magnesium and zinc
D zinc, magnesium, calcium and sodium

15. Andradite is an ore that has the chemical formula $Ca_3Fe_2SiO_3$.

What is the electronic configuration of the calcium ion in the compound?

A 3,2,1,3
B +2
C 2,8,8
D 2,8,3

16. When vinegar is added to baking powder, a gas is produced that turns calcium hydroxide solution cloudy.

What is the name of the gas?

A ammonia
B carbon dioxide
C oxygen
D sulphur dioxide

17. CFCs are classified as chlorofluorocarbons. Which environmental condition could CFCs cause?

A acid rain
B depletion of the ozone layer
C eutrophication
D smog

18. When potassium iodide solution is added to lead(II) nitrate solution, a precipitate and the solution of a salt are produced.

Which chemical equation represents this reaction?

A $2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$
B $2KI(l) + Pb(NO_3)_2(aq) \rightarrow PbI_2(aq) + 2KNO_3(s)$
C $2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI_2(aq) + 2KNO_3(aq)$
D $2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI(s) + 2KNO_3(s)$

19. Which mineral exported from The Bahamas is used in the extraction of Iron from its ore?

A aragonite
B andradite
C bauxite
D chromite

20. Which element has a valency of +3?

A aluminium
B calcium
C oxygen
D sulphur

Aluminium chloride can be prepared by passing dry chlorine gas over heated aluminium metal. [A_r: Al = 27.0; Cl = 35.5]

The reaction is $2Al(s) + 3Cl_2(g) \rightarrow 2AlCl_3(s)$

Use the information given to answer questions **21**, **22**, **23** and **24**.

21. What is the molecular mass of aluminium chloride?

A 98.0 g
B 133.5 g
C 196.0 g
D 267.0 g

22. What is the approximate percentage of aluminium in aluminium chloride?

A 14%
B 20%
C 28%
D 40%

23. Which mass of aluminium is needed to make 2 moles of aluminium chloride?

A 2 g
B 27 g
C 54 g
D 133.5 g

24. What is the total number of moles of reactants shown in the equation?

A 2
B 3
C 5
D 7

25. Which statements about trends in the Periodic Table are **correct**?

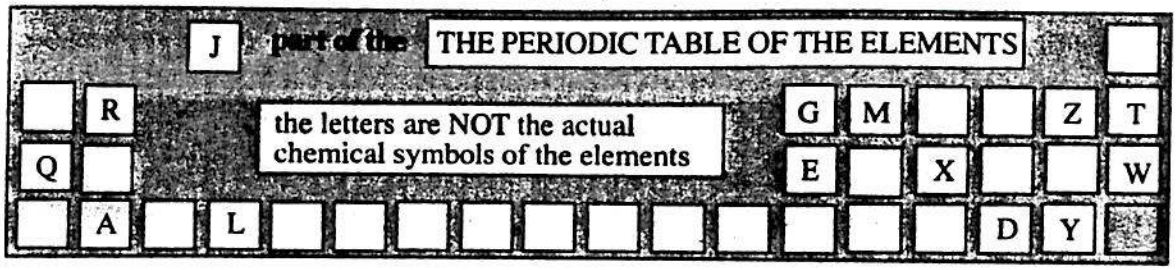
I electronegativity increases when elements are more metallic
II the number of neutrons in an atom increases by 1 each time across a Period
III as metal atoms increase in size, outer electrons are harder to lose
IV as non-metals atoms increase in size, extra electrons are harder to gain

A statements I and II
B statements II, III and IV
C statements I and IV
D statements I, II, III and IV

26. How is a pain killer, such as Tylenol or Panadol, used to relieve headaches classified?

A analgesics
B antibiotics
C antidepressants
D hallucinogens

The diagram shows partial sections of The Periodic Table, however, letters used are **NOT** the symbols of the elements. Use this diagram and the copy of the Periodic Table on **page 2** to answer questions **27, 28, 29** and **30.**



27. Which letter represents the most reactive metal?

A G
B R
C Q
D M

28. Which element forms an ion with a negative charge of 2?

A R
B M
C X
D D

29. Which elements are part of the group known as the halogens?

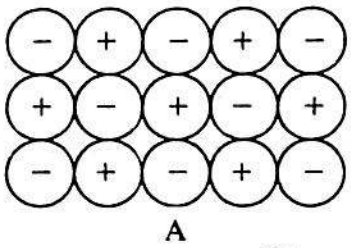
A R, A
B G, E
C Z, Y
D T, W

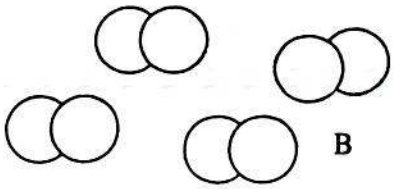
30. Which elements are soft, silvery coloured metals?

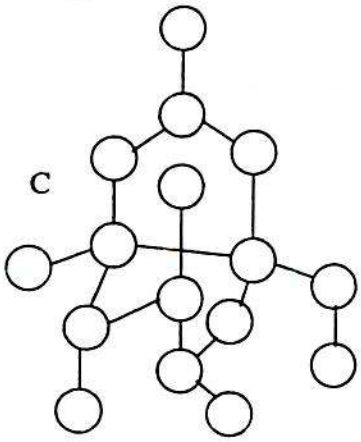
A R, A
B G, E
C Z, Y
D T, W

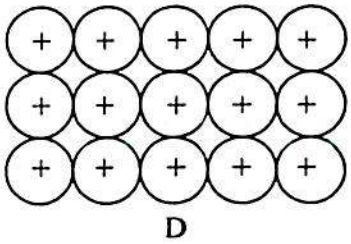
Use the accompanying information and diagrams to answer questions **31** to **34**.

Substances can come in a variety of structures. The diagrams A, B, C and D show structures of four substances which are elements or compounds.









Which structure represents a substance that

31.	is a gas at r.t.p.?	A	B	C	D
32.	conducts electricity when molten but not when solid;	A	B	C	D
33.	is very hard and does not conduct electricity;	A	B	C	D
34.	conducts electricity both when it is solid and when it is liquid?	A	B	C	D

35. Which Law describes the relationship between volume and temperature for a given mass of gas at constant pressure?

A Avogadro's Law
B Boyle's Law
C Charles' Law
D Dalton's Law

36. The substances A, B, C and D are all naturally occurring and used as sources of chemicals.

Which of them is a single chemical compound?

A air
B limestone
C petroleum
D sea water

37. Ammonium compounds contain nitrogen. What are these compounds most often used as?

A antiseptics
B anti-perspirants
C cleaning agents
D fertilizers

38. In an experiment 0.36 g of diamond is burned in pure oxygen at r.t.p. What volume of carbon dioxide gas is produced? [r.t.p. molar volume is 24,000 cm^3]

A 36 cm^3
B 240 cm^3
C 480 cm^3
D 720 cm^3

39. The combustion of ethane can be represented by the equation shown

$$XC_2H_4 + YO_2 \rightarrow 2CO_2 + 2H_2O$$

To balance the equation, what must the values of **X** and **Y** be?

	X	Y
A	1	2
B	2	3
C	1	3
D	2	2

40. Sulphur dioxide is the anhydride of which acid?

A hydrosulphuric acid
B hyposulphurous acid
C sulphurous acid
D sulphuric acid

41. What are the properties of pure water?

I it is made up of diatomic molecules
II its molecules contain only covalent bonds
III above 100 °C, it is invisible in the atmosphere

A I, II and III
B I and II only
C II and III only
D I only