CANDIDATE – PLEASE NOTE!
You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.
Signature

TEST CODE **01212010**

FORM TP 2011056

MAY/JUNE 2011

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

CHEMISTRY

Paper 01 – General Proficiency

75 minutes

03 JUNE 2011 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 75 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) metre
   (B) newton
   (C) second
   (D) kilogram

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ

   The best answer to this item is "metre", so answer space (A) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. You may return to the omitted item later. Your score will be the total number of correct answers.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.

   The use of silent electronic calculators is allowed.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Which of the following phrases illustrates diffusion?

(A) Perfume scent throughout the air in a room
(B) The random motion of pollen dust in water
(C) The swelling of red beans when soaked in water
(D) The loss of heat from a hot body to a cold body

Items **2 - 4** refer to the following table.

Particle	Number of Protons	Number of Electrons	Number of Neutrons
V	8	8	8
W	16	16	16
X	8	8	9
Y	16	18	16

2. The particle X is an atom of

(A) chlorine
(B) nitrogen
(C) oxygen
(D) sulphur

3. Which of the following particles represents an anion?

(A) V
(B) W
(C) X
(D) Y

4. Which of the following pairs are isotopes?

(A) V and W
(B) W and Y
(C) X and V
(D) Y and X

5. Which of the following ions requires the LARGEST number of moles of electrons to liberate one mole of it?

(A) Al^{3+}
(B) Cl^{-}
(C) Cu^{2+}
(D) O^{2-}

Items **6 - 7** refer to the following information.

The atomic number of Element Z is 13.

6. In which group of the periodic table should Element Z be placed?

(A) 2
(B) 3
(C) 4
(D) 5

7. The oxidation state of an ion of Element Z would MOST probably be

(A) –5
(B) –3
(C) +3
(D) +5

8. Which of the following mixtures can be referred to as a standard solution?

(A) Iodine in 50 cm^3 of ethanol
(B) Sodium chloride in 50 cm^3 of water
(C) 30 g of sodium chloride in water
(D) 30 g of iodine in 50 cm^3 of ethanol

9. When solid lead nitrate is heated, it decomposes giving off nitrogen (IV) oxide and oxygen. The balanced equation for this reaction is

(A) $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2(g) + O_2(g)$

(B) $Pb(NO_3)_2(s) \rightarrow PbO(s) + NO_2(g) + O_2(g)$

(C) $Pb(NO_3)_2(s) \rightarrow PbO(s) + 2NO_2(g) + O_2(g)$

(D) $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 2NO_2(g) + O_2(g)$

---

10. Which of the following compounds has the GREATEST percentage by mass of carbon present in one mole? (M_r = relative molecular mass; relative atomic mass: H = 1; C = 12; O = 16)

(A) $C_2H_4O_2$ ($M_r = 60$)
(B) C_3H_8O ($M_r = 60$)
(C) C_2H_6O ($M_r = 46$)
(D) $C_6H_{12}O_6$ ($M_r = 180$)

11. A metallic bond is formed when

(A) cations are held together by a sea of mobile electrons
(B) positive metal ions are held together by a sea of anions
(C) anions are held together by negative electrons
(D) metal atoms are held together by molecular forces

12. An example of a substance with a macro-molecular structure is

(A) starch
(B) solid iodine
(C) copper sheet
(D) ethyl ethanoate

13. Which of the following is the CORRECT formula for ammonium carbonate?

(A) NH_4CO_3
(B) $NH_4(CO_3)_2$
(C) $(NH_4)_2CO_3$
(D) $(NH_4)_2(CO_3)_2$

14. Graphite is used as an electrode because it

(A) does not burn
(B) has mobile electrons
(C) is a metal
(D) is a reducing agent

15. Which of the following statements about covalent compounds are TRUE?

I. They are mainly solids.
II. They usually have low melting and boiling points.
III. They are usually insoluble in water.
IV. They contain only ions.

(A) I and III only
(B) I and IV only
(C) II and III only
(D) II and IV only

16. A piece of calcium was added to some distilled water in a container. The gas produced would be expected to

(A) relight a glowing splint
(B) give a 'pop' with a lighted splint
(C) decolourize acidified aqueous potassium manganate (VII)
(D) turn acidified aqueous potassium dichromate green

17. A separating funnel can be used to separate a mixture of

(A) kerosene and water
(B) kerosene and ethanol
(C) solid sodium chloride and water
(D) solid sodium chloride and kerosene

18. One way in which hydrogen resembles the Group 7 elements is that hydrogen

(A) is a colourless gas like the halogens
(B) is one electron short of a rare gas structure
(C) donates its one electron very easily and forms an H^+ ion
(D) has its atoms held together by electrovalent bonds

19. The pH of fresh sugar cane juice which is usually in the range 5.0 - 5.5 can be changed to 7.5 - 8.0 for more efficient processing by adding

(A) acetic (ethanoic) acid, CH_3CO_2H
(B) limestone, $CaCO_3$
(C) slaked lime, $Ca(OH)_2$
(D) sodium chloride, NaCl

20. Sulphuric acid is a stronger acid than ethanoic acid (acetic acid) in aqueous solution because sulphuric acid

(A) is more corrosive than ethanoic acid
(B) is obtainable in high concentrations
(C) causes sugar to char whereas ethanoic acid does not
(D) ionises to a greater extent than ethanoic acid

21. Which of the following is NOT a normal salt?

(A) K_2CO_3
(B) KNO_3
(C) Na_2CO_3
(D) $NaHCO_3$

---

22. The ionic equation for the reaction between an acid and a carbonate may be represented as

(A) $H^+(aq) + CO_3^{2-}(aq) \rightarrow HCO_3^-(aq)$
(B) $2H^+(aq) + CO_3^{2-}(aq) \rightarrow H_2CO_3(aq)$
(C) $2H^+(aq) + CO_3^{2-}(aq) \rightarrow CO_2(g) + H_2O(l)$
(D) $H^+(aq) + CO_3^{2-}(aq) \rightarrow CO_2(g) + H_2O(l)$

GO ON TO THE NEXT PAGE

Items 23 - 24 refer to the compounds in the following equation:

$NO_2(g) + SO_2(g) \rightarrow NO(g) + SO_3(g)$

23. Which of the compounds is reduced?

(A) NO_2

(B) SO_2

(C) NO

(D) SO_3

24. Which of the compounds is the oxidising agent?

(A) NO_2

(B) SO_2

(C) NO

(D) SO_3

25. Acidified potassium manganate (VII) is usually used as

(A) a reducing agent
(B) an oxidising agent
(C) both an oxidising and a reducing agent
(D) a dehydrating agent

26. Which of the following occurs to a metal atom when it becomes an ion?

(A) Gains electrons and is oxidised.
(B) Gains electrons and is reduced.
(C) Loses electrons and is oxidised.
(D) Loses electrons and is reduced.

27. In which of the following does hydrogen have a negative oxidation number?

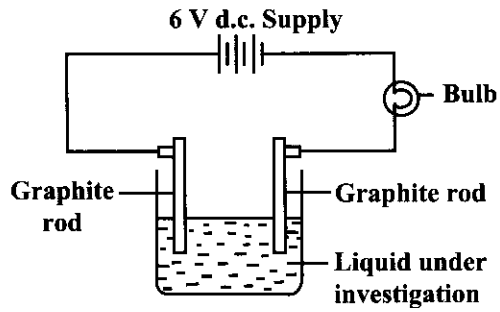
(A) CH_4

(B) H_2O_2

(C) NH_3

(D) NaH

Item 28 refers to the following apparatus which is used to measure the relative conductivity of various substances.



28. If solutions containing one mole of solute per dm^3 of aqueous solution are investigated, which solution should cause the bulb to glow BRIGHTEST?

(A) Ammonia
(B) Ethanoic acid
(C) Sulphuric acid
(D) Water

29. Which of the following will NOT conduct electricity?

(A) Solid calcium
(B) Solid calcium chloride
(C) Molten calcium chloride
(D) A solution of calcium chloride in water

30. A current of 5 amperes was passed for 193 seconds through a solution of copper (II) sulphate using copper electrodes. The mass of copper that would be gained at the

(A) anode is 0.005 g
(B) cathode is 0.005 g
(C) anode is 0.320 g
(D) cathode is 0.320 g

(Relative atom mass of Cu = 64; Faraday constant = 96 500 coulombs per mole)

31. Which of the following elements does NOT react with H^+ (aq) ions to give hydrogen gas?

(A) Copper
(B) Iron
(C) Lead
(D) Zinc

32. Which of the following statements BEST characterises a catalyst?

(A) It alters the quantity of the products formed.
(B) It is always unchanged chemically at the end of a reaction.
(C) It is always unchanged physically at the end of a reaction.
(D) It is always used up in a chemical reaction.

33. Which of the following statements would be TRUE of exothermic reactions?

I. Heat energy is absorbed from the surroundings.
II. Heat energy is given out to the surroundings.
III. The products possess less energy than the reactants.

(A) I only
(B) III only
(C) I and III only
(D) II and III only

34. The reaction occurring at the cathode during the electrolysis of copper sulphate using inert electrodes is given by the equation

(A) $Cu \rightarrow Cu^{2+} + 2e^-$
(B) $Cu^{2+} + 2e^- \rightarrow Cu$
(C) $2H^+ + 2e^- \rightarrow H_2$
(D) $4OH^- - 4e^- \rightarrow 2H_2O + O_2$

35. Which of the following substances conducts an electric current but remains chemically unchanged?

(A) Aqueous copper (II) sulphate
(B) Copper
(C) Sulphur
(D) Sodium chloride

Items **36 - 38** refer to the following information.

A compound when treated with concentrated hydrochloric acid gives off a greenish-yellow gas which bleaches moist red litmus paper.

36. The compound is MOST likely to be

(A) copper (II) sulphate
(B) iron (III) oxide
(C) manganese (II) oxide
(D) potassium manganate (VII)

37. The concentrated hydrochloric acid is acting as

(A) an acid
(B) a catalyst
(C) a reducing agent
(D) an oxidising agent

38. The gas given off is

(A) chlorine
(B) hydrogen sulphide
(C) nitrogen dioxide
(D) sulphur dioxide

39. A recently discovered element is thought to be a metal. Which of the following physical properties would BEST confirm this?

(A) Density
(B) Hardness
(C) Melting point
(D) Electrical conductivity

Items **40 - 41** refer to the following compounds.

(A) CO
(B) CaO
(C) H_2S
(D) SO_2

Items **40 - 41** require a particular choice from the compounds above. The choice may be used more than once, once or not at all.

Which compound

40. is one of the MAIN substances responsible for the formation of acid rain?

41. may be used to counteract the effects of acid rain on the soil?

Item **42** refers to the following types of chemical reactions which occur in the carbon cycle.

I. Decomposition
II. Combustion
III. Synthesis

42. Which of these reactions would be responsible for returning carbon dioxide to the atmosphere?

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

43. Over time, aluminium articles do not deteriorate in air as do iron articles. Which of the following statements gives the CORRECT reason?

(A) Aluminium is higher up in the activity series than iron, therefore it is more resistant to corrosion than iron.
(B) Aluminium is lower than iron in the activity series, therefore it reacts less readily with air than iron.
(C) Both metals form hydroxide coats but the aluminium hydroxide prevents further reaction while the iron hydroxide does not.
(D) Both metals form oxide coats but aluminium oxide prevents further reaction while the iron oxide does not.

44. Which of the following elements is MOST electropositive?

(A) Aluminium
(B) Copper
(C) Magnesium
(D) Zinc

45. Ammonia may be produced in the laboratory by heating a mixture of ammonium chloride and

(A) copper
(B) calcium hydroxide
(C) ammonium sulphate
(D) calcium chloride

46. Which of the following substances is the catalyst used in the manufacture of sulphuric acid by the contact process?

(A) Iron
(B) Nickel
(C) Aluminium oxide
(D) Vanadium pentoxide

47. The compound ethene is described as being unsaturated. This means that the

(A) carbon atoms in ethene are linked by single bonds
(B) carbon atoms in the molecule are very reactive
(C) molecule contains at least one double bond
(D) molecule has insufficient hydrogen atoms

48. Which of the following would be characteristic of a homologous series?

I. All members possess the same general molecular formula.
II. Each member differs from the next by a common group.
III. All members have similar chemical properties.
IV. The physical properties of members change gradually as the relative molecular mass changes.

(A) I only
(B) I and IV only
(C) II and III only
(D) I, II, III and IV

49. Which of the following pairs of structural formulae are isomers of C_4H_{10}?

I. $H_3C - CH_2 - CH_2 - CH_3$

II.
$$H_3C - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$$

III.
$$\underset{\displaystyle CH_3}{\underset{|}{H_2C}} - CH_2 - CH_3$$

IV.
$$H_3C - \underset{\displaystyle CH_3}{\underset{|}{CH_2}} - CH_2$$

(A) I and II only
(B) I and III only
(C) II and IV only
(D) III and IV only

50. Ethyl ethanoate and fats are classified as esters. From this information it can be deduced that they BOTH

(A) are soluble in water
(B) burn with a blue flame
(C) contain the —COOR group
(D) have a pleasant odour

Items **51 - 53** refer to the following organic compounds.

(A) Ethanol
(B) Ethene
(C) Ethanoic acid
(D) Ethyl ethanoate

In answering Items **51 - 53** a particular choice from the above may be made more than once, once, or not at all.

Which of the organic compounds

51. undergoes addition reactions?

52. is immiscible with water and is sweet smelling?

53. is dehydrated by concentrated sulphuric acid to produce a gas which decolourises bromine?

54. Which of the following is used in the breathalyser test to detect the presence of alcohol?

(A) Lime water
(B) Lighter splint
(C) Bromine water
(D) Potassium dichromate

GO ON TO THE NEXT PAGE

Item **55** refers to the reaction represented by the equation below.

$RCOOH(aq) + NaOH(aq) \rightarrow RCOONa(aq) + H_2O(l)$

55. Which of the following processes CORRECTLY describes the reaction above?

(A) Decomposition
(B) Neutralization
(C) Precipitation
(D) Reduction

---

56. The MAJOR natural source of alkanes and alkenes is

(A) petroleum
(B) natural gas
(C) the earth's crust
(D) the atmosphere

57. The process by which large molecules of hydrocarbons are broken up into smaller molecules is called

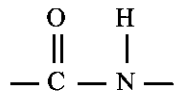
(A) condensation
(B) cracking
(C) polymerization
(D) saponification

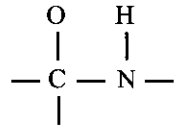
58. The reaction of fats with concentrated aqueous sodium hydroxide is commonly referred to as

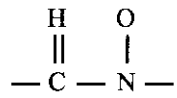
(A) condensation
(B) esterification
(C) neutralization
(D) saponification

59. Which of the following linkages is found in an amide?

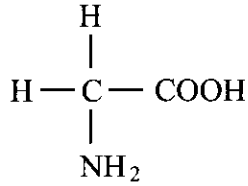
(A)


(B)


(C)


(D)


60. Which of the following types of polymer may be derived from compounds like the one below?



(A) Polyamide
(B) Polyalkene
(C) Polyester
(D) Polysaccharide

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.