FORM TP 2018004

CANDIDATE – PLEASE NOTE:
Print your name on the line below and write this booklet number on your answer sheet. Failure to do so may result in disqualification.

TEST CODE **01212010**

JANUARY 2018

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

CHEMISTRY

Paper 01 – General Proficiency

1 hour 15 minutes

18 JANUARY 2018 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 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 (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, go on to the next one. You may return to that item later.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. You may use a silent, non-programmable calculator to answer items.

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

1. Particles of a solid cannot move about freely because the

(A) particles have a high density
(B) forces of attraction are very strong
(C) forces of attraction are very weak
(D) particles cannot be easily compressed

2. Which of the following processes does NOT provide evidence in support of the particulate nature of matter?

(A) Osmosis
(B) Diffusion
(C) Filtration
(D) Brownian motion

3. Which of the following mixtures are arranged in order of INCREASING particle size?

(A) Solutions, colloids, suspensions
(B) Solutions, suspensions, colloids
(C) Colloids, solutions, suspensions
(D) Suspensions, colloids, solutions

4. Sulfuric acid is a stronger acid than ethanoic acid (acetic acid) in aqueous solution because sulfuric acid

(A) is more corrosive than ethanoic acid
(B) is more concentrated than ethanoic acid
(C) ionizes to a greater extent than ethanoic acid
(D) causes sugar to char whereas ethanoic acid does not

5. Two particles have the following compositions:

(i) 10 protons, 12 neutrons, 10 electrons
(ii) 10 protons, 11 neutrons, 10 electrons

Therefore, BOTH particles are

(A) anions
(B) isotopes
(C) cations
(D) metals

6. In the notation $^{35}_{17}Cl$ the number 17 represents the

(A) charge
(B) mass number
(C) oxidation state
(D) atomic number

7. What mass of oxygen atoms contains the same number of moles as 112 g of sulfur atoms?

[RAM: O = 16; S = 32]

(A) 0.56 g
(B) 5.60 g
(C) 56.00 g
(D) 560.00 g

8. Which of the following halogens is a liquid at room temperature?

(A) Iodine
(B) Bromine
(C) Fluorine
(D) Chlorine

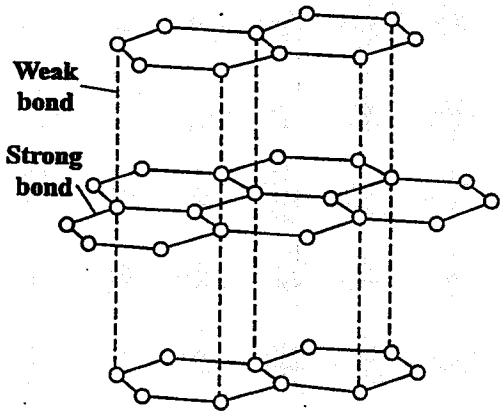
9. Sodium chloride has a high melting point because

(A) sodium has a high melting point
(B) chlorine is a powerful oxidizing agent
(C) the crystals do not absorb heat readily
(D) the ions are bound by strong electrostatic forces

10. A new element R shows chemical properties similar to the element sodium. What is the correct formula of a compound formed with R and sulfur?

(A) R_2S
(B) RS_2
(C) RS
(D) R_2S_2

Item 11 refers to the following diagram.



11. The diagram above represents the arrangement of atoms in

(A) sulfur
(B) benzene
(C) graphite
(D) diamond

12. 'Ionic bond formation' results from the

(A) donation of electrons from a non-metal to a metal to achieve stability
(B) donation of electrons from a metal to a non-metal to achieve stability
(C) attraction between the positively charged ions of a metal and a pool of electrons
(D) sharing of electrons between the atoms of a metal and non-metal to achieve stability

13. Sulfur and oxygen are in the same group of the periodic table because

(A) they can react with each other
(B) they can form covalent compounds
(C) they have the same number of electrons in their outer shell
(D) the atomic number of sulfur is 16 and the relative atomic mass of oxygen is 16

14. An acid can be defined as a

(A) proton donor
(B) neutron donor
(C) proton acceptor
(D) neutron acceptor

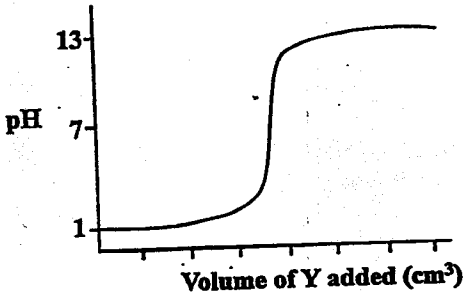
15. A salt was heated with a certain base. The gas evolved turned moist red litmus paper blue. Which of the following ions does the salt contain?

(A) Nitrate(V)
(B) Ammonium
(C) Sulfate(VI)
(D) Carbonate

16. The calcium ion has an oxidation number of +2 because the calcium atom has

(A) two electrons in its outermost shell
(B) six electrons in its outermost shell
(C) two allotropes
(D) two isotopes

Item 17 refers to the following graph which shows the variation of the pH of the mixture formed when Solution Y is added to a fixed volume of Solution X.



17. Which of the following pairs of substances can represent solutions X and Y?

	X	Y
(A)	$HCl_{(aq)}$	H_2O
(B)	$KOH_{(aq)}$	H_2O
(C)	$HCl_{(aq)}$	$KOH_{(aq)}$
(D)	$KOH_{(aq)}$	$HCl_{(aq)}$

18. The relative atomic mass of carbon is 12 and that of oxygen is 16. Therefore, 88 g of carbon dioxide consists of

(A) 3.1 moles of carbon dioxide
(B) 12 moles of carbon and 32 moles of oxygen
(C) 1 mole of carbon atoms and 2 moles of oxygen atoms
(D) 2 moles of carbon atoms and 4 moles of oxygen atoms

19. A piece of metal is reacted with an acid to produce hydrogen gas. Which of the following procedures should be employed in order to increase the rate of the reaction?

I. Increasing the temperature at which the reaction is carried out
II. Subdividing the piece of metal
III. Reducing the concentration of the acid

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

20. Which of the following pairs of elements exhibit allotropy?

(A) Sulfur and carbon
(B) Sulfur and nitrogen
(C) Carbon and chlorine
(D) Nitrogen and phosphorus

21. In which of the following processes is fractional distillation NOT used?

(A) Refining of crude petroleum
(B) Conversion of alkanes into alkenes
(C) Separation of liquid air into nitrogen and oxygen
(D) Separation of ethanol from a fermentation mixture

Items 22–24 refer to the following information.

A piece of calcium was added to some distilled water in a container and the following observations were recorded.

1. The reaction was rapid.
2. Bubbles of gas evolved.
3. A cloudy suspension formed.
4. The temperature increased.

22. The gas produced is expected to

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

23. The 'cloudy' suspension was produced because in water

(A) calcium hydroxide is slightly soluble
(B) calcium oxide is slightly soluble
(C) calcium carbonate is insoluble
(D) calcium sulfate is insoluble

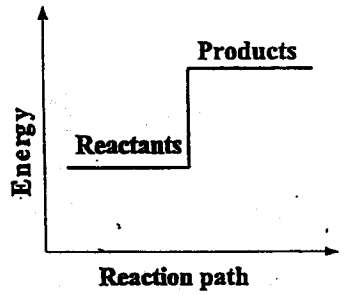
24. A sample of the suspension was filtered and the pH of the filtrate determined. The expected pH of the filtrate should be approximately

(A) 3
(B) 5
(C) 7
(D) 10

25. Which of the following substances reacts with an acid, liberating a gas which turns lime water 'milky'?

(A) Methyl orange
(B) Barium chloride
(C) Calcium carbonate
(D) Magnesium metal

Item 26 refers to the following energy profile diagram.



26. From the energy profile diagram above, it can be said that the reactants

(A) cannot be converted into products
(B) absorb energy to form products
(C) give out heat when they react
(D) give energy to products

27. The oxidation number of silicon in Na_2SiO_3 is

(A) 1
(B) 2
(C) 3
(D) 4

28. When a concentrated solution of sodium chloride is electrolysed using carbon electrodes,

(A) chlorine is liberated at the anode
(B) sodium is liberated at the cathode
(C) the solution at the anode is acidic
(D) the solution at the cathode is acidic

29. The rate of a chemical reaction does NOT depend on the

(A) presence of a catalyst
(B) concentration of the reactants
(C) temperature of the reacting system
(D) energy change associated with the reaction

30. Which of the following elements form an acidic oxide when burnt in air?

I Aluminium
II Carbon
III Nitrogen

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

31. When a piece of magnesium ribbon is burnt in air, magnesium oxide is formed. It is then placed in water and tested with litmus solution, which turns blue.

The above experiment shows that magnesium oxide is

(A) acidic
(B) basic
(C) neutral
(D) insoluble

32. A suitable drying agent for a laboratory preparation of ammonia is

(A) calcium oxide
(B) calcium chloride
(C) anhydrous copper sulfate
(D) concentrated sulfuric acid

33. Which of the following metals will NOT displace hydrogen from dilute hydrochloric acid?

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

34. Potassium is a metal. From this information ONLY, it may be deduced that potassium

(A) is soft
(B) is very reactive
(C) has a low melting point
(D) is a good conductor of electricity

35. An alloy is

(A) a type of element
(B) a mixture of metals
(C) a compound of metals
(D) the same as aluminium

36. Which of the following gases forms white fumes when a glass rod, dipped in aqueous ammonia, is held in it?

(A) Ammonia
(B) Nitrogen(IV) oxide
(C) Hydrogen chloride
(D) Steam

Items 37–38 refer to the extraction of aluminium from bauxite.

37. Cryolite is used

(A) to lower the melting point of the electrolyte
(B) as a source of additional ions
(C) to protect the carbon anode
(D) as the electrolyte

38. The carbon anode tends to

(A) react with the cryolite
(B) be oxidized by oxygen
(C) dissolve in the electrolyte
(D) be oxidized by fluorine from cryolite

39. Which of the following elements is an important constituent of chlorophyll?

(A) Iron
(B) Copper
(C) Calcium
(D) Magnesium

40. Which of the following is/are true of non metals?

I. They are reducing agents.
II. They are capable of replacing hydrogen in acids to form salts.
III. They are generally poor conductors of electricity.

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

41. The main substances responsible for acid rain are

(A) chlorofluorocarbons
(B) sulfur dioxide and sulfur trioxide
(C) lead compounds in exhaust fumes
(D) carbon dioxide and carbon monoxide

42. Which of the following elements is the MOST electropositive?

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

Item 43 refers to the following sequence of reactions involving iron compounds, where I, II, III and IV represent the progressive stages in the sequence.

$$FeCO_3 \xrightarrow[I]{} FeO \xrightarrow[II]{} Fe_2O_3 \xrightarrow[III]{} Fe_2(SO_4)_3 \xrightarrow[IV]{} Fe(OH)_3$$

43. A suitable reagent that could be used at stage IV is

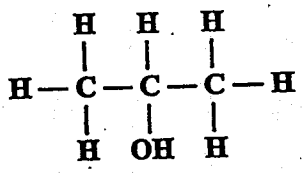
(A) steam
(B) hydrogen
(C) solid copper oxide
(D) aqueous sodium hydroxide

44. Which of the following features is NOT true of all homologous series of compounds?

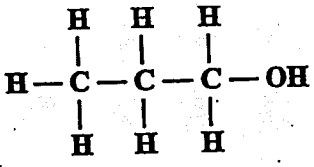
The members of the series have

(A) similar chemical properties
(B) the same empirical formula
(C) the same functional group
(D) the same general formula

Item 45 refers to two organic compounds, I and II, of molecular formula C_3H_8O, with the following structures:



Compound I

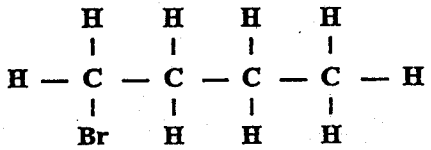


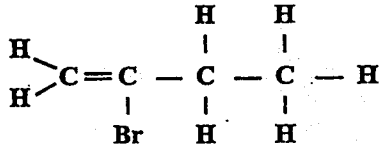
Compound II

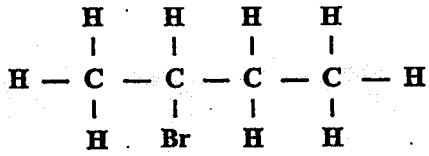
45. Compounds I and II are known as the

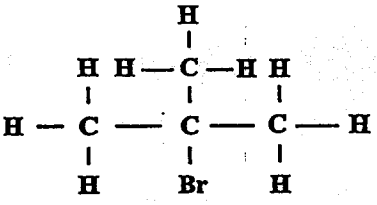
(A) isomers of C_3H_8O
(B) isotopes of C_3H_8O
(C) condensed formulae of C_3H_8O
(D) molecular formulae of C_3H_8O

46. The compound 2-bromobutane has a structural formula of

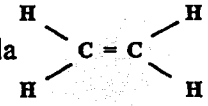
(A) 

(B) 

(C) 

(D) 

47. Which of the following about ethane is correct?

(A) Structural formula 

(B) Molecular formula – C_2H_4
(C) Empirical formula – CH_2
(D) General formula – C_nH_{2n+2}

48. Which of the following substances would an alkane react?

(A) Chlorine
(B) Hydrogen
(C) Ethanol
(D) Steam

Items 49–50 refer to the following general formulae.

(A) C_nH_{2n}

(B) C_nH_{2n+2}

(C) $C_nH_{2n+1}OH$

(D) $C_nH_{2n+1}COOH$

In answering Items 49–50, each option may be used once, more than once or not at all.

49. Which of the above is the formula of a compound that undergoes a substitution reaction with bromine?

50. Which of the above is the formula of a compound which burns with a sooty flame?

51. Which of the following statements are true of alkanes and alkenes?

I. Both burn in air to give carbon dioxide and water.
II. Alkanes undergo substitution reactions whilst alkenes undergo addition reactions.
III. Alkanes are saturated hydrocarbons whilst alkenes are unsaturated hydrocarbons.

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

Items 52–53 refer to the following options.

(A) Addition
(B) Isomerism
(C) Esterification
(D) Polymerization

In answering Items 52–53, each option may be used once, more than once or not at all.

52. What is the name of the catalysed reaction which uses an alcohol and an organic acid?

53. What is the name of the process in which proteins are formed from amino acids?

54. Which of the following equations represents the fermentation of sugars, using glucose as the substrate?

(A) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

(B) $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

(C) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

(D) $C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11} + H_2O$

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55. When large alkane molecules are cracked, the products are a mixture of

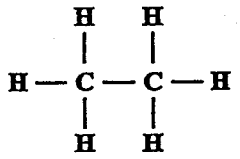
(A) small alkane molecules
(B) small alkene molecules
(C) large and small alkane molecules
(D) small alkane and small alkene molecules

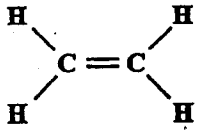
56. Which of the following are reactions of ethanoic acid?

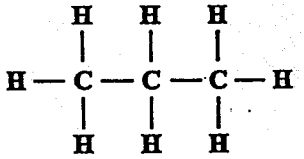
I. It forms a salt with aqueous sodium hydroxide.
II. It liberates carbon dioxide from a carbonate.
III. It liberates hydrogen on contact with a strongly electropositive metal.

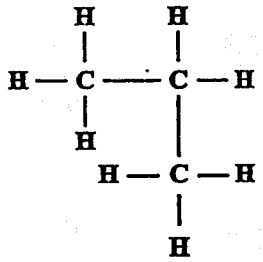
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

57. Which of the following compounds can decolorize potassium manganate(VII)?

(A) 

(B) 

(C) 

(D) 

58. Which of the following is NOT formed from condensation polymerization?

(A) Polyalkenes
(B) Polyamides
(C) Polyesters
(D) Polysaccharides

59. It is better to use soapless detergents for washing in hard water than it is to use soap because soapless detergents

(A) are cheaper than soaps
(B) are more biodegradable than soaps
(C) are more soluble in hard water than soaps
(D) form an insoluble scum in hard water

60. Which of the following hydrocarbons is the MAJOR constituent of natural gas?

(A) Methane
(B) Propane
(C) Ethane
(D) Butane

END OF TEST

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