CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

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FORM TP 2020055

TEST CODE **01212010**

MAY/JUNE 2020

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

CHEMISTRY

Paper 01 – General Proficiency

1 hour 15 minutes

05 JUNE 2020 (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) second
   (C) newton
   (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.

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1. Which of the following processes provide evidence of the particulate nature of matter?

I. Diffusion
II. Filtration
III. Osmosis

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

2. 'Mass number' is the number of

(A) neutrons plus protons
(B) neutrons minus protons
(C) electrons plus neutrons
(D) electrons plus protons

3. The arrangement of electrons in atoms of X and Y are 2, 8, 5 and 2, 8, 6 respectively. Which of the following represents X and Y?

	X	Y
(A)	Non-metal	Non-metal
(B)	Non-metal	Metal
(C)	Metal	Non-metal
(D)	Metal	Metal

Items 4–6 refer to the information in the following table.

Element	Number of Protons	Number of Electrons	Number of Neutrons
Q	8	8	8
R	16	16	16
S	8	8	9
T	16	18	16

4. Which of the following elements is an anion?

(A) Q
(B) R
(C) S
(D) T

5. Which of the following pairs of elements are isotopes?

(A) Q and R
(B) R and T
(C) Q and S
(D) S and T

6. Element Q is

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

7. Which of the following acids will NOT form an acid salt?

(A) H_3PO_4
(B) H_2CO_3
(C) H_2SO_4
(D) CH_3CO_2H

8. An ion with a single negative charge may be converted into a neutral atom by

(A) losing a neutron
(B) gaining a proton
(C) losing an electron
(D) gaining an electron

9. Which of the following aqueous solutions contains 1 mole of hydrogen ions?

(A) 2 dm^3 of 0.5 mol dm^{-3} HCl
(B) 2 dm^3 of 0.5 mol dm^{-3} H_2SO_4
(C) 1 dm^3 of 1.0 mol dm^{-3} H_2SO_4
(D) 1 dm^3 of 1.0 mol dm^{-3} CH_3COOH

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

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

11. 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) RS_2
(B) RS
(C) R_2S
(D) R_2S_2

Item **12** refers to the information in the following table.

Element	Atomic Number
I	3
II	6
III	17
IV	18

12. Which TWO elements above, when combined with each other, form an ionic compound?

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

Item **13** refers to Compound X, which melts at 18 °C and boils at 55 °C.

13. Compound X is MOST likely

(A) a liquid metal
(B) a giant molecule
(C) a simple molecule
(D) an ionic compound

14. Which of the following statements BEST describes the formation of a metallic bond?

(A) Anions are held together by electrons.
(B) Metal atoms are held together by anions.
(C) Metal ions are held together by a sea of anions.
(D) Cations are held together by a sea of mobile electrons.

15. Covalent compounds can be formed between

(A) a metal and a non-metal
(B) a positive ion and a negative ion
(C) two identical non-metal atoms, excluding the noble gases
(D) two identical non-metal atoms, including the noble gases

16. Graphite can be used as a lubricant because of the

(A) loose electrons which can move throughout the lattice
(B) weak attraction among the hexagonal layers of carbon atoms
(C) strong attraction among the hexagonal layers of carbon atoms
(D) strong attraction within the hexagonal layers of carbon atoms

17. Which set of elements forms molecules which contain two atoms?

(A) Period 2
(B) Group 2
(C) Group 7
(D) Period 3

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

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

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

(A) CH_4
(B) H_2O_2
(C) NH_3
(D) NaH

20. Which of the following when added to sulfuric acid would be the LEAST suitable method for preparing copper(II) sulfate?

(A) Copper(II) oxide
(B) Copper(II) chloride
(C) Copper(II) carbonate
(D) Copper(II) hydroxide

21. The pH of fresh sugar cane juice, which is usually 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) sodium chloride, NaCl
(C) slaked lime, $Ca(OH)_2$
(D) limestone, $CaCO_3$

22. Which of the substances, represented by the options, A, B, C and D in the following table, is MOST likely sodium chloride?

Substance	Boiling Point (°C)	Electrical Conductivity	
		Solid State	Aqueous State
(A)	1465	No	Yes
(B)	444	No	No
(C)	2600	Yes	No
(D)	–35	No	Yes

Items **23–24** refer to the following equation.

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

23. Which of the following compounds is reduced?

(A) NO
(B) NO_2
(C) SO_2
(D) SO_3

24. Which of the following compounds is the oxidizing agent?

(A) NO
(B) NO_2
(C) SO_2
(D) SO_3

25. Which of the following acids is weakly ionized in aqueous solutions?

(A) Nitric acid
(B) Ethanoic acid
(C) Sulfuric acid
(D) Hydrochloric acid

26. Which of the statements below is true for the following equation?

$Mg(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2(g)$

(A) Mg is oxidized from oxidation state 0 to +2.
(B) Mg is reduced from oxidation state +2 to 0.
(C) Hydrogen is reduced from oxidation state +2 to 0.
(D) Hydrogen is oxidized from oxidation state 0 to +1.

Items **27–28** refer to the following table showing various tests for gases.

	Test	Observation
(A)	Damp blue litmus paper	Damp blue litmus turns red
(B)	Glowing splint	Splint relights
(C)	Damp red litmus paper	Damp red litmus turns blue
(D)	Lit splint	Splint extinguishes with a pop

In answering Items **27–28**, each option may be used once, more than once or not at all.

27. Which test can be used to identify ammonia gas?

28. Which test can be used to identify an acidic gas?

29. Which of the following occurs in a metal atom when it becomes an ion?

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

30. On adding aqueous hydrochloric acid to a solution in a test tube, a gas is given off which extinguishes a burning splint. This shows the presence of

(A) nitrate ions
(B) sodium ions
(C) ammonium ions
(D) carbonate ions

GO ON TO THE NEXT PAGE

31. 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

32. An atom with atomic structure $^{27}_{13}X$ contains

(A) 13 protons, 14 neutrons
(B) 13 protons, 27 neutrons
(C) 14 protons, 13 neutrons
(D) 27 protons, 13 neutrons

33. Which of the following is a list of ALL the raw materials used in the extraction of iron?

(A) Air, iron ore and limestone
(B) Air, coke, cryolite and limestone
(C) Air, coke, iron ore and limestone
(D) Coke, iron ore, bauxite and limestone

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

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

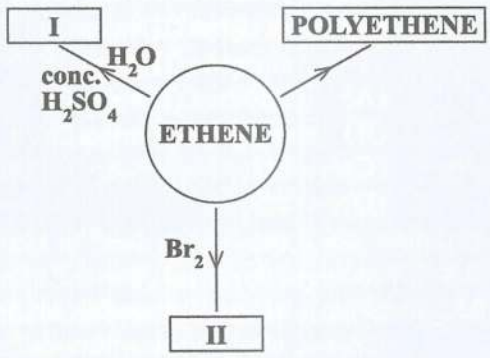
35. How many coulombs (C) of electricity passes through an electrolyte when a current of 100 A flows for 10 minutes?

(A) 100
(B) 600
(C) 10 000
(D) 60 000

36. Which of the following gases will give a positive test with dry cobalt chloride paper?

(A) O_2
(B) H_2
(C) CO_2
(D) H_2O

Items **37–38** refer to the following chart showing the conversion of ethene to different products.



37. The product, polyethene, is a

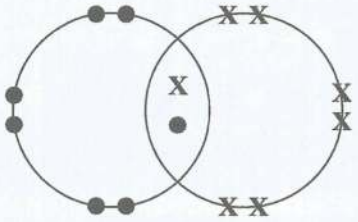
(A) gas
(B) solid
(C) liquid
(D) solution

38. Product **I** is

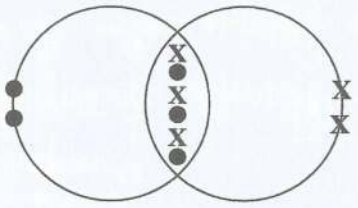
(A) ethane
(B) ethanol
(C) ethanoic acid
(D) ethyl ethanoate

39. Which of the following diagrams BEST illustrates bonding in hydrogen bromide?

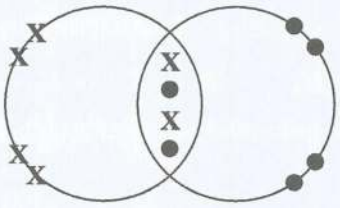
(A)



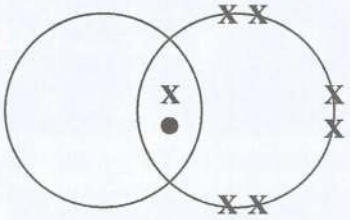
(B)



(C)



(D)



40. A solution, when treated with the gas sulfur dioxide, becomes green. The solution contains potassium

(A) nitrate
(B) sulfate
(C) manganate(VII)
(D) dichromate(VI)

Items **41–42** refer to the following table which shows the reaction of four metals, W, X, Y and Z, with water or steam. The table also shows the products formed when the nitrates of each metal are heated.

Metals	Reaction with Water/Steam	Products Formed When Nitrate is Heated
W	No reaction	Metal, NO_2 and O_2
X	Reacts with steam but not with cold water	Oxide, NO_2 and O_2
Y	Reacts rapidly with cold water	Nitrite and oxygen
Z	Reacts slowly with cold water	Oxide, NO_2 and O_2

41. Which of the metals is LIKELY to form a soluble hydroxide?

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

42. In which of the following pairs of metals is the first metal MOST likely to displace the second metal from solution?

(A) X, Y
(B) Z, X
(C) W, X
(D) Z, Y

43. Which of the following molecules could be obtained by cracking the alkane, C_8H_{18}?

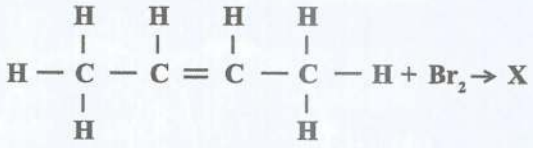
I. C_2H_4
II. C_6H_{14}
III. $C_{16}H_{34}$

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

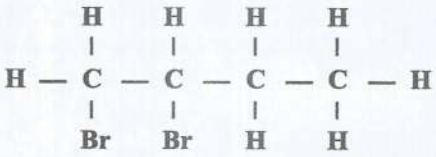
44. Which of the following processes produces a gas which is different from the other processes?

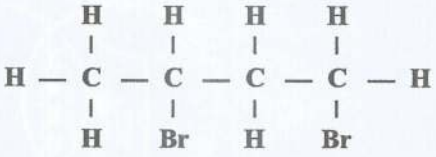
(A) Respiration in animals
(B) Photosynthesis in plants
(C) Heating calcium carbonate
(D) Oxidation of carbon monoxide

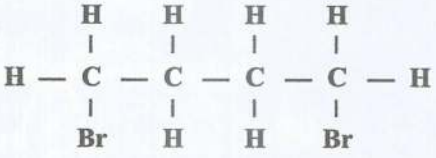
Item **45** refers to the following equation.

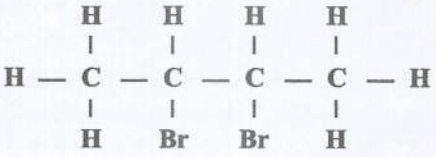


45. What is the correct structural formula of X?

(A)


(B)


(C)


(D)


46. Which of the following compounds contains a saturated hydrocarbon?

(A) Natural gas
(B) Propene
(C) Ethanol
(D) Vinegar

47. How many isomers of butane, C_4H_{10}, are there?

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

Item **48** refer to the following equation.

Organic Acid + Alcohol $\rightleftharpoons$ Ester + Water.

48. The forward reaction is known as

(A) synthesis
(B) hydrolysis
(C) esterification
(D) polymerization

Items **49–50** refer to the following metals.

(A) Al
(B) Cu
(C) Fe
(D) Na

In answering Items **49–50**, a particular metal may be selected more than once, once or not at all.

49. Which metal reacts vigorously with water to produce a strongly alkaline solution?

50. Which metal has an alloy which is used in the manufacture of aircraft?

51. Which of the following substances is soluble in water?

(A) C_3H_7OH
(B) C_3H_6
(C) C_3H_8
(D) $CH_3COOC_2H_5$

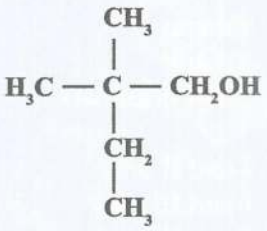
52. Which of the following substances is an important constituent of chlorophyll?

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

53. A suitable drying agent for the laboratory preparation of ammonia gas is

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

Item **54** refers to the following compound.



54. Which of the following phrases correctly describes the compound shown?

(A) An alkane
(B) An alcohol
(C) A branch alkane
(D) Non-reactive with sodium

55. Which of the following observations is expected when aqueous silver nitrate is added to aqueous potassium chloride?

(A) A pungent gas is evolved.
(B) A blue precipitate appears.
(C) A white precipitate appears.
(D) A brown precipitate appears.

56. A polyamide is formed by a condensation reaction between a molecule containing

(A) at least one -COOH group with another containing at least one -NH_2 group
(B) at least one -OH group with another containing at least one -COOH group
(C) at least one -OH group with another containing at least one -NH_2 group
(D) two -OH groups with another containing two -COOH groups

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

The members of the series have

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

58. Which of the following substances can be produced DIRECTLY from ethanol?

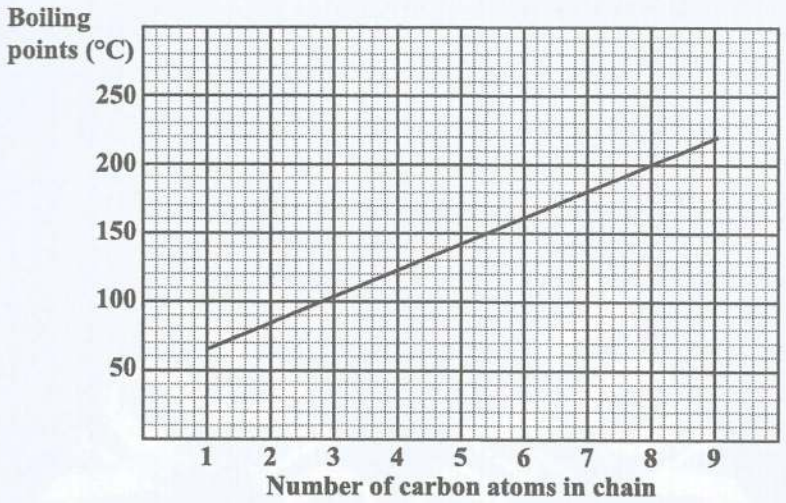
I. Ethene
II. Ethane
III. Ethyl ethanoate

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

59. Which of the following statements is TRUE?

(A) The particles in a gas are larger when heated.
(B) The particles in a gas are further apart when heated.
(C) The particles in a gas are very closely packed together.
(D) The particles in a gas have strong forces between them.

Item 60 refers to the following graph which shows the boiling points of some straight-chain alcohols.



60. Which of the following molecular formulae represents the alcohol whose boiling point is 160 °C?

(A) $CH_3(CH_2)_3OH$
(B) $CH_3(CH_2)_4OH$
(C) $CH_3(CH_2)_5OH$
(D) $CH_3(CH_2)_6OH$

END OF TEST

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