FORM TP 2022055

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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TEST CODE **01212010**

MAY/JUNE 2022

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

CHEMISTRY

Paper 01 – General Proficiency

1 hour 15 minutes

03 JUNE 2022 (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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Items **1** and **2** refer to the following table which shows four sets of properties represented by options A, B, C and D below.

	Relative Charge	Approximate Mass
(A)	–1	0
(B)	0	1
(C)	+1	1
(D)	0	2

In answering Items **1** and **2**, each option may be used once, more than once, or not at all.

1. Which set of properties above refers to an electron?

2. Which set of properties above refers to a neutron?

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

4. From which of the following substances can a solid be obtained by the process of sedimentation?

(A) Gels
(B) Emulsions
(C) Foams
(D) Suspensions

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5. From the table below, which of the substances represented by options, A, B, C and D, is MOST likely sodium chloride?

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

6. Which of the following techniques may be used to separate a mixture of plant pigments?

(A) Centrifugation
(B) Solvent extraction
(C) Fractional distillation
(D) Paper chromatography

7. Which of the following substances supplies protons as the only positive ions in aqueous solutions?

(A) Salt
(B) Base
(C) Acid
(D) Alkali

8. 'Mass number' is the number of

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

Items 9 and 10 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.

9. 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)

10. 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

11. 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, $CaCO_3$

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

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. The particles in a gas

(A) are very closely packed together
(B) have strong forces between them
(C) get larger when heated
(D) can move in any direction

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. Which of the following features are true about the arrangement of electrons, protons and neutrons in an atom?

I. Protons and neutrons are found in the nucleus.
II. Electrons can be found anywhere outside the nucleus.
III. The number of protons is the same as the number of electrons.

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

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 statements BEST describes a metallic bond?

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

19. Which of the following compounds is covalent?

(A) Potassium chloride
(B) Calcium chloride
(C) Hydrogen chloride
(D) Magnesium chloride

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. 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

22. 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

Items **23** and **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 statements is NOT true?

(A) Aqueous ammonia is a weak electrolyte.
(B) Sulfuric acid is a strong electrolyte.
(C) Copper is a strong electrolyte.
(D) Ethanol is a nonelectrolyte.

26. Which of the following substances, when added to pure water, SIGNIFICANTLY increases the water's conductivity?

(A) Graphite
(B) Iron(II) hydroxide
(C) Copper(II) hydroxide
(D) Sodium chloride

27. When an exothermic reaction occurs, energy is

(A) absorbed from the environment
(B) released to the environment
(C) absorbed from the reactants
(D) released from the products

28. 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

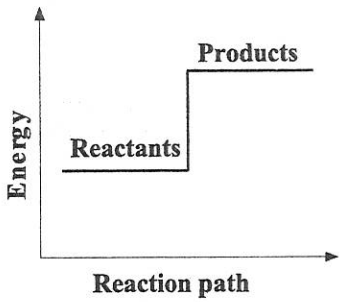
29. Which of the following occurs in a metal atom when it becomes an ion?

(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. During the electrolysis of aqueous copper(II) sulfate solution using inert electrodes, the ions migrating to the cathode are

(A) Cu^{2+} (aq) and H^+ (aq)
(B) H^+ (aq) and OH^- (aq)
(C) SO_4^{2-} (aq) and OH^- (aq)
(D) Cu^{2+} (aq) and SO_4^{2-} (aq)

Item 31 refers to the following energy profile diagram.



31. 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

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. A solution has a pH of 1. This solution would be expected to react with

(A) zinc metal to produce hydrogen
(B) hydrochloric acid to produce chlorine
(C) zinc metal to produce a solution of pH 10
(D) hydrochloric acid to produce a salt and water

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

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

35. Which metal appears between copper and aluminium in the reactivity series and is an important component in haemoglobin?

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

36. Which of the following statements about sulfur are true?

I. It is used in the vulcanization of rubber.
II. It is used in the extraction of iron from iron ore.
III. It is used in the manufacturing of explosives.

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

37. Which of the following gases shows NO reaction with moist litmus paper?

(A) Ammonia
(B) Hydrogen
(C) Sulfur dioxide
(D) Hydrogen sulfide

38. 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

39. Which of the following statements is true of carbon monoxide?

(A) It is an acidic gas.
(B) It is very soluble in water.
(C) It turns lime water milky.
(D) It reduces iron(II) oxide.

40. Which of the following metals is an important constituent of chlorophyll?

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

Items **41** and **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) W, X
(B) X, Y
(C) Z, Y
(D) Z, X

43. $FeCl_2$ and $FeCl_3$ are two chlorides of iron. Which of the following statements about these two chlorides of iron are true?

I. The percentage of iron by mass in the two chlorides is different.
II. The colours of the aqueous solutions of the two chlorides are different.
III. The aqueous solutions of the two chlorides do not conduct electricity.

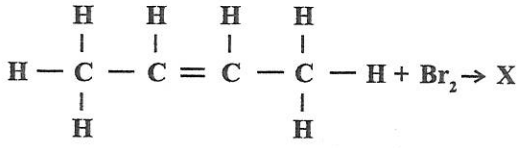
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

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

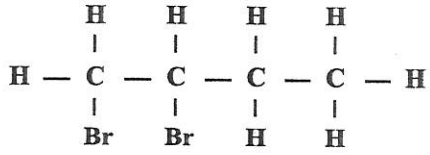
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Item **45** refers to the following equation.

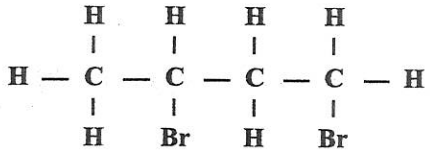


45. What is the correct structural formula of X?

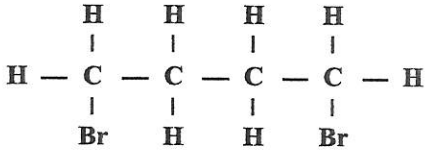
(A)



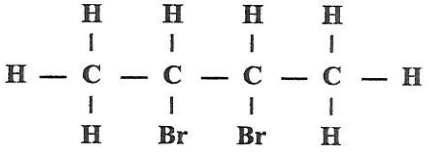
(B)



(C)



(D)



Items **46** and **47** refer to the following types of reactions.

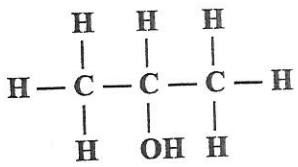
(A) Addition
(B) Isomerism
(C) Esterification
(D) Polymerization

In answering Items **46** and **47**, each option may be used once, more than once or not at all.

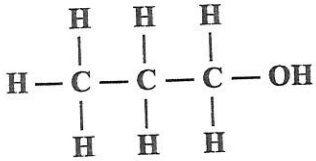
46. What is the name of the catalysed reaction which uses an alcohol and an organic acid?

47. What is the name of the process by which proteins are formed from amino acids?

Item 48 refers to two organic compounds, I and II, of molecular formula C_3H_8O, with the following structures:



Compound I

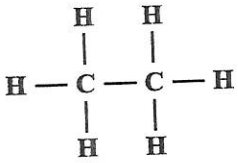


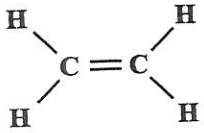
Compound II

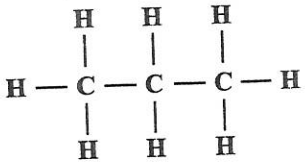
48. Compounds I and II are known as the

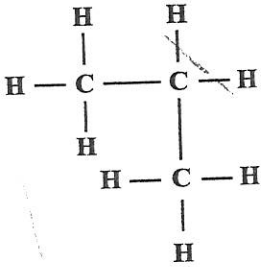
(A) isomers of C_3H_8O
(B) isotopes of C_3H_8O
(C) condensed formulae of C_3H_8O
(D) molecular formulae of C_3H_8O

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

(A) 

(B) 

(C) 

(D) 

50. Which of the following is a natural source of hydrocarbons?

(A) Carbon
(B) Methane
(C) Hydrogen
(D) Petroleum

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. Hexane is an alkane with six carbon atoms per molecule. Which of the following is the formula for hexane?

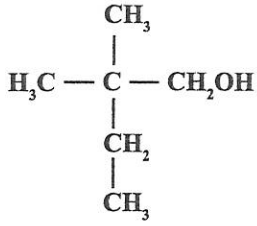
(A) C_6H_{12}
(B) C_6H_{14}
(C) C_6H_{16}
(D) C_6H_{18}

53. Which of the following tests can be used to distinguish between an alkane and an alkene?

I. Burning
II. Conductivity
III. Adding bromine solution

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

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 substances is NOT a polymer?

(A) Nylon
(B) Protein
(C) Fructose
(D) Cellulose

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 substances is a product of a halogenation reaction with methane?

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

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

Items **59** and **60** refer to the following compounds.

(A) C_2H_4
(B) C_2H_6
(C) $CH_3(CH_2)_2COOH$
(D) $CH_3(CH_2)_3OH$

In answering Items **59** and **60**, each option may be used once, more than once or not at all.

59. Which compound is an alcohol?

60. Which compound is an alkene?

END OF TEST

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