FORM TP 2021055

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.

TEST CODE **01212010**

MAY/JUNE 2021

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

CHEMISTRY

Paper 01 – General Proficiency

1 hour 15 minutes

04 JUNE 2021 (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. The particles in a gas

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

2. The mass number of an element is the number of

(A) neutrons in an atom of the element
(B) protons and electrons in an atom of the element
(C) neutrons and protons in an atom of the element
(D) protons, neutrons and electrons in an atom of the element

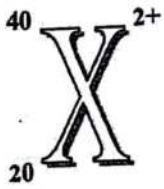
3. The arrangement of electrons in atoms of X and Y are 2, 8, 5 and 2, 8, 6 respectively. Which of the following represents X and Y?

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

4. 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

Item 5 refers to the following diagram in which X represents the symbol of a positive ion.

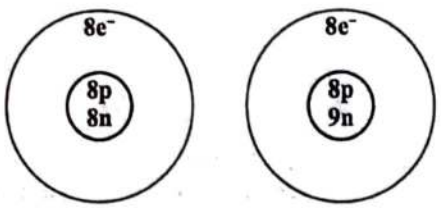


5. Which of the following pairs represents the number of neutrons and electrons in X?

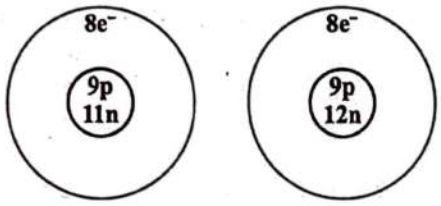
	Number of Neutrons	Number of Electrons
(A)	60	20
(B)	60	18
(C)	20	20
(D)	20	18

6. An element, X, has 8 electrons in its outer shell. Which of the following diagrams are possible isotopes of X?

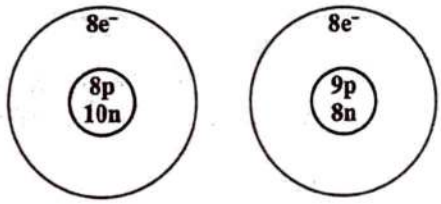
(A)



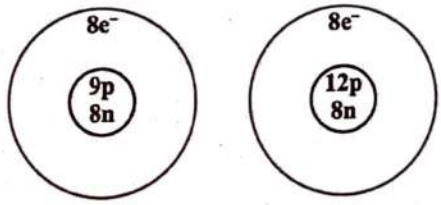
(B)



(C)



(D)



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

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

8. The mass of '1 mole of atoms of an element' refers to the quantity of

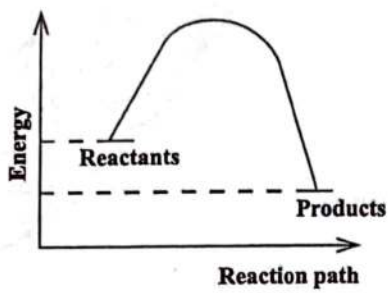
(A) 1 atom of the element
(B) an element which contains 6.0×10^{23} atoms
(C) an element which occupies 24.0 dm^3 at STP
(D) an element which combines completely with 12 g of carbon-12

9. Which of the following terms describes calcium chloride?

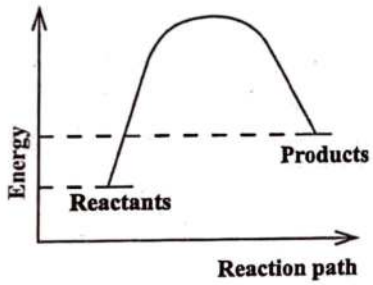
(A) Giant ionic structure
(B) Giant covalent structure
(C) Simple molecular crystal
(D) Macromolecular structure

10. Which of the following diagrams illustrates the course of an exothermic reaction?

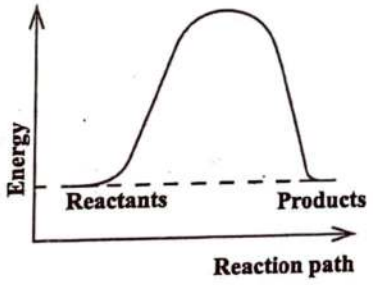
(A)



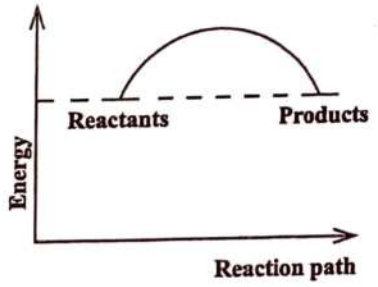
(B)



(C)



(D)



Item 11 refers to the following types of substances.

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

11. Which of the substances above can be described as the oxide of a metal?

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

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

13. An atom has 20 electrons. When it ionizes, it has the same electronic configuration as

(A) argon
(B) neon
(C) sodium
(D) calcium

14. The mass concentration of a potassium chloride solution is 60 g dm^{-3}. What is the mass of potassium chloride in 25 cm^3 of this solution?

(A) 0.0015 g
(B) 0.15 g
(C) 1.5 g
(D) 15.0 g

15. Which of the following elements exhibits allotropy?

(A) Carbon
(B) Silicon
(C) Uranium
(D) Aluminium

Item 16 refers to the following information.

Element	Atomic Number
W	3
X	6
Y	17

16. Which TWO elements above, when combined, form MAINLY ionic compounds?

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

17. The number of shared electron pairs in the methane (CH_4) molecule is

(A) 4
(B) 6
(C) 8
(D) 10

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

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

19. A solution having a pH of 1 will

(A) neutralize a solution of pH 4
(B) react with zinc metal to produce hydrogen
(C) react with zinc metal to produce a solution of pH 10
(D) react with hydrochloric acid to produce a salt and water

20. Which of the following oxides reacts with both acids and bases?

(A) MgO
(B) CuO
(C) Al_2O_3
(D) CaO

21. Barium is below calcium in Group II of the periodic table. When these two metals react with water, the main difference observed is the

(A) rate of reaction
(B) type of gas evolved
(C) colour of the product
(D) colour change with litmus

Item 22 refers to one mole of EACH of the following acids.

I. H_2SO_4
II. CH_3COOH
III. $(COOH)_2$

22. Which of the acids above would require MORE than one mole of NaOH(aq) for complete neutralization?

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

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23. 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, $CaCO_3$

24. An example of a substance with a giant covalent structure is

(A) copper
(B) diamond
(C) solid iodine
(D) sodium chloride

Item 25 refers to the following sequence of reactions involving iron compounds, where I, II, III and IV represent progressive stages in the sequence.

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

25. In which stage is the oxidation state of iron increased?

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

26. Which of the following factors will usually increase the rate of catalytic decomposition of hydrogen peroxide?

(A) Increasing the temperature
(B) Applying a greater external pressure
(C) Using a larger volume of hydrogen peroxide
(D) Using the catalyst in lumps rather than in powdered form

27. 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

28. Which of the following substances does NOT conduct electricity?

(A) Lead
(B) Copper
(C) Ethanol
(D) Ethanoic acid

29. Which of the following energy changes occurs during the breaking of a chemical bond?

(A) Energy is released.
(B) Energy is required.
(C) There is no energy change.
(D) The process is exothermic.

30. Which of the following terms describes starch?

(A) Giant ionic structure
(B) Giant covalent structure
(C) Simple molecular crystal
(D) Macromolecular structure

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

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

32. Which of the following pairs of reagents will result in the formation of a yellow precipitate?

(A) $Fe_2(SO_4)_3/NH_3(aq)$

(B) $CuSO_4(aq)/NH_3(aq)$

(C) $Pb(NO_3)_2(aq)/KI(aq)$

(D) $FeSO_4(aq)/NaOH(aq)$

33. How many covalent bonds are there in a nitrogen molecule?

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

34. 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 brown precipitate appears.
(D) A white precipitate appears.

Item 35 refers 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 nitrates of each metal are heated.

Metal	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 O_2
Z	Reacts slowly with cold water	Oxide, NO_2 and O_2

35. Which of the metals above is likely to form a soluble hydroxide?

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

36. Which of the following are features of metals?

I. Form basic oxides
II. Form solid chlorides
III. Conduct electricity when molten

(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 procedures can be used to identify ammonia gas?

(A) Placing red and blue litmus paper in a jar of the gas
(B) Placing a glowing splint in a jar of the gas
(C) Placing a burning splint in a jar of the gas
(D) Passing the gas through lime water

38. Glucose is converted to starch or cellulose by

(A) dehydrogenation
(B) oxidation and reduction
(C) addition polymerization
(D) condensation polymerization

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

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

40. Which of the following aqueous solutions will produce a blue precipitate with aqueous sodium hydroxide?

(A) Iron(II) nitrate
(B) Iron(III) nitrate
(C) Copper(II) nitrate
(D) Aluminium nitrate

41. In which of the following processes is sulfur used?

I. Vulcanization of rubber
II. Manufacture of explosives
III. Extraction of iron from iron ore

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

42. Which of the following methods can be used in the extraction of aluminium?

(A) Reduction of the oxide by carbon
(B) Reduction of the oxide by hydrogen
(C) Electrolysis of the oxide in its molten state
(D) Displacement by a metal higher up the electrochemical series

43. When copper(II) carbonate is heated alone in a dry test tube, a gas is evolved and a black residue is formed. This gas is expected to

(A) turn red litmus blue
(B) relight a glowing splint
(C) decolourize acidified aqueous potassium manganate(VII)
(D) form a white precipitate with aqueous calcium hydroxide

44. Which of the following reactions is LEAST likely to occur?

(A) $Fe(s) + Cu(NO_3)_2(aq) \rightarrow Fe(NO_3)_2(aq) + Cu(s)$

(B) $Pb(s) + Fe(NO_3)_2(aq) \rightarrow Pb(NO_3)_2(aq) + Fe(s)$

(C) $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

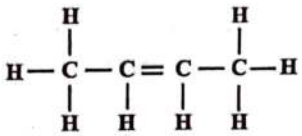
(D) $Mg(s) + Zn(NO_3)_2(aq) \rightarrow Mg(NO_3)_2(aq) + Zn(s)$

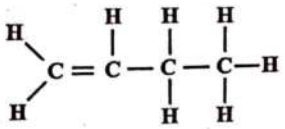
45. The compound $CH_3CH_2CH_2CH_2OH$ is called

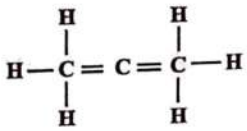
(A) 1-propanol
(B) 4-propanol
(C) 4-butanol
(D) 1-butanol

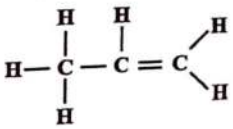
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46. Which of the following structures represents a molecule of but-2-ene?

(A) 

(B) 

(C) 

(D) 

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

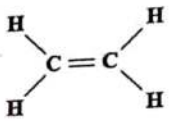
The members of a series have

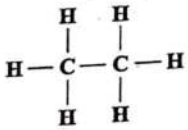
(A) the same functional group
(B) the same general formula
(C) similar chemical properties
(D) the same empirical formula

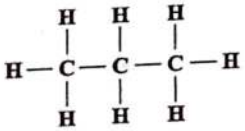
48. Which of the following reactions occurs between propene and bromine?

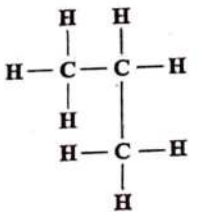
(A) Addition
(B) Substitution
(C) Precipitation
(D) Condensation

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

(A) 

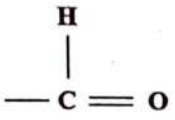
(B) 

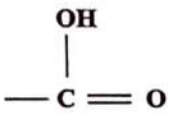
(C) 

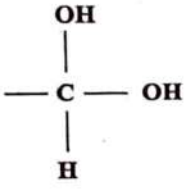
(D) 

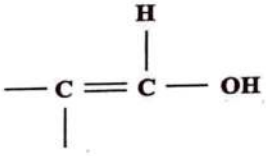
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50. The functional group present in carboxylic acids is

(A) 

(B) 

(C) 

(D) 

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

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

52. The compound which has the formula $CH_3CH = CHCH_2CH_2CH_3$ is

(A) an alkene
(B) a polymer
(C) a carboxylic acid
(D) an unsaturated acid

53. 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

54. The MAJOR natural source of alkanes and alkenes is

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

Items 55–56 refer to the following equation.

Organic acid + Alcohol $\rightleftharpoons$ Ester + Water

55. The forward reaction is known as

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

56. The reverse reaction is known as

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

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57. Hexane has the formula C_6H_{14}. Which of the following statements is true about hexane?

I. It is a covalent compound.
II. It is an unsaturated compound.
III. It belongs to a group of compounds known as alkanes.

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

58. The fermentation of sugars, using glucose as the substrate, can be represented by the equation

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

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

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

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

59. The disadvantage of using a soapless detergent is that it

(A) is not affected by hard water
(B) causes scum with hard water
(C) is used widely in industries
(D) is non-biodegradable

60. 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

END OF TEST

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