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 2017004 TEST CODE **01212010**

JANUARY 2017

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

CHEMISTRY

Paper 01 – General Proficiency

1 hour 15 minutes

18 JANUARY 2017 (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. In which of the following situations is Brownian motion demonstrated?

(A) Pollen grains moving at random in water
(B) The scent of perfume moving from one part of a room to another
(C) The swelling of red beans when soaked in water
(D) Loss of heat from a hot body to a cold body

Item 2 refers to the four sets of properties represented by the options, A, B, C and D, below.

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

2. Which of the properties above refer to a neutron?

3. From the table below, which of the substances represented by the options, A, B, C and D, 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

4. Which of the following compounds is soluble in cold water?

(A) Lead sulfate
(B) Lead nitrate
(C) Lead chloride
(D) Lead carbonate

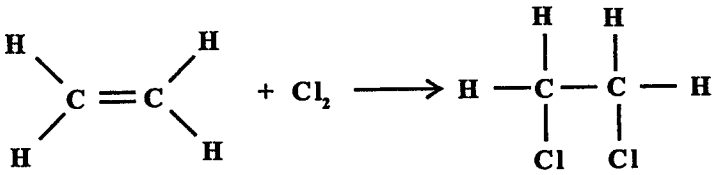
5. Which of the following oxides shows both acidic and basic properties?

(A) Iron(II) oxide
(B) Sodium oxide
(C) Calcium oxide
(D) Aluminium oxide

6. Which of the following statements BEST describes the difference between an atom and an ion?

(A) An atom is electrically neutral but an ion is positively charged.
(B) An atom is electrically neutral but an ion is negatively charged.
(C) An atom contains equal numbers of protons and electrons whereas an ion contains more electrons than protons.
(D) An atom contains equal numbers of protons and electrons whereas an ion contains unequal numbers of protons and electrons.

Item 7 refers to the following equation which represents the reaction between ethene and chlorine.



7. What type of reaction does the equation represent?

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

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8. Which of the following is classified as a neutral oxide?

(A) Sodium oxide
(B) Sulfur dioxide
(C) Carbon dioxide
(D) Carbon monoxide

9. An element, X, has an electron configuration 2, 8, 1. At which of the following positions is the element in the Periodic Table?

(A) Period 1 Group I
(B) Period 1 Group II
(C) Period 3 Group I
(D) Period 3 Group II

Items 10–11 refer to the following information.

When a compound is treated with concentrated hydrochloric acid, a greenish-yellow gas which bleaches moist red litmus paper is given off.

10. The gas given off is

(A) chlorine
(B) ammonia
(C) sulfur dioxide
(D) nitrogen dioxide

11. The concentrated hydrochloric acid is acting as

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

12. Two solutions are to be mixed in order to demonstrate endothermic change. Which of the following techniques would be MOST appropriate?

(A) Taking mass readings
(B) Taking temperature readings
(C) Monitoring the pH of the solutions
(D) Carefully observing colour changes

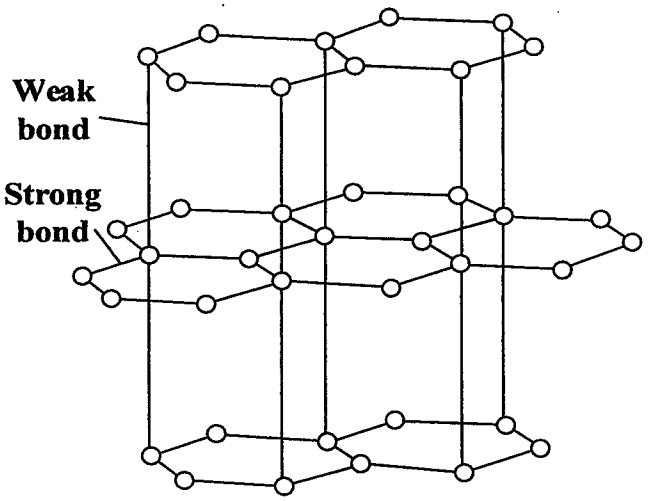
13. Crystals of sodium chloride are BEST described as

(A) ionic
(B) metallic
(C) molecular
(D) macromolecular

14. Ethanoic acid reacts with ethanol to form an ester and water. How many moles of ethanoic acid are required to produce 0.5 mol of the ester?

(A) 0.05
(B) 0.5
(C) 1
(D) 2

Item 15 refers to the following diagram.



15. The diagram above represents the arrangement of atoms in

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

16. Which of the following statements regarding the effect of a catalyst on a reaction is INCORRECT?

(A) It has no effect on the yield of products.
(B) It is unchanged chemically on completion of the reaction.
(C) It allows equilibrium to be attained more rapidly in a reversible reaction.
(D) It lowers the energy of the reactants so that the reaction occurs at a faster rate.

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

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

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

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

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

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

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

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

Items 21–22 refer to the following information.

A solution of iron(II) sulfate was added until in EXCESS to a solution of barium nitrate. The precipitate produced was filtered off and water was added to the residue in the filter paper.

21. The colour of the precipitate produced was

(A) yellow
(B) brown
(C) green
(D) white

22. Water was added to the residue to

(A) dissolve the precipitate
(B) prevent further reaction
(C) purify the precipitate
(D) dilute the filtrate

23. The atoms of element **Y** contain 19 electrons. The chemistry of element **Y** will be similar to

(A) aluminium
(B) magnesium
(C) bromine
(D) lithium

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

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

25. During the reaction between ethanol and ethanoic acid, a small quantity of concentrated sulfuric acid is added to

(A) oxidize the ethanol
(B) catalyse the reaction
(C) dehydrate the ethanol
(D) hydrolyse the products

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

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

27. $FeCl_2$ and $FeCl_3$ are two chlorides of iron. Which of the following statements about these two chlorides of iron is/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 only
(B) III only
(C) I and II only
(D) I and III only

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28. 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) $2Pb(NO_3)_2(s) \rightarrow PbO(s) + 2NO_2(g) + O_2(g)$

29. Which of the following compounds yields a brown gas and a black solid residue on heating?

(A) Sodium carbonate
(B) Copper hydroxide
(C) Sodium nitrate
(D) Copper nitrate

30. Which of the following metals are extracted from their ores by reduction of their oxides with carbon?

(A) Aluminium and magnesium
(B) Lead and magnesium
(C) Zinc and aluminium
(D) Iron and zinc

31. 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)

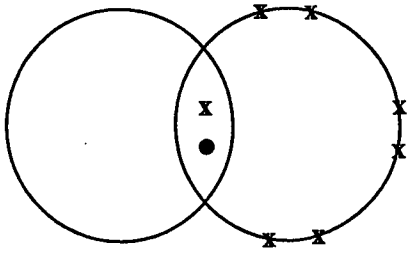
(B) H^+ (aq) and OH^- (aq)

(C) SO_4^{2-} (aq) and OH^- (aq)

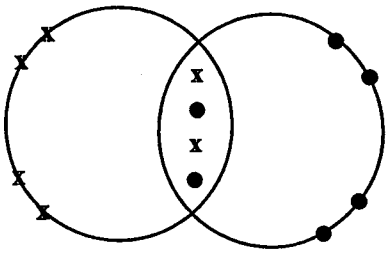
(D) Cu^{2+} (aq) and SO_4^{2-} (aq)

Items 32–33 refer to the following diagrams which represent bonding as it occurs in certain compounds.

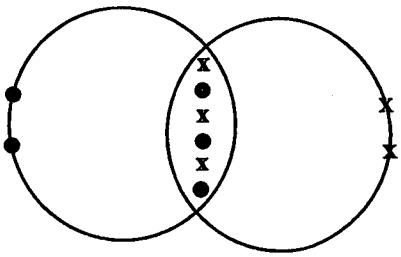
(A)



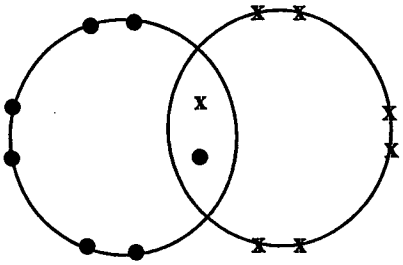
(B)



(C)



(D)



In answering Items 32–33, each option may be used once, more than once or not at all.

32. Which of the diagrams illustrates bonding in chlorine?

33. Which of the diagrams illustrates bonding in oxygen?

34. 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

Items 35–36 refer to the following reactions.

(A) Hydrolysis
(B) Dehydration
(C) Saponification
(D) Esterification

In answering Items 35–36, each reaction may be used once, more than once, or not at all.

35. In which reaction is ethane produced from ethanol?

36. Which reaction involves the boiling of a fat or oil with aqueous sodium hydroxide (caustic soda)?

Items 37–38 refer to the following acids.

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

In answering Items 37–38, a particular acid may be used once, more than once, or not at all.

37. Which acid functions as a dehydrating agent when concentrated?

38. Which acid reacts with copper to produce an acidic, reddish-brown gas?

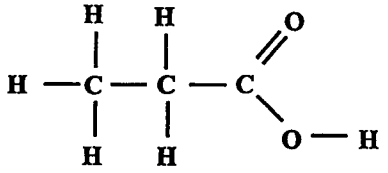
39. Which of the following ionic equations involves oxidation?

(A) $S^{2-} - 2e^- \rightarrow S$
(B) $Cl_2 + 2e^- \rightarrow 2Cl^-$
(C) $2H^+ + 2e^- \rightarrow H_2$
(D) $Na^+ + e^- \rightarrow Na$

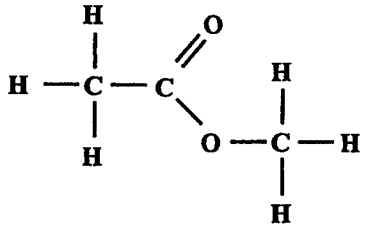
40. Which of the following methods is used for the extraction of aluminium?

(A) Electrolysis of its molten oxide
(B) Reduction of its oxide using coke
(C) Electrolysis of its aqueous chloride
(D) Reduction of its oxide using carbon monoxide

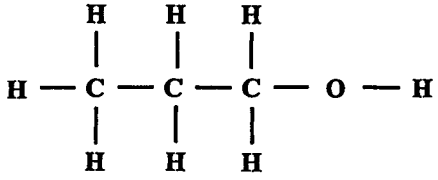
Item 41 refers to the fully displayed structural formulae of compounds Q, R and S shown below.



Q



R



S

41. Which of the following correctly identifies the homologous series to which each compound belongs?

	Q	R	S
(A)	Ester	Acid	Alcohol
(B)	Acid	Alcohol	Ester
(C)	Alcohol	Ester	Acid
(D)	Acid	Ester	Alcohol

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42. Which of the following metals neither reacts with water nor displaces hydrogen from dilute hydrochloric acid?

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

43. The existence of millions of organic compounds is due primarily to the ability of carbon to form

I. multiple bonds
II. ring structures
III. branched chains

(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 aqueous solutions will produce a yellow precipitate with aqueous potassium iodide?

(A) Lead nitrate
(B) Zinc sulfate
(C) Calcium chloride
(D) Sodium carbonate

Item 45 refers to the following information.

It was found that magnesium metal displaces zinc ions in zinc sulfate, while zinc metal displaces lead ions in lead sulfate.

45. What is the order of reactivity, from most reactive to least reactive?

(A) Pb, Zn and Mg
(B) Mg, Zn and Pb
(C) Zn, Mg and Pb
(D) Zn, Pb and Mg

Items 46–47 refer to the following organic compounds.

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

In answering Items 46–47, each compound may be used once, more than once or not at all.

46. Which of the compounds can be hydrated?

47. Which of the compounds has a pH less than 7?

48. Which of the following is produced when carbon monoxide reacts with iron(III) oxide?

(A) O_2 only
(B) Fe only
(C) CO_2 and CO only
(D) CO_2 and Fe only

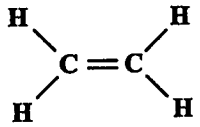
49. A piece of limestone is treated with dilute hydrochloric acid. Which of the following would be observed?

I. Effervescence occurs.
II. A gas is evolved with a pungent odour.
III. A gas is evolved which turns limewater milky.

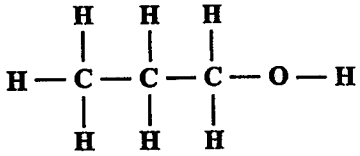
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

50. Which of the following structures represents a compound that can react with an alcohol to produce a sweet smelling liquid?

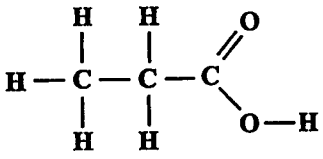
(A)



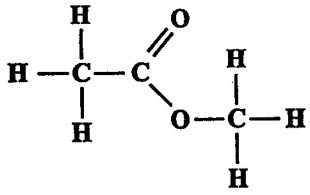
(B)



(C)



(D)



51. Steel is often used in place of iron because it

(A) is more susceptible to corrosion
(B) has a lower melting point
(C) is stronger
(D) is cheaper

52. 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

53. Which of the following is the reason for adding cryolite to pure alumina in the extraction of aluminium by electrolysis?

(A) It lowers the melting point.
(B) It reduces the resistance.
(C) It reduces the current.
(D) It prevents damage.

54. What type of reaction occurs when zinc metal is added to copper sulfate solution?

(A) Combustion
(B) Neutralization
(C) Displacement
(D) Decomposition

55. A formula of a gas with a distinctive colour is

(A) SO_2
(B) NO_2
(C) CO_2
(D) NH_3

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

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

57. ALL members of a homologous series have similar

(A) densities
(B) boiling points
(C) chemical properties
(D) physical properties

58. Glucose is converted to starch or cellulose by

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

59. Which of these compounds will react with bromine solution only if light is present?

(A) C_2H_2
(B) C_2H_4
(C) C_2H_6
(D) C_4H_8

60. During the manufacture of ethanol by fermentation, the gas evolved

(A) burns with a blue flame
(B) turns limewater cloudy
(C) relights a glowing splint
(D) turns potassium dichromate green

END OF TEST

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