CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD
General Certificate of Education Examination

0715 CHEMISTRY 1

JUNE 2017 ADVANCED LEVEL

Centre Number	
Centre Name	
Candidate Identification No.	
Candidate Name	

Mobile phones are NOT allowed in the examination room.

MULTIPLE CHOICE QUESTION PAPER

One and a half hours

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you start answering the questions in this paper. Make sure you have a soft HB pencil and an eraser for this examination.

1. USE A SOFT HB PENCIL THROUGHOUT THE EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Before the examination begins:

3. Check that this question booklet is headed "0715 CHEMISTRY 1 - Advanced Level"
4. Fill in the information required in the spaces above.
5. Fill in the information required in the spaces provided on the answer sheet using your HB pencil: Candidate Name, Exam Session, Subject Code and Candidate Identification Number. Take care that you do not crease or fold the answer sheet or make any marks on it other than those asked for in these instruction.

How to answer the questions in this Examination

6. Answer ALL the 50 questions in this Examination. All questions carry equal marks.
7. Non-programmable calculators are allowed.
8. Each question has FOUR suggested answers: A, B, C and D. Decide on which answer is appropriate. Find the number of the question on the Answer Sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen.
   For example, if C is your correct answer, mark C as shown below:

[A] [B] [~~C~~] [D]

9. Mark only one answer for each question. If you mark more than one answer, you will score a zero for that question. If you change your mind about an answer, erase the first mark carefully, then mark your new answer.
10. Avoid spending too much time on any one question. If you find a question difficult, move on to the next question. You can come back to this question later.
11. Do all rough work in this booklet using the blank spaces in the question booklet.
12. At the end of the examination, the invigilator shall collect first the answer sheet and then the question booklet. DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH ANY.

Turn Over

Questions 1 - 36 (Thirty-six questions).
Directions: each of the questions or incomplete statements in this section is followed by four suggested answers. Select the best answer in each case.

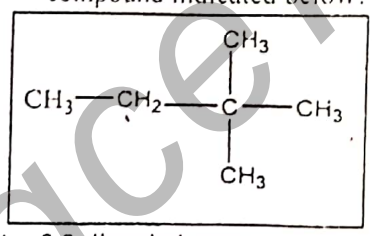
1. The number of moles of carbon dioxide (CO_2) gas present in 44.8 cm^3 at standard temperature and pressure (STP) (molar gas volume = 22,400 cm^3) is given by:
   - A 44.8 cm^3/22,400 cm^3/mol
   - B 44.0 cm^3/22,400 cm^3/mol
   - C 44.0 cm^3/44.8 cm^3/mol
   - D (44.8 cm^3 x 44 cm^3) / 22,400 cm^3/mol

2. When the nuclide $^{239}_{93}Np$ undergoes beta decay (β- decay) the nuclide produced is
   - A $^{239}_{92}U$
   - B $^{238}_{92}U$
   - C $^{239}_{94}Pa$
   - D $^{240}_{93}Np$

3. The relative molecular mass of a hydrocarbon is 56. What is its molecular formula?
   - A C_4H_8
   - B C_5H_6
   - C C_4H_{10}
   - D C_5H_8

4. In a nitrate(V), NO_3^-
   - A The nitrogen reacting atom uses 5 unpaired electrons for bonding.
   - B Nitrogen forms one dative bond and three covalent bonds
   - C Nitrogen promotes one 2s electron to a higher energy level
   - D Nitrogen readily loses five electrons

5. What is the accepted conventional name of the compound indicated below?



   - A. 2,2-dimethylpropane
   - B. 3,3-dimethylbutane
   - C. 2,2-dimethylbutane
   - D. trimethylpropane

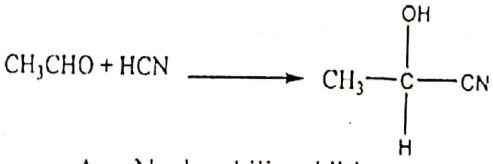
6. An element, X, has an atomic number of 25. The electronic configuration of its ion X^{2+} is
   - A [Ar]$3d^5\ 4s^2$
   - B [Ar]$3d^5\ 4s^0$
   - C [Ar]$3d^4\ 4s^1$
   - D [Ar]$3d^3\ 4s^2$

7. Given that the standard enthalpies of formation in kJ mol^{-1} of CO(g), CO_2(g) and H_2O(g) are respectively -110, -394 and -242. What is the standard enthalpy change for the following reaction?
   $CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$
   - A -262
   - B +42
   - C -746
   - D -42

8. For the elements across period 2 of the Periodic Table, lithium (Li) to Neon (Ne)
   - A the melting point increases from Li to C and then decreases to Ne
   - B the atomic radius decreases with increase in atomic number
   - C all the oxides can be classified as either basic or acidic
   - D all the chlorides are solids at room temperature

9. 0.15 g of a volatile organic liquid when vaporized in a suitable apparatus occupied a volume of 77 cm^3 at 372K and 753 mmHg pressure; molar gas constant = 0.082 atm dm^3 mol^{-1} K^{-1}. The relative molecular mass of the liquid is given by
   - A $\frac{(0.15 \times 0.082 \times 373 \times 760}{(753 \times 0.077)}$
   - B $\frac{(0.15 \times 0.082 \times 753}{(760 \times 0.077)}$
   - C $\frac{(0.15 \times 0.082 \times 372}{(753 \times 0.077)}$
   - D $\frac{(0.15 \times 0.082 \times 372}{(753 \times 77)}$

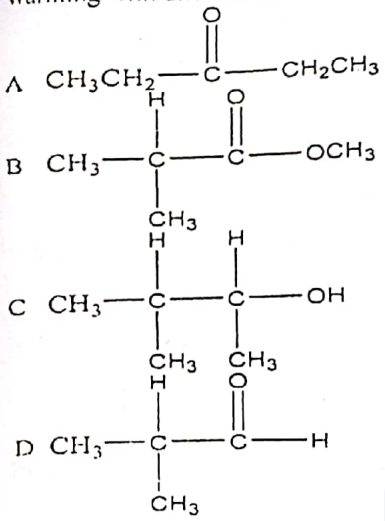
10. Identify the type of organic reaction involved in the reaction below.



   - A Nucleophilic addition
   - B Condensation reaction
   - C Electrophilic addition
   - D Hydrolysis

11. Which of the following bond type accounts for the reaction between boron trifluoride and ammonia?
   - A Ionic bond
   - B Hydrogen bond
   - C Dative covalent bond
   - D van der Waals' force

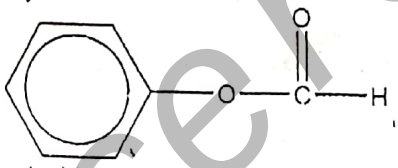
2. Select the compound which forms methanol on warming with dilute NaOH solution.



A
B
C
D

3. In an experiment to determine the relative molecular mass of ethanoic acid in an organic solvent, 120 was obtained instead of the expected value of 60. What could be the explanation for this phenomenon?
   A Vapours of volatile liquids deviate from ideal gas behavior.
   B Ethanoic acid decomposes to methane and carbon dioxide.
   C Ethanoic acid partially dissociates.
   D Ethanoic acid vapour exists in the form of the dimers.

4. When the compound represented by the structural formula



is warmed with aqueous solution of dilute sodium hydroxide, the most likely products formed are
   A benzoic acid and methanol .
   B phenol and methanoic acid.
   C phenol and sodium methanoate.
   D phenol and methanol.

15. The two nuclei in the hydrogen molecule ion (H_2^+) are held together by
   A an ionic bond.
   B a dative covalent bond.
   C electrostatic attraction between the two hydrogen atoms.
   D mutual sharing of the electron charge cloud.

16. The acidity constant of propanoic acid is 1.26×10^{-5} What is the pH of a 0.1 M solution of this acid?
   A 1.00
   B 1.12
   C 2.74
   D 2.95

17. Which of the following statements is true?
   A All oxides of the s-block elements are basic.
   B The solubility of Group I sulphates decreases down the group while that of Group 2 sulphates increases down the group.
   C The thermal stability of the carbonates of the s-block elements increases down both Groups I and 2.
   D Beryllium and magnesium both react with water to form basic hydroxides

18. Which of the following steps is **unlikely** to occur in the chlorination of methane?
   A $Cl_2 \rightarrow Cl\cdot + H\cdot$
   B $Cl_2 \rightarrow Cl\cdot + Cl\cdot$
   C $CH_3\cdot + Cl_2 \rightarrow CH_3Cl + Cl\cdot$
   D $CH_4 + Cl\cdot \rightarrow CH_3\cdot + HCl$

19. Two pure liquids, S and T, which form an ideal mixture, have vapour pressures 12.9 kPa and 26.8 kPa respectively at 25 °C. What is the vapour pressure of a mixture containing 2.0 moles of S and 1.0 mole of T and 25°C.
   A 39.7 kPa
   B 22.2 k,Pa
   C 17.5 kPa
   D 19.9 kPa

20. Which of the following is the product formed when acidified sodium dichromate(VI) oxidises propan-2-ol (2-propanol) ?
   A propanoic acid
   B propanone
   C propanal
   D methoxyethane

21. In which of the following solutions will the reaction with 1.0 g $CaCO_3$ be fastest?
   A 100 cm^3 of 1.0 M H_2SO_4
   B 50 cm^3 of 1.0 M HNO_3
   C 25 cm^3 2.0 M HCl
   D 100 cm^3 of 0.5 M HNO_3

22. A sample of oxygen gas contains ^{16}O and ^{18}O. The peaks in the mass spectrum of the oxygen sample would be at mass numbers
A 17 and 34
B 16 and 18
C 16, 18, 32 and 36
D 16, 18, 32,34 and 36

23. One property of a buffer solution, prepared from a weak acid and its sodium salt is that
A its pH is less than the pH of the original acid
B its pH is unaffected by the addition of any quantity of H^+ ions
C its pH is greater than the pH of the original acid
D It has a pH of 7

24. Which of the following species is trigonal bipyramidal?
A AlH_4^-
B PCl_4^+
C PCl_5
D SnH_4

25. An oxidizing agent is a species that
A is oxidized in a reaction
B is reduced in a reaction
C loses electrons
D has an increase in oxidation state

26. The half-life of radioactive $^{233}_{91}Pa$ is 28 days. How many days will it take for the radioactivity to fall to one-eighth of the initial value?
A 56
B 84
C 112
D 28

27. In the production of sulphuric acid, the sulphur trioxide in the Contact process is
A dissolved in water
B dissolved in oleum or fuming sulphuric acid
C absorbed by concentrated sulphuric acid
D liquefied by applying pressure

28. What colour would be observed when iron(III) chloride is added to the following equilibrium reaction?
$Fe^{3+}(aq) + 3CNS^-(aq) \rightleftharpoons Fe(CNS)_3(aq)$
pale yellow colourless blood red
A colourless
B Blood red
C Pale yellow
D Green

29. Select the compound which is optically active from the list below.
A $CH_3CH_2-C(=O)-CH_2CH_3$
B $CH_3-CH(CH_3)-C(=O)-OCH_3$
C $CH_3-CH(CH_3)-CH(CH_3)-OH$
D $CH_3-CH(CH_3)-C(=O)-H$

30. Which of the following statements is true for a pair of miscible liquids whose mixture shows negative deviation from Raoult's Law?
A The total vapour pressure decreases.
B Slight drop in temperature is observed when the liquids are mixed.
C The intermolecular forces are broken.
D The total volume of the mixture is increased.

31. Given a cell composed of the following half-cells:
$I_2(aq), 2I^-(aq)/Pt$ $E^0 = +0.544V$
$Fe^{3+}(aq), Fe^{2+}(aq)/Pt$ $E^0 = +0.770V$
Which of the following species is the strongest reducing agent?
A I_2 (aq)
B Fe^{3+}(aq)
C Fe^{2+}aq)
D I^- (aq)

32. A possible isomer of buta-1,3-diene (1,3-butadiene), $CH_2=CH-CH=CH_2$ is
A cyclobutane
B butene
C butyne
D cyclobutadiene

33. The reaction $H_2O + NH_3 \leftrightharpoons NH_4OH$ could be classified as
A Substitution
B Redox
C Acid/base
D Disproportionation

34. For the Group 14 (Group IV) elements C to Pb;
A The stability of +2 oxidation state decreases down the group
B All the tetrachlorides hydrolyze in water to give acidic solutions
C PbO is amphoteric while PbO_2 is acidic
D The stability of the tetrahydrides decreases down the group

35. K, L and M are elements in the same short period of the Periodic Table. The oxide of K is a giant molecule, the oxide of L is a simple molecular and the oxide of M is ionic. Arrange the elements in increasing atomic number.
A K,M,L
B M,K,L
C L,M,K
D K,L,M

36. Which of the following gases has the highest volume at STP? (RAM: He :4; 0: 16; Cl : 35.5;N:14)
A 4.0 g Helium
B 14.0 g Nitrogen
C 16.0 g Oxygen
D 35.5 g chlorine

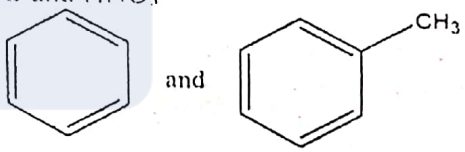
Question : 37 - 46 (Ten questions)
Directions: For each of the questions below, ONE or MORE of the responses is (are) correct. Decide which of the responses is (are) correct. Then choose:
A if 1,2 and 3 are all correct
B if 1 and 2 only are correct
C if 2 and 3 only are correct
D if 3 only is correct

Directions Summarized			
A	B	C	D
1,2,3 correct	1,2 only	2,3 only	3 only

37. Which of the following compounds will give a yellow precipitate when reacted with a solution of potassium iodide (KI) and sodium hypochlorite (NaOCl)
1 CH_3CH_2OH
2 CH_3CHO
3 $C_6H_5COCH_3$
A
B
C
D

38. From the following data;
$Zn^{2+}(aq)/Zn(s)$ $E^0 = -0.76V$
$Fe^{3+}(aq)/ Fe^{2+}(aq)$ $E^0 = -0.77V$
It can be deduced that
1 The standard emf for the cell Zn(s)/ $Zn^{2+}(aq)\| Fe^{3+}(aq)/Fe^{2+}(aq)$/pt is -1.54V
2 Zinc is a more powerful reductant than $Fe^{2+}(aq)$
3 $Fe^{3+}(aq)$ can oxidized Zinc under standard condition
A
B
C
D

39. The anomalous behavior of lithium (Li) in group I can be attributed to:
1 its high electropositivity
2 its small size
3 the ability of Li^+ ions to polarize small anions like N^{3-}
A
B
C
D

40. Which of the following pairs of compounds will form an ideal mixture?
1 $CHCl_3$ and CH_3COCH_3
2 H_2O and HNO_3
3  and

A
B
C
D

41. The graph of boiling point against hydrides of Group 14,15,16,17 (Group IV, V, VI, VII) reveals that:
1 The boiling points of the hydrides of the Group 14 element increases down the group due to increase in van der waal's forces.
2 The boiling points of the first members of the hydrides of Group 15, 16 and 17 have abnormally high boiling points because their molecules are held by hydrogen bonds.
3 The boiling points of the hydrides of Group 17 decrease down the group due to decrease in the strength of the hydrogen bonds.
A
B
C
D

42. The two isomers corresponding to the molecular formula $C_3H_6O_2$
1 can be distinguished using PCl_5
2 are functional group isomers
3 will undergo condensation reaction

A
B
C
D

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43. The Rutherford gold-foil experiment led to the discovery of
1 The electron
2 The neutron
3 The position and properties of the nucleus

A
B
C
D

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44. Phenylamine ($C_6H_5NH_2$) is a brown liquid.
1 It is insoluble in water but soluble in dilute acids
2 It will react with bromine water to give a white precipitate
3 It can be separated from the reaction mixture when prepared by reduction of nitrobenzene by steam distillation

A
B
C
D

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45. Which of the following group 14 (Group IV) element/compounds have giant covalent lattices?
1 SiO_2
2 Ge
3 SnO_2

A
B
C
D

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46. The solubility of ionic compounds depends on
1 the strength of the electrostatic attraction between the oppositely charged ions
2 hydration energy
3 the sizes of the ions

A
B
C
D

Questions 47 - 50 (Four questions)
Directions: Each of the following questions consists of a statement in. the left-hand column followed by a second statement in the right-hand column. Decide whether the first statement is true or false. Decide whether the second statement is true or false. Then choose:

A — If both statements are true and the second statement is a CORRECT explanation of the first statement

B — If both statements are true and the second statement is NOT a CORRECT explanation of the first statement.

C — If the first statement is true, but the second statement is false.

D — If the first statement is false, but the second statement is true.

Summary of Directions			
	First Statement	Second Statement	
A	True	True	Second statement is a CORRECT explanation of the first
B	True	True	Second statement is NOT a CORRECT explanation of the first
C	True	False	
D	False	True	

	FIRST STATEMENT	SECOND STATEMENT
47.	Chlorination of methyl benzene in UV light proceeds via free radical substitution	Methyl benzene is oxidized to benzoic acid by $H^+/KMnO_4(aq)$
48	The hydrogen atom shows only one series of spectral lines	The hydrogen atom contains only one electron
49.	All d-block elements are transition metals	Transition metals and compounds function as catalyst because they contain available empty d-orbital's
50.	Ethoxyethane has a lower boiling point than butan-l -ol (1 -butanol).	Butan-l-ol (1-butanol) molecules are held by hydrogen bonds which are stronger than van der waal's forces of attraction in ethoxyethane.