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MARCH 2023

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| <p>The Teachers' Resource Unit and the Regional Inspectorate of Pedagogy, in collaboration with NWCTA</p> | <p>SUBJECT CODE NUMBER 0715</p> | <p>PAPER NUMBER 1</p> |
| <p>GENERAL CERTIFICATE OF EDUCATION REGIONAL MOCK EXAMINATION</p> | <p>SUBJECT TITLE CHEMISTRY</p> | |
| <p>CANDIDATE NAME: <i>Antoine A. N. Njoh</i></p> | | |
| <p>CANDIDATE NUMBER: <i>123456</i></p> | | |
| <p>CENTRE NUMBER: <i>1234</i></p> | | |
| <p>ADVANCED LEVEL</p> | | |

Time Allowed: One and a half hours
INSTRUCTIONS TO CANDIDATES:

Mobile phones are **NOT ALLOWED** in the examination room.

1. USE A SOFT HB PENCIL THROUGHOUT THIS 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 "Advanced level -0715 code and subject title—CHEMISTRY Paper 1".
4. Insert the information required in the spaces above.
5. Without opening the booklet, pull out the answer sheet carefully from inside the front cover of this booklet. 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 instructions.
6. Insert the information required in the spaces provided on the answer sheet using your HB pencil:

Candidate Name, Centre Number, Candidate Number, Subject Code Number, and Paper number

How to answer questions in this examination:

7. Answer ALL the 50 questions in this examination. All questions carry equal marks.
8. Non-programmable calculators are allowed.
9. For each question there are four suggested answers, A, B, C and D. Decide which answer is correct. 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]
10. Mark only one answer for each question. If you mark more than one answer, you will score zero for that question. If you change your mind about an answer, erase the first mark carefully, and then mark your new answer.
11. Avoid spending much time on any question. If you find a question difficult, move to the next question. You can come back to this question later.
12. Do all rough work in this booklet using, where necessary, the blank spaces in the question booklet.
13. You must not take this booklet and answer sheet out of the examination room. All question booklets and answer sheets will be collected at the end of the examination.

Question 1-35 (thirty-five 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. Which statement about the Avogadro constant is correct
- It is the number of atoms in one mole of neon
 - It is the mass of 6.02×10^{23} atoms of any elements
 - It is the number of atoms in 12g of any element
 - It is the mass of one mole of any element

2. Identify the element with a hexagonal closed packed structure

- Na
- Ba
- Fe
- Mg

3. Which of the following factors increases the rate of a chemical reaction

- Decrease in temperature
- Decrease in pressure
- Decrease in activation energy
- Decrease in concentration of reactant

4. A sample of a compound with relative molecular mass 150 has the following composition by mass 2.4g carbon, 0.3g Hydrogen and 4.8g oxygen. Its empirical formula is (R.A.M C=12, H=1, O=16)

- CH_2O_2
- $\text{C}_2\text{H}_3\text{O}_3$
- CHO
- $\text{C}_4\text{H}_6\text{O}_6$

5. The general formula for a cycloalkane is

- C_nH_{2n}
- C_nH_n
- $\text{C}_n\text{H}_{2n+2}$
- $\text{C}_n\text{H}_{2n-2}$

6. A compound has the structure $\text{CH}_2=\text{CHCHBrCH}_3$. The number of stereo isomers is

- | | Geometric | Optical |
|------|-----------|---------|
| A. 0 | 0 | 0 |
| B. 0 | 2 | 2 |
| C. 2 | 2 | 2 |
| D. 4 | 2 | 2 |

7. Which element when burnt in oxygen produces an oxide which is a reducing agent

- Na
- Mg
- Al
- S

8. The species with a trigonal pyramidal shape is

- BF_3
- SO_3^{2-}
- CO_3^{2-}
- NH_4^+

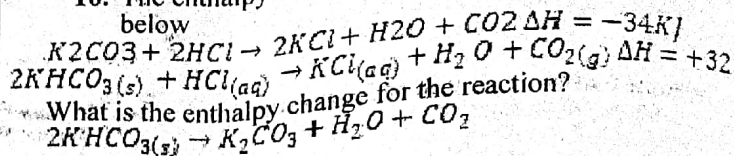
9. The element Sulphur produces a mass spectrum with the following peaks

| m/e value of peak | 32 | 33 | 34 | 36 |
|--------------------|-------|------|------|------|
| Relative abundance | 95.02 | 0.76 | 4.20 | 0.02 |

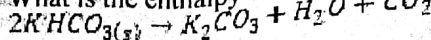
The relative atomic mass of Sulphur is

- 32.07
- 32.08
- 32.09
- 32.10

10. The enthalpy change for two reactions are shown below



What is the enthalpy change for the reaction?



- 31.6
- 1.2
- 66.8
- 99.6

11. Radioactive Fermium has a half-life of 7 hours. The time taken for the radioactivity to decay to 1/8 of its initial value is

- 7 hours
- 14 hours
- 21 hours
- 28 hours

12. A standard solution of ammonium iron (II)sulphate, $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$, is prepared by dissolving 4.9g of the salt and making up the volume to 250cm^3 in a volumetric flask. The molarity of sulphate ions in the solution is: (molar mass = 392.)

- 0.05M
- 1M
- 0.1M
- 0.5M

13. In the mass spectrum of an organic compound

- the highest peak indicates the parent ion
- the parent ion is equivalent to the fragment with the largest size
- the peak with the highest mass to charge ratio gives the relative molecular mass of the compound.
- the mass to charge ratio of the highest peak gives the relative molecular mass of the compound.

14. Which compound produces a yellow precipitate with 2,4-Dinitrophenylhydrazine reagent and also with alkaline aqueous iodine

- Butan-2-ol
- Butanal
- Butanone
- Pentan-3-one

15. Which of the following compounds is the most basic

- $\text{C}_6\text{H}_5\text{NH}_2$
- $\text{C}_2\text{H}_5\text{NH}_2$
- NH_3
- CH_3CONH_2

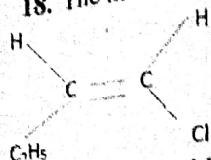
16. Which statement about the compounds of group II is correct

- BaCO_3 is less thermally stable than SrCO_3
- BaSO_4 is less soluble than MgSO_4
- $\text{Ca}(\text{OH})_2$ is less soluble than $\text{Mg}(\text{OH})_2$
- $\text{Ca}(\text{NO}_3)_2$ is more thermally stable than $\text{Sr}(\text{NO}_3)_2$

17. Select an equation that represents the second ionization energy of chlorine

- $\text{Cl}_{(g)} \rightarrow \text{Cl}_{(g)}^+ + e^-$
- $\text{Cl}_{(g)} \rightarrow \text{Cl}_{(g)}^{2+} + 2e^-$
- $\text{Cl}_{(g)}^+ \rightarrow \text{Cl}_{(g)}^{2+} + e^-$
- $\text{Cl}_{(g)} \rightarrow \text{Cl}_{(g)}^{2+} + 2e^-$

18. The name of the compound below is



- A. Cis-1-chloro-2-ethylethene
- B. Trans-1-chloro-2-ethylethene
- C. Cis-1-Chlorobut-1-ene
- D. Trans-1-chlorobut-1-ene

19. Chlorine gas is widely used to treat contaminated water. When chlorine gas is added to water, which chemical species present is responsible for killing bacteria

- A. ClO_2
- B. Cl^-
- C. HCl
- D. ClO^-

20. The reaction between ethanoyl chloride and water to give an acid is classified as

- A. Electrophilic addition
- B. Electrophilic substitution
- C. Nucleophilic substitution
- D. Nucleophilic addition

21. A solution of sulphuric acid has a pH of 1.39, the molar concentration of the sulphuric acid solution is

- A. 0.04
- B. 0.02
- C. 0.2
- D. 0.4

22. The oxidation number of carbon in the oxalate ion, $\text{C}_2\text{O}_4^{2-}$ is

- A. +2
- B. +3
- C. +4
- D. -3

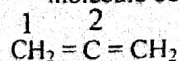
23. The line emission spectrum of an element is proof that electrons

- A. Are in quantized energy levels
- B. have a negligible mass
- C. are negatively charged
- D. have wavelike properties.

24. Which of the following aqueous solutions is basic ($\text{pH} > 7$)

- A. NaCl
- B. NH_4Cl
- C. CH_3COONa
- D. NaHSO_4

25. State the type of hybridization for carbon two in the molecule below



- A. sp
- B. sp^2
- C. sp^3
- D. sp^d

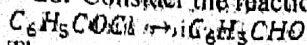
26. Impure Aniline can be purified by

- A. Recrystallisation
- B. Filtration
- C. Solvent extraction
- D. D Steam distillation

27. Which pair of liquids will give a drop in temperature when mixed?

- A. Benzene and methylbenzene
- B. Ethanol and water
- C. Propanone and butanone
- D. Nitric acid and water

28. Consider the reaction



The reagent and reaction condition necessary for the conversion are

- A. acidified KMnO_4 , reflux
- B. ethanol, room temperature, reflux
- C. LiAlH_4 /dry ether, reflux
- D. H_2 , poisoned palladium catalyst, heat

29. For the group IV elements carbon to lead, choose the correct statement

- A. The stability of the +4-oxidation state increases down the group
- B. All the tetrachloride hydrolyze in water
- C. PbO is amphoteric while PbO_2 is acidic
- D. Tin (II) compounds are slightly less stable than Tin (IV) compounds

30. What is the environmental consequence of the uncontrolled use of fertilizers

- A. acid rain
- B. low oxygen levels in streams
- C. ozone depletion
- D. greenhouse effect

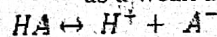
31. The atomic number of chromium is 24. The correct electronic configuration of chromium in the compound $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ is

- A. $[\text{Ar}]3d^24s^1$
- B. $[\text{Ar}]3d^44s^0$
- C. $[\text{Ar}]3d^34s^0$
- D. $[\text{Ar}]3d^24s^2$

32. Which of the following techniques would be most appropriate in determining the arrangement of ions in a crystal

- A. Nuclear magnetic resonance spectroscopy
- B. X-ray diffraction
- C. Mass spectrometry
- D. Infra-red spectroscopy

33. Bromothymol blue can be used as an indicator in acid base titrations. The indicator can be regarded as a weak acid which ionizes as follows



Yellow Blue

This means that bromothymol blue is

- A. Blue in acidic solution
- B. Yellow in basic medium
- C. Blue in basic medium
- D. Colorless in acidic medium

34. For the reaction $\text{A} + 2\text{Y} \rightarrow \text{Z}$ the rate is quadrupled when $[\text{X}]$ is doubled and $[\text{Y}]$ is kept constant; rate is constant when $[\text{Y}]$ is doubled and $[\text{X}]$ is kept constant. The rate expression for the reaction is

- A. $\text{R} = k[\text{X}][\text{Y}]$
- B. $\text{R} = k[\text{X}]^2$
- C. $\text{R} = k[\text{Y}]^2$
- D. $\text{R} = k[\text{X}]^2[\text{Y}]$

35. Uranium-235 undergoes alpha decay to give Y which decays by beta emission to form Z. α -decay β -decay
- ${}^{235}_{92}\text{U} \rightarrow \text{Y} \rightarrow \text{Z}$ The atomic number of Z is
- 91
 - 90
 - 231
 - 230

Question 36-45

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.

- If 1, 2 and 3 are correct
- If 1 and 2 only are correct
- If 2 and 3 only are correct
- If 3 only is correct.

| Directions summarized | | | |
|-----------------------|-----------------|-----------------|----------------|
| A | B | C | D |
| 1, 2, 3 correct | 1 and 2 correct | 2 and 3 correct | 3 only correct |

36. In calculating the enthalpy of solution of potassium chloride, the data necessary include
- the lattice enthalpy of potassium chloride
 - the enthalpy of hydration of the component ions
 - the heat of formation of potassium chloride

[A. B. C. D]

37. Which alcohol CANNOT be dehydrated to form alkenes

- $(\text{CH}_3)_3\text{COH}$
- $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
- CH_3OH

[A. B. C. D]

38. The products obtained from the ozonolysis of the alkene $(\text{CH}_3)_2 = \text{CH}_2$ is (are)

- HCHO
- CH_3COCH_3
- $\text{CH}_3\text{CH}_2\text{CHO}$

[A. B. C. D]

39. Correct statements about the structure of the chlorate (V), ClO_3^- include

- there is delocalization of electrons in the ion.
- all the oxygen - chlorine - oxygen bond angles are all identical.
- the chlorine atom has lone pair of electrons

[A. B. C. D]

40. In which of the following are the species written in order of decreasing radius

- $\text{Li}^+, \text{Na}^+, \text{K}^+$
- $\text{Al}^{3+}, \text{Al}^{2+}, \text{Al}^+$
- $\text{N}^{3-}, \text{O}^{2-}, \text{F}^-$

[A. B. C. D]

41. From the following data $\text{Zn}^{3+}/\text{ZnE}^0 = -0.76\text{V}$, $\text{Fe}^{3+}/\text{Fe}^{2+}\text{E}^0 = +0.77\text{V}$ it can be deduced that

- the standard emf for the cell $\text{Zn}|\text{Zn}^{2+}/\text{Fe}^{3+}, \text{Fe}^{2+}|\text{Pt(s)}$ is -1.53V
- Zinc is a more powerful reductant than Fe^{2+}
- Fe^{3+} can oxidize Zinc under standard conditions

[A. B. C. D]

42. Which of the following processes are endothermic

- $2\text{O}_2(\text{g}) \rightarrow 2\text{O}(\text{g})$
- $2\text{O}(\text{g}) + e \rightarrow \text{O}_2^-(\text{g})$
- $3\text{O}(\text{g}) + e \rightarrow \text{O}_3^-(\text{g})$

[A. B. C. D]

43. Which change will increase the amount of SO_3 at equilibrium for the reaction $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3 \Delta H = -197\text{KJ}$

- increasing the temperature
- adding a catalyst
- decreasing the volume

[A. B. C. D]

44. Hydrogen bonding is the main factor responsible for

- the dimerization of benzoic acid
- the boiling point of water is higher than that of hydrosulphide
- the boiling point of methylbutane is lower than that of pentane

[A. B. C. D]

45. The element with electronic configuration $[\text{Ar}]3d^{10}4s^24p^2$ is

- a typical metal
- in group IV of the periodic table
- found in the p-block of the periodic table

[A. B. C. D]

Questions 46-50 (fine 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

- If both statements are true and the second statement is a CORRECT Explanation of the first statement
- If both statements are true but the second is NOT a CORRECT explanation of the first statement
- If the first statement is true but the second statement is false
- If the first statement is false but the second 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 |
|-----|--|---|
| 46. | EDTA is useful in treating heavy metal poisoning | EDTA is a chelating ligand |
| 47. | Methylbenzene is easier to nitrate than benzene | The methyl group has an electron releasing (+I) effect |
| 48. | Ethynine gives a white precipitate when reacted with ammoniacal silver nitrate | A molecule of ethyne contains four sigma bonds and one pi bond |
| 49. | All D-block elements are transition metals | Scandium and Zinc form stable ions |
| 50. | First ionization energy generally increases across a period. | Breaks in ionization energy are due to the existence of s and p subshells |

END