

0715/ 1/2024  
CHEMISTRY A/L

**SOUTH WEST REGIONAL MOCK EXAMINATION  
GENERAL EDUCATION**

The Teachers' Resource Unit (TRU) in collaboration with the Regional Pedagogic Inspectorate of Pedagogy for science Education and South West Chemistry Teachers' Association (SOWECTA)	<b>Subject Code</b> <b>0715</b>	<b>Paper Number</b> <b>1</b>
<b>CANDIDATE NAME</b> .....	<b>Subject Title</b>  <b>CHEMISTRY</b>	
<b>CANDIDATE NUMBER</b> .....		
<b>CENTRE NUMBER</b> .....		
<b>ADVANCED LEVEL</b>	<b>DATE</b> <b>MONDAY, 18</b> <b>/03/2024 (Morning)</b>	

**Time Allowed: One hour thirty minutes**

**INSTRUCTIONS TO CANDIDATES:**

- USE A SOFT HB PENCIL THROUGHOUT THIS EXAMINATION.
- DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.  
Before the Examination begins:
  - Check that this question booklet is headed "Advanced Level – 0715 Chemistry, Paper 1".
  - Insert the information required in the spaces provided above.
  - 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.
  - 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:
  - Answer ALL the 50 questions in this examination. All questions carry equal marks.
  - Non-programmable calculators are allowed.
  - 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
  - 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.
  - 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.
  - Do all rough work in this booklet using, where necessary, the blank spaces in the question booklet.
  - Mobile phones are **NOT ALLOWED** in the examination room.
  - 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 – 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.

- The property of group (IV) elements which decreases with increasing atomic number is:
  - The inert-pair effect.
  - The stability of the +4 oxidation state
  - The oxidizing power of the dioxides
  - The stability of the +2 oxidation state
- Which of the halogens would NOT disproportionate in cold dilute alkali?
  - Chlorine
  - Bromine
  - Iodine
  - Fluorine
- The empirical formula of a compound is  $\text{CH}$ . If its molar mass is 78, what is its molecular formula?
  - $\text{C}_2\text{H}_2$
  - $\text{CH}_4$
  - $\text{C}_3\text{H}_4$
  - $\text{C}_6\text{H}_6$
- What do you understand by the term: *molecularity of a reaction*?
  - It is the overall order of a reaction.
  - It is the total number of reactant molecules in a reaction.
  - It is the total number of molecules involved in the slowest step of the reaction.
  - It is the total number of gaseous molecules in a reaction.
- A transition metal is defined as an element which:
  - is found between groups II and III of the periodic table.
  - has a variable oxidation state.
  - occurs in the d-block of the periodic table.
  - forms an ion with a partially filled d-subshell.
- The definition "It is the number of times the average mass of one atom of an element is heavier than one-twelfth the mass of one atom of carbon -12 isotope" refers to:
  - The mole
  - Relative atomic mass
  - Relative molecular mass
  - Avogadro constant
- Identify the pair below with the same shape.
  - $\text{NH}_3$  and  $\text{BH}_3$
  - $\text{SO}_4^{2-}$  and  $\text{CO}_3^{2-}$
  - $\text{POCl}_3$  and  $\text{CH}_3\text{CH}_3$
  - $\text{NO}_3^-$  and  $\text{PO}_4^{3-}$
- An element has a relative atomic mass of 69.7 and gives two peaks in its mass spectrum. If one of the peaks appears at a mass point of 68.9 with a relative abundance of 60%; what will be the mass point of the other peak?
  - 71
  - 70.23
  - 69.3
  - 70.9
- A group IV chloride which is insoluble in cold water but soluble in hot water is:
  - $\text{PbCl}_2$
  - $\text{CCl}_4$
  - $\text{SiCl}_4$
  - $\text{GeCl}_2$
- When butan-2-ol is heated with concentrated sulphuric acid at  $170^\circ\text{C}$ , the major product obtained is but-2-ene while the minor product is but-1-ene. What principle is used to determine the major product of this reaction?
  - Saytzeff's (Zaitsev's) rule
  - Hoffmann degradation
  - Markovnikov's (Markofnikoff's) rule
  - Clemenson's rule
- What does the definition "It is the ordered arrangement of particles in a crystal", represent?
  - Space lattice
  - Crystal
  - Crystal structure
  - Unit cell
- A reddish brown precipitate is obtained when a certain organic compound is passed through ammoniacal Copper(I) chloride. The organic compound formed is likely:
  - But-1-ene
  - But-1-yne
  - Benzene
  - But-2-yne
- Which pair below are isotopes?
  - 1 g of  $^{212}_{82}\text{Pb}$  and 10 g of  $^{212}_{82}\text{Pb}$
  - 1 g of  $^{212}_{82}\text{Pb}$  and 1 g of  $^{210}_{82}\text{Pb}^{2+}$
  - 1 mol of  $^{210}_{82}\text{Pb}$  and 1 mol of  $^{212}_{82}\text{Pb}$
  - 1 mol of  $^{210}_{82}\text{Pb}$  and 1 mol of  $^{212}_{82}\text{Pb}^{2+}$
- A drop of concentrated sulphuric acid on a cube of sugar turns the portion black. This is because the sulphuric acid is:
  - A drying agent
  - A strong acid
  - A dehydrating agent
  - An oxidising agent



15. A chloride of an element in the period (Na - Ar) of the periodic table is a liquid at room temperature. It readily hydrolyses in air producing white fumes and a white precipitate. The chemical formula of the chloride is:  
 A  $\text{CCl}_4$   
 B  $\text{PCl}_3$   
 C  $\text{PCl}_5$   
 D  $\text{SiCl}_4$
16. Iodine dissolved in sodium hydroxide can be used to distinguish between which pair of compounds?  
 A  $\text{CH}_3\text{CHO} / \text{CH}_3\text{CH}_2\text{OH}$   
 B  $\text{CH}_3\text{COCH}_3 / \text{CH}_3\text{CH}_2\text{CHO}$   
 C  $\text{CH}_3\text{C}\equiv\text{CCH}_3 / \text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$   
 D  $\text{CH}_3\text{CH}=\text{CHCH}_3 / \text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
17. Which of the following factors is applied to increase the yield of ammonia gas in the Haber process.  
 A Vanadium(V) oxide catalyst  
 B High temperature of about  $250^\circ\text{C}$   
 C Platinum-Rhodium catalyst  
 D High pressure of about 250 atm
18. The pH of a 0.01M solution of methanoic acid is 2.9 at  $25^\circ\text{C}$ . What is the dissociation constant ( $K_a$ ) of the acid?  
 A  $1.26 \times 10^{-3} \text{ M}$   
 B  $1.0 \times 10^{-2} \text{ M}$   
 C  $1.6 \times 10^{-4} \text{ M}$   
 D  $4.62 \times 10^{-1} \text{ M}$
19. Which of the following reagents is suitable to distinguishing between butanal and butanone?  
 A  $\text{KCN}/\text{dil H}_2\text{SO}_4 / 10\text{-}20^\circ\text{C}$   
 B Fehling's solution.  
 C Iodine solution / sodium chlorate (I).  
 D 2,4-dinitrophenylhydrazine.
20. An organic compound X reacts with bromine dissolved in Potassium hydroxide at  $90^\circ\text{C}$  to produce ethylamine. Give the name of compound X  
 A Propanoic acid  
 B Propanamide  
 C Ethanoic anhydride  
 D Ethanamide
21. An element has the electronic structure:  $[\text{Ar}]3d^{10}4s^24p^5$ . State the group and period to which the element belongs.  
 A Group 2 Period 5  
 B Group 7 Period 4  
 C Group 5 Period 2  
 D Group 4 Period 3
22. The IUPAC name of the complex  $[\text{Co}(\text{en})_2\text{Cl}_2]$  is:  
 A bis(ethylenediamine)dichlorocobalt(III) ion.  
 B bis(ethylenediamine)dichlorocobaltate(I) ion.  
 C bis(ethylenediamine)dichlorocobaltate(III) ion.  
 D bis(ethylenediamine)dichlorocobaltate(I) ion.
23. Ionisation energy generally increases across period 2. Why is the first ionization energy of oxygen lower than that of nitrogen?  
 A Oxygen is more electronegative than nitrogen.  
 B Oxygen has a partially filled p-subshell but nitrogen has half-filled p-subshell.  
 C Oxygen has a half-filled p-subshell while nitrogen has a filled p-subshell.  
 D Oxygen has a smaller electron charge density than nitrogen.
24. The molecular formula of 3-chloro-2,2-dimethylpropan-1-ol is:  
 A  $\text{C}_5\text{H}_{10}\text{OCl}$   
 B  $\text{C}_5\text{H}_8\text{OCl}$   
 C  $\text{C}_5\text{H}_{11}\text{OCl}$   
 D  $\text{C}_5\text{H}_9\text{OCl}$
25. Which of the properties below is the same for all the alkaline-earth metals (Group II)?  
 A Their nitrates thermally decompose into the oxide, nitrogen dioxide and oxygen.  
 B Their nitrates thermally decompose into the nitrite and oxygen.  
 C Their oxides are basic.  
 D Their carbonates are soluble in water.
26. Consider the reaction  
 $\text{CH}_3\text{COOH} + \text{CH}_3\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{COOCH}_2\text{CH}_3 + \text{H}_2\text{O}$   
 What mass of ethylethanoate ( $\text{CH}_3\text{COOCH}_2\text{CH}_3$ ) would be obtained from 20g of Ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ )?  
 [RAM; C = 12, O = 16, H = 1]  
 A 22.96 g  
 B 38.26 g  
 C 52.8 g  
 D 12 g
27. Arrange the following molecules in order of increasing boiling points:  
 (i)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$   
 (ii)  $\text{H}_3\text{CH}_2\text{CHOHCH}_2\text{CH}_3$   
 (iii)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
 (iv)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$   
 A (iv), (i), (ii), (iii)  
 B (i), (iv), (ii), (iii)  
 C (i), (ii), (iii), (iv)  
 D (iii), (i), (ii), (iv)

28. Which of the following pairs of compounds constitutes functional group isomers?

- A Diethyl ether and butan-1-ol
- B Propan-1-ol and propan-2-ol
- C But-1-ene and but-1-yne
- D Butane and 2-methylpropane

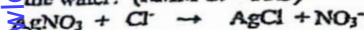
29. The successive ionization energies of an element in kJ/mol are given below:  
738, 1451, 7733, 10541, 13620, 17995, 21704, 25657, 31862, 38458, 169996, 189371. How many energy levels are there in an atom of the element?

- A 12
- B 3
- C 6
- D 2

30. A reagent W gives a similar observation when reacted with ethanoic acid and ethanol. The reagent is:

- A Acidified Potassium permanganate
- B Acidified Potassium dichromate
- C Fehling's solution
- D Thionylchloride

31. A 10 g sample of chlorinated tap water required 20.2 cm<sup>3</sup> of 0.1M AgNO<sub>3</sub> in a titration. What is the mass of chloride ions in the water? (RMM Cl = 35.5)



- 2.20 g
- 0.0202 g
- 0.0717 g
- 9.9283 g

32. Why do the hydrides of the halogens become more acidic as the group is descended?

- A H-X bond dissociation energy decreases
- B H-X bond dissociation energy increases.
- C The size of the halogen atoms decreases.
- D The H-X bond length decreases.

33. For the reaction:  $A + B \rightarrow C$ , the following data was obtained:

Exp't	[A] mol/dm <sup>3</sup>	[B] mol/dm <sup>3</sup>	Relative rate
1	0.1	0.1	1
2	0.2	0.1	4
3	0.1	0.2	2

The reaction is:

- A First order with respect to B
- B Second order with respect to B
- C First order with respect to A
- D Overall second order

34. Why are amines generally more basic than amides?

- A The lone pair of electrons on the nitrogen atom in amines is not delocalized but that on the nitrogen atom in amides is delocalized.
- B Amines contain no oxygen while amides contain oxygen.
- C Amines are derived from ammonia which is basic while amides are derived from carboxylic acids which are acidic.
- D Amines react with cold nitrous acid while amides do not.

35. An organic compound on ozonolysis gives propanone (CH<sub>3</sub>COCH<sub>3</sub>) and propanal (CH<sub>3</sub>CH<sub>2</sub>CHO). Deduce the structural formula of the compound.

- A CH<sub>3</sub>CH=CHCH(CH<sub>3</sub>)<sub>2</sub>
- B CH<sub>3</sub>CH<sub>2</sub>CH=C(CH<sub>3</sub>)<sub>2</sub>
- C CH<sub>3</sub>CH<sub>2</sub>CH=CHCH<sub>2</sub>CH<sub>3</sub>
- D CH<sub>2</sub>=CHCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>

36. The pair of values below represents the theoretical and experimental lattice energies in kJ/mol of a series of compounds. Select the compound with highest ionic character.

- A -736 and -867
- B -730 and -735
- C -766 and -776
- D -685 and -688

Questions 37 – 45 (nine 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 summarised

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

37. Concerning phase equilibrium and Raoult's law:

- 1 All miscible liquids obey Raoult's law.
- 2 A mixture of propan-1-ol and propan-2-ol will deviate positively from Raoult's law.
- 3 An azeotropic mixture is a non-ideal mixture with a constant boiling point and whose composition does not change on boiling.

- A
- B
- C
- D



38. Phenols and alcohols are all hydroxy-compounds; which of the following reagents can be used to distinguish between phenols and alcohols?

- 1 Phosphorus pentachloride.
- 2 Neutral iron(III) chloride.
- 3 Tollen's reagent.

A  
B  
C  
D

39. Lithium and magnesium show a diagonal relationship in the periodic table. This is shown by the following properties:

- 1 Their hydrogencarbonates do not exist in the solid state.
2. Their chlorides contain water of crystallization.
3. Their nitrates thermally decompose to the oxides.

A  
B  
C  
D

40. The sodium fusion or Lassaigne's test is used to determine the presence of the following elements in organic compounds:

1. Nitrogen and Sulphur.
2. Halogens.
3. Carbon and Hydrogen

A  
B  
C  
D

41. The organic compound below has the following property (properties):  
 $\text{CH}_2\text{OH}-\text{CHOH}-\text{CHOH}-\text{CHOH}-\text{CHOH}-\text{CHO}$

1. It has four asymmetric carbon atoms.
2. It reacts with ammoniacal silver nitrate (Tollen's reagent) to produce a silver mirror.
3. It produces a red precipitate with Fehling's solution.

A  
B  
C  
D

42. The vapour pressures of methanol and ethanol are 94 mmHg and 44 mmHg respectively at a given temperature. Given a mixture containing 0.625 mol and 2.174 mol of methanol and ethanol respectively.

1. The mole fraction of ethanol in the mixture is 0.223.
2. The partial vapour pressure of methanol is 20.96 mmHg.
3. A mixture of ethanol and methanol constitutes an ideal mixture

A  
B  
C  
D

43. Which of the following statement(s) is (are) true of the compounds of period 3 elements.

1. Aluminium oxide reacts both with dilute hydrochloric and aqueous potassium hydroxide.
2. The hydrides of sodium and Magnesium react with water to form hydrogen gas.
3. Both Aluminium chloride and Aluminium hydride react with water to form  $\text{Al}(\text{OH})_3$ .

A  
B  
C  
D

44. The product(s) of the reaction of phenol with dilute nitric acid at RTP is (are):

1. 3-nitrophenol
2. 2-nitrophenol
3. 4-nitrophenol

A  
B  
C  
D

45. Methylbenzene reacts with acidified potassium permanganate to produce benzoic acid. Which of these compounds would also give benzoic acid when reacted with acidified potassium permanganate?

1. Phenylmethanol
2. Phenylmethanal
3. Ethylbenzene

A  
B  
C  
D

**Questions 46 – 50 (Five questions)**

**Directions:** Each the following questions consists of a statement on the left-hand column followed by a second statement on the right-hand column. 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 <b>CORRECT</b> explanation of the first.
B	True	True	Second statement is <b>NOT</b> a <b>CORRECT</b> explanation of the first
C	True	False	
D	False	True	

	FIRST STATEMENT	SECOND STATEMENT
46	The $K_c$ for an endothermic reaction decreases with an increase in temperature.	The equilibrium position of an endothermic reaction shifts to the right with an increase in temperature.
47	Benzoic acid reacts with the nitrating mixture to form only one product.	Phenylamine reacts with the nitrating mixture to form two products.
48	The second electron affinity of oxygen is endothermic.	A lot of energy is required to bring two like charged species together.
49	The standard electrode potential of a half cell remains unchanged when the quantities of the reacting materials are increased.	Standard electrode potential values are only indicative of the probability of a reaction occurring.
50	Amino acids in a solution of pH greater than 7 exist as positively charged ions	Amino acids exist as zwitterions in a neutral solution.