

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)	Subject Code 0715	Paper Number 1
CANDIDATE NAME CANDIDATE NUMBER CENTRE NUMBER	Subject Title CHEMISTRY	
ADVANCED LEVEL	DATE 29/03/2022 (Morning)	

Time Allowed: One hour thirty minutes

INSTRUCTIONS TO CANDIDATES:

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 Chemistry, Paper 1".
4. Insert the information required in the spaces provided 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. Mobile phones are NOT ALLOWED in the examination room.
14. 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

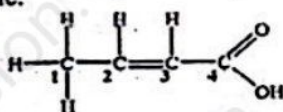
Questions 1 – 37 (Thirty-seven questions).

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. A molar solution is:

- A. A solution of 1 mol of solute dissolve in 1 dm³ of solvent.
- B. A solution of 1 mol of solute dissolve in 1 kg of solvent.
- C. A solution of 1 mol of solute dissolve in 1 dm³ of solution.
- D. A solution of 1 gram of solute dissolve in 1 dm³ of solution.

2. Identify the hybridization of carbon in the following molecule.



	1	2	3	4
A	sp ³	sp ²	sp ²	sp ²
B	sp ²	sp ²	sp ²	sp
C	sp ³	sp	sp ²	sp
D	sp	sp ²	sp	sp ²

3. When a solution of potassium iodide is treated with silver nitrate (v) solution, AgNO₃ it forms

- A. A yellow precipitate insoluble in aqueous NH₃
- B. A cream precipitate insoluble in aqueous NH₃
- C. A white precipitate soluble in aqueous NH₃
- D. A pale-yellow precipitate soluble in aqueous NH₃

4. Which of the following chlorides neither ionizes nor hydrolyzes in water

- A. SiCl₄
- B. NaCl
- C. CCl₄
- D. CuCl₂

5. The correct formula of an OXO acid of chlorine which has an oxidation state of +3 and +7 are respectively,

- | | |
|----------------------|-------------------|
| +3 | +7 |
| A. HClO ₃ | HClO ₄ |
| B. HClO ₂ | HClO ₄ |
| C. HClO | HClO ₃ |
| D. HClO ₃ | HClO |

6. Identify the compound that can exhibit stereoisomerism?

- A. CH₃CH₂CHO
- B. CH₃CH(CH₃)₂
- C. CH₃CH₂COCH₃
- D. CH₃CH₂CH(OH)CH₃

7. What is the coordination number of Iron in the complex compound K₂[Fe(CN)₆]?

- A. 3
- B. 4
- C. 6
- D. 8

8. The general outer electronic configuration of the group V element is?

- A. np⁵
- B. ns²np³
- C. nsnp⁴
- D. ns²np⁵

9. Which of the following d block metal ions forms colourless complex ions and compounds:

- A. Mn⁴⁺
- B. Cr³⁺
- C. Fe²⁺
- D. Cu⁺

10. Which properties account for the diagonal relationship between elements in the periodic table?

- A. Similar oxidation state and ionization energy
- B. Similar melting point and boiling point
- C. Similar electronegativity and atomic size
- D. Ability to catenate and hybridize.

11. Which statement describes bonding in hydrocyanic acid, HCN?

- A. Electrostatic attraction between H⁺ and CN⁻ ions
- B. Van der Waals force and hydrogen bond.
- C. Van der Waals force only
- D. Electrostatic attraction between shared electron pair and positive nuclei

12. Which of the following is a property unique to group IV elements?

- A. Variable Oxidation
- B. Diagonal Relationship
- C. Hybridization
- D. Catenation

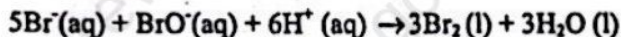
13. Which of the following elements has the largest second ionization energy?

- A. Sodium
- B. Potassium
- C. Magnesium
- D. Calcium

14. Which of the following is an acidic oxide of the third period of the periodic table?

- A. Na_2O
- B. NO_2
- C. CO
- D. SiO_2

15. Bromine can be produced from the following reaction;



Which two methods that could be used to monitor the rate of the reaction?

- A. Conductivity and dilatometry
- B. Colorimetry and dilatometry
- C. Conductimetry and Colourimetry
- D. Titrimetry and dilatometry

16. Analysis of 2.20 g of a compound of phosphorus and sulphur showed that it contained 1.24 g of phosphorus. The empirical formula of the compound is?

(RAM: P = 31, S = 32).

- A. P_2S
- B. P_4S_3
- C. P_3S_4
- D. P_2S_3

17. Identify the particle X in the nuclear reaction ${}^4_2\text{He} + {}^{14}_7\text{N} \rightarrow {}^{17}_8\text{O} + \text{X}$ by giving its mass number and atomic number.

- A. 17 and 8 respectively
- B. 19 and 2 respectively
- C. 19 and 8 respectively
- D. 17 and 10 respectively

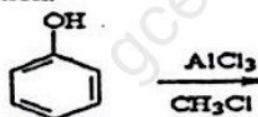
18. What volume of 12.0 M HCl is required to prepare 75.0 mL of 3.50 M HCl?

- A. 21.9 mL
- B. 0.560 mL
- C. 257 mL
- D. 75.0 mL

19. Which of the following will change the value of K_c ?

- A. Concentration changes
- B. Pressure changes
- C. Temperature change
- D. Employing a catalyst

20. Predict the major product of the following reaction.



- A. *m*-chlorophenol
- B. *o*-chlorophenol and *p*-chlorophenol
- C. *o*-hydroxytoluene and *p*-hydroxytoluene
- D. *m*-hydroxytoluene

21. Why are scandium and zinc considered as d-block elements but not as transitional metals?

- A. They do not form coloured compound
- B. They do not form ions or compounds with partially filled d-orbitals
- C. They are not paramagnetic
- D. They do not form complexes

22. The pH of a 0.01 M solution of NaOH is?

- A. 14
- B. 12
- C. 11
- D. 13

23. Identify the element with the highest melting point.

- A. Boron
- B. Carbon
- C. Aluminum
- D. Silicon

24. The most suitable reagent for the conversion of CH_3CONH_2 to CH_3NH_2 is?

- A. LiAlH_4 / dry ether
- B. NaNO_2/HCl , temp $< 5^\circ\text{C}$
- C. Red P_4 / Zn / Heat
- D. Br_2 / KOH

25. Which of the following nitrates will decompose to give the nitrite and oxygen?

- A. NaNO_3
- B. LiNO_3
- C. $\text{Mg}(\text{NO}_3)_2$
- D. $\text{Ca}(\text{NO}_3)_2$

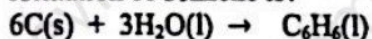
26. The reaction $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$ is an example of:

- A. A free radical substitution
- B. An electrophilic substitution
- C. A nucleophilic substitution.
- D. A nucleophilic addition.

27. Which of the following species is a Lewis base?

- A. AlCl_3
- B. BF_3
- C. OH^-
- D. H^+

28. Given the following standard enthalpy changes in KJ/mol: $\Delta H^\circ_f(\text{C}_6\text{H}_6) = -3267.6$; $\Delta H^\circ_f(\text{H}_2\text{O}) = -285.9$; $\Delta H^\circ_f(\text{CO}_2) = -393.5$. The standard enthalpy of formation of benzene is?



- A. +48.9
- B. +2016.4
- C. -679.4
- D. -2874.1

29. An organic compound gives out white fumes with PCl_5 and reacts with a mixture of NaOH and I_2 to give triiodomethane. The compound could be?

- A. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- B. CH_3COCH_3
- C. $\text{CH}_3\text{CH}_2\text{OH}$
- D. $\text{CH}_3\text{-O-CH}_3$

30. The strongest oxidizing agent among the halogens is?

- A. F_2
- B. Cl_2
- C. Br_2
- D. I_2

31. For the reaction $\text{R} \rightarrow \text{P}$: What is the order of the reaction with respect to R, if the rate increases 9 times when the concentration of R is tripled?

- A. First order
- B. Third order
- C. Zero order
- D. Second order

32. A mixture that boils without change in composition is?

- A. A minimum boiling point mixture
- B. A maximum boiling point mixture
- C. A constant boiling point mixture
- D. A mixture without a maximum or minimum point

33. The lattice energy for rubidium chloride is -657 KJmol^{-1} and its heat of solution is $+9 \text{ KJmol}^{-1}$. The hydration energy of rubidium chloride is?

- A. -648 KJmol^{-1}
- B. $+648 \text{ KJmol}^{-1}$
- C. -676 KJmol^{-1}
- D. $+676 \text{ KJmol}^{-1}$

34. Which one of the following techniques would be most appropriate in identifying the position of hydrogen atoms in an organic compound?

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

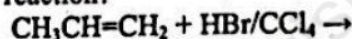
35. What is the oxidation state of sulphur in potassium persulphate, $\text{K}_2\text{S}_2\text{O}_8$?

- A. +6
- B. +4
- C. -2
- D. +7

36. Which of the following is an environmental effect of Nitrogen?

- A. It's oxides cause acid rain.
- B. Its ammonium salts are used as fertilizer.
- C. It's atmospheric fixation to nourish the soil
- D. Its nitride is used in the manufacture of rechargeable lithium batteries.

37. What is the major product of the following reaction?



- A. $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
- B. $\text{CH}_3\text{CHBrCH}_3$
- C. $\text{CH}_2\text{BrCH=CH}_2$
- D. $\text{CH}_3\text{CH=CHBr}$

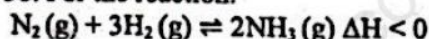
Questions 38 – 45 (Eight questions).

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.

SUMMARISED DIRECTIONS

A	B	C	D
1, 2 and 3 All Correct	1 and 2 Only Correct	2 and 3 Only Correct	3 Only Correct

38. For the reaction:



- Increasing the pressure, increases the value of the equilibrium constant K_p .
- Liquifying the ammonia once formed increases the yield.
- The optimum conditions for the best yield are a pressure of 200atm, a temperature of $\approx 700\text{K}$ and the use of finely divided Iron catalyst

39. Which conditions are required to give a good yield of ethanoic acid when ethanol is oxidized using potassium dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$?

- Add sulphuric acid.
- Heat the reaction mixture under reflux
- Distill the product as the oxidizing agent is added.

40. Which of the following is/are acylating agents?

1. RCO_2R
2. $(\text{RCO})_2\text{O}$
3. RCOCl

41. What will happen when 1 cm^3 of 0.001 M HCl is added to a buffer solution of $0.1 \text{ M H}_2\text{CO}_3$ and 0.04 M NaHCO_3 ?

1. The pH of the buffer will reduce.
2. The pH of the buffer will increase.
3. The H^+ ions from HCl will be picked up by the excess HCO_3^- supplied from NaHCO_3 .

42. The decay of 75% ${}^{63}_{29}\text{Cu}$ to ${}^{59}_{28}\text{Ni}$ has a half-life of 0.01 years.

1. The decay is an alpha decay followed by a beta decay.
2. The decay constant is 69.3 year^{-1}
3. The decay is an alpha decay.

43. Which of the following is true about carbonyl compounds?

1. Both Aldehydes and Ketones react with Tollen's reagent to form a silver mirror.
2. All Aldehydes and Ketones have antiseptic smell.
3. The anion formed after the loss of the α -hydrogen atom is resonance stabilized

44. Compound A was prepared by oxidation of compound B with alkaline KMnO_4 . Compound A on reduction with LiAlH_4 gets converted back to compound B. When compound A is heated with compound B in the presence of H_2SO_4 , it produces fruity smell of Compound C.

1. Compound A is an alcohol.
2. Compound B is a carboxylic acid.
3. Compound C is an Ester.

45. Consider the electrode systems;

$$E^\circ \text{Mg}^{2+}(\text{aq})/\text{Mg}(\text{s}) = -2.36 \text{ V and}$$

$$E^\circ \text{Zn}^{2+}(\text{aq})/\text{Zn}(\text{s}) = -0.76 \text{ V}$$

When the two electrodes are coupled to give a spontaneous reaction:

1. The cell potential for the couple is $+1.60 \text{ V}$.
2. The cell diagram for the process is $\text{Mg}(\text{s})/\text{Mg}^{2+}(\text{aq})//\text{Zn}^{2+}(\text{aq})/\text{Zn}(\text{s})$
3. The couple forms an electrolytic cell.

Questions 46 – 50 (Five questions).

Directions: Each of the 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 and the second statement is False.
 D If the first statement is False but the second statement is True.

DIRECTIONS SUMMARISED

Option	First Statement	Second Statement	Comment
A	TRUE	TRUE	Second statement is a CORRECT explanation of the first statement.
B	TRUE	TRUE	Second statement is NOT a CORRECT explanation of the first statement.
C	TRUE	FALSE	
D	FALSE	TRUE	

	FIRST STATEMENT	SECOND STATEMENT
46	The coordination number of Na^+ and Cl^- ion in NaCl crystal lattice are each 6.	NaCl crystal lattice adopts a face centered cubic (fcc) unit cell.
47	The halogens show a change in physical state from gas in F_2 and Cl_2 , through liquid in Br_2 to solid in I_2 and At_2	Down group VII van der waals forces increases in strength with increase in atomic number.
48	$\text{CH}_3\text{CH}_2\text{OH}$ and CS_2 forms a miscible liquid mixture that deviate positively from Raoult's law	On mixing ethanol and carbon disulphide, strong H-bonds in ethanol are broken by interaction with CS_2 molecules.
49	Ammonia coordinates with boron trifluoride to form H_3NBF_3	Ammonia in its reaction with boron trifluoride behaves as an Arrhenius base
50	Mg^{2+} , Al^{3+} , O^{2-} and N^{3-} are isoelectronic ions.	The ionic radius of the ions increases in the order: $\text{Mg}^{2+} < \text{Al}^{3+} < \text{O}^{2-} < \text{N}^{3-}$

END