GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

0715 CHEMISTRY 1

JUNE 2022 **ADVANCED LEVEL**

Centre Number	
Centre Name	
Candidate Identification Number	
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 **"Advanced Level - 0715 CHEMISTRY 1"**
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 instructions.

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 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 the answer sheet first and then the question booklet. DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH IT.

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. Select an oxide which is acidic and a solid.
   A SiO_2
   B CO_2
   C PbO
   D SnO

2. Identify the element with a body centered cubic packed arrangement.
   A Copper
   B Sodium
   C Magnesium
   D Silver

3. What is the shape of the nitrate ion, NO_3^-?
   A Tetrahedral
   B Trigonal planar
   C Trigonal pyramidal
   D Trigonal bipyramidal

4. How many isomers could be obtained from the compound with molecular formula $C_3H_6O_2$?
   A 5
   B 4
   C 3
   D 2

5. Which of the following techniques would be most appropriate in identifying the position of hydrogen atoms in an organic compound?
   A Infra-red spectroscopy
   B Mass spectroscopy
   C X-ray diffraction
   D Nuclear magnetic resonance

6. Calculate the number of moles of hydroxide ions present in 2.90 g of a solution of magnesium hydroxide, $Mg(OH)_2$.
   (RAM : Mg = 24; O = 16; H = 1).
   A 0.05 moles
   B 0.071 moles
   C 0.1 moles
   D 0.14 moles

7. Which experiment led to the discovery of the nucleus?
   A Gold foil experiment
   B Beryllium foil experiment
   C Cathode ray experiment
   D Light scattering experiment

8. Choose the element with the highest value of the first ionisation energy.
   A Lithium
   B Beryllium
   C Soduim
   D Magnesium

9. Sulphuric acid is manufactured on a large scale by the contact process. State the conditions needed for an optimum yield of the acid.
   A Temperature of 200 °C, Pressure 250 atm, V_2O_5catalyst
   B Temperature of 600 °C, Pressure of 1 atm, V_2O_5catalyst
   C Temperature of 500 °C, Pressure of 250 atm, V_2O_5 catalyst
   D Temperature of 500 °C, Pressure of 1 atm, V_2O_5 catalyst

10. Which of these compounds will give a yellow precipitate with a characteristic smell when reacted with $NaOH/I_2$?
    A C_6H_5OH
    B CH_3CH_2CHO
    C $CH_3CH(OH)CH_3$
    D $CH_3CH_2COCH_2CH_3$

11. Identify the product formed from the reaction:
    $(CH_3)_2CO + 4[H] \xrightarrow{Zn/Hg,\ Conc\ HCl}$
    A C_2H_5COOH
    B $CH_3CHOHCH_3$
    C $CH_3CH_2CH_2OH$
    D $CH_3CH_2CH_3$

12. At 50 °C, the ionic product of water, Kw is 5.7×10^{-14} mol^2/dm^6, what is the pH of water at this temperature?
    A 2.3
    B 6.6
    C 7.0
    D 7.3

13. The table below shows two half-cell equations and their corresponding values of standard redox potentials.
    A: $Pb^{2+}(aq) + 2\acute{e} \rightarrow Pb(s)$ $E^0 = -0.13V$
    B: $I_2(s) + 2\acute{e} \rightarrow 2I^-(aq)$ $E^0 = +1.36V$
    Write the cell diagram that results when A and B are connected.
    A $Pb(s) / Pb^{2+}(aq) // I_2(aq), 2I^-(aq)/Pt$
    B $Pb(s) /Pb^{2+}(aq) // 2I^-(aq), I_2(aq)/Pt$
    C $Pt/2I^-(aq), I_2(aq) // Pb^{2+}(aq)/ Pb(s)$
    D $Pt/I_2(aq), 2I^-(aq) // Pb(s)/Pb^{2+}(aq)$

14. Which experimental evidence indicates that a mixture of 2 miscible liquids shows positive deviation from Raoult's law?
A The total volume of the mixture is equal to the sum of the volumes of the individual liquids.
B The temperature of the solution falls slightly since bonds are broken.
C The temperature of the solution rises slightly since bonds are formed.
D The total volume of the mixture is slightly less than the sum of the volumes of the individual liquids

15. Identify the decomposition reaction which will NOT take place.
A $Li_2CO_3 \rightarrow Li_2O + CO_2$
B $2NaNO_3 \rightarrow 2NaNO_2 + O_2$
C $2Ca(NO_3)_2 \rightarrow 2CaO + 4NO_2 + O_2$
D $Na_2CO_3 \rightarrow Na_2O + CO_2$

16. Choose the correct colour and physical state of bromine.
A Reddish brown gas
B Yellow liquid
C Reddish brown liquid
D Pale yellow gas

17. Why do transition metals exhibit variable oxidation states?
A They have electrons in both the 3d and 4s orbitals.
B They are found in the d-block of the periodic table.
C During bonding they can lose electrons from both the 3d and 4s orbitals since both orbitals have similar energies.
D They have empty d-orbitals.

18. What is the formula of amino ethanoic acid in neutral solution?
A $H_3N^+CH_2COO^-$
B H_2NCH_2COOH
C $H_3N^+CH_2COOH$
D $H_2NCH_2COO^-$

19. Which of the following reaction leads to a reduction in the carbon chain?
A $RCONH_2 + H_2O|H^+$, heat
B $RCONH_2 + P_2O_5$, heat
C $RCONH_2 + NaNO_2|$dil HCl
D $RCONH_2 + Br_2 + 4KOH$, heat

20. Give the composition of an acid buffer.
A A weak acid and a soluble salt of the weak acid.
B A strong acid and a soluble salt of the strong acid.
C An acid and a soluble salt of the acid.
D A weak acid and a soluble salt of a strong acid.

21. Which species are lost in converting the radioactive element X to Y in the equation below:
$^{162}_{80}X \rightarrow {}^{154}_{77}Y$
A 1alpha particle and 1 beta particle
B 1 alpha particle and 2 beta particles
C 2 alpha particles and 1 beta particle
D 2 alpha particles and 2 beta particles

22. The results in the table below were obtained for the reaction: A + B → C

Expt	[A] mol/dm^3	[B] mol/dm^3	Initial rate mol/dm^{-3}s^{-1}
1	0.1	1.0	2.0×10^{-3}
2	0.1	2.0	4.0×10^{-3}
3	0.2	1.0	8.0×10^{-3}

What is the order of the reaction with respect to A?
A First order
B Second order
C Third order
D Zero order

23. Which pair of liquids when mixed will show a negative deviation from Raoult's law?
A Benzene and methyl benzene
B Ethanol and water
C Propanone and hexane
D Ethyl ethanoate and trichloromethane

24. Identify an element in period 2 of the Periodic Table with a giant molecular structure.
A Silicon
B Aluminium
C Boron
D Beryllium

25. In which of these compounds is the oxidation state of nitrogen -1?
A N_2H_4
B NH_2OH
C Mg_3N_2
D N_2O

26. Given that the standard enthalpy of combustion of methanol, CH_3OH is -726 kJ mol^{-1} and of methanal, HCHO is -55 kJ mol^{-1}. Determine the enthalpy change for the reaction
CH_3OH [O] HCHO

A +671 kJ mol^{-1}
B +781 kJ mol^{-1}
C -781 kJ mol^{-1}
D -671 kJ mol^{-1}

27. Consider the equilibrium reaction:
$2SO_2(g) + O_2(g) \leftrightharpoons 2SO_3(g)$ $\Delta H = -198$ kJ
Which factor will cause an increase in the value of the equilibrium constant Kp?
A Increase in temperature
B Increase in pressure
C Increase in concentration of the reactants
D Decrease in temperature

28. Give the reagent(s) and reaction condition(s) for the conversion: $C_2H_4 \rightarrow C_2H_6$
A H_2 (g), Pt or Pd, 150 °C
B H_2(g), Zn\Cu in aq alcohol
C H_2(g), Cr_2O_3\Al_2O_3, 600 °C
D H_2(g), $LiAlH_4$

29. What is a nucleophile?
A It is a reagent which is electron deficient and attacks the nucleus of an atom.
B It is a reagent which is electron deficient and attacks electron rich sites.
C It is a reagent which is electron rich and attacks the electron deficient site of a molecule
D It is a reagent which is electron rich and will attack electron rich sites.

30. Name the complex ion: $[CrCl_2(H_2O)_4]^+$
A Tetraaquadichlorochromium(I) ion
B Tetraaquadichlorochromium(III) ion
C Tetraaquadichlorochromate(I)ion
D Dichlorotetraaquachromate(III) ion

31. Which technique(s) can be used for measuring the rate of the reaction below:
$CH_3COCH_3(aq) + I_2(aq) \rightarrow CH_3COCH_2I(aq) + HI(aq)$
A Colorimetry and pressure measurement
B Titrimetry only
C Colorimetry and titrimetry
D Titrimetry and pressure measurement

32. A mixture contains 1 mole of ammonia, 2.5 moles of hydrogen gas and 12 moles of nitrogen gas. Assuming that the total pressure is 3 atm, calculate the partial pressure of nitrogen in the mixture.
A 15.5 atm
B 0.484 atm
C 0.194 atm.
D 2.32 atm

33. An organic compound X, gives a white precipitate if passed through an ammoniacal solution of silver nitrate. What is the possible structure of X?
A R-C≡C-R
B $RCH_2C{\equiv}CH$
C RCH=CHR
D $RCH_2CH{=}CH_2$

34. Which product is formed when benzene reacts with chlorine in the presence of ultra-violet light?
A 1-chlorobenzene
B 1,2-dichlorobenzene
C 1,2,3,4,5,6-hexachlorobenzene
D 1,2,3,4,5,6-hexachlorocyclohexane

35. With reference to the elements in group IV of the periodic table, what is the inert pair effect?
A Reluctance of the outermost two s-electrons to take part in bonding.
B Reluctance of the s-electrons to take part in bonding
C Reluctance of the inner 2s-electrons to take part in bonding.
D Reluctance of the outermost p-electrons to take part in bonding.

36. The mass of one mole of hydrogen atom is:
A 6.02×10^{23}g
B 1/12 g
C 1 g
D 2 g

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

37. Which statement(s) is/are correct concerning d-block elements.
    1. Scandium and zinc are not considered transition metals because they both form compounds with completely filled d-orbitals.
    2. A complex ion is formed when a central metal atom or ion is linked by dative covalent bonds to neutral molecules or negatively charged ions called ligands.
    3. All ligands must possess at least a lone pair of electrons.

A
B
C
D

---

38. Select the correct statement(s) below:
    1. A covalent bond is an electrostatic force of attraction between the shared electron pair and the positive nuclei.
    2. The polarizing power of a cation increases as its charge increases and as its ionic size decreases.
    3. The bonding in $AlCl_3$ is ionic with some degree of covalent character

A
B
C
D

---

39. A sigma bond is formed: -
    1. during the overlap of an s and a p orbital.
    2. during the overlap of different p orbitals linearly.
    3. during the lateral overlap of 2 parallel p orbitals of adjacent atoms.

A
B
C
D

---

40. Identify the correct statement(s) on racemic mixtures.
    1. It can be separated into its enantiomers by chromatography.
    2. It is a mixture of equal parts of enantiomers.
    3. It is optically inactive

A
B
C
D

---

41. Which of the statement(s) below is/are true concerning the elements or compounds of group VII of the periodic table?
    1. HBr is prepared in the laboratory by the reaction of sodium bromide and concentrated sulphuric acid.
    2. The bond energy of the Cl-Cl bond is greater than the bond energy of the F-F bond.
    3. The acid strength of the oxoacids increases in the order: $HClO < HClO_2 < HClO_3 < HClO_4$

A
B
C
D

---

42. The group IV element(s) that exhibit allotropy is/are
    1. Silicon
    2. Germanium
    3. Tin

A
B
C
D

---

43. Alkenes can be prepared by the following method (s).

1. From alkynes by reduction using $LiAlH_4$ in dry ether.
2. By the dehydration of an alcohol using concentrated sulphuric acid at 140 °C
3. An alkene is produced when a halogenoalkane is refluxed with with a concentrated solution of alcoholic potassium hydroxide

A
B
C
D

---

44. What happens when a solution of barium sulphate is dissolved in a solution of 0.1 M sodium sulphate?

1. The concentration of the sulphate ion increases in the system.
2. The concentration of barium ions in solution reduces.
3. The solubility of barium sulphate is increased.

A
B
C
D

---

45. The reagent $LiAlH_4$/dry ether is used as a reducing agent in: -

1. The reduction of carbonyl compounds to alcohols.
2. The reduction of carboxylic acids to alcohols.
3. The reduction of nitriles to amines.

A
B
C
D

Questions 46 - 50 (Five 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
46.	Phenylamine is a stronger base than ammonia	The lone pair of electrons on the nitrogen atom in phenylamine is delocalized around the benzene ring making it less available for donation to an acid.
47.	The lattice energy of an ionic compound is exothermic.	Heat is absorbed when bonds are formed.
48.	In dilute solution, hydrofluoric acid is a weak acid.	The bonding in the hydrogen fluoride molecule is very strong and there is also hydrogen bonding between molecules of hydrogen fluoride.
49.	The concentration of a solution is the amount of solute dissolved in a known volume of solution.	When a solution is diluted, the quantity of solute does not change.
50.	With the exception of beryllium and magnesium, the s-block elements react rapidly with cold water to produce hydrogen and the metal hydroxide.	The group II metals are less reactive towards water than their corresponding group I elements in the same period.

GO BACK AND CHECK YOUR WORK