



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

CHEMISTRY

PAPER 3 Multiple Choice

9189/3

NOVEMBER 2014 SESSION

1 hour

Additional materials:

- Data Booklet
- Mathematical tables and/or calculator
- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A, B, C** and **D**. Choose the one you consider correct and record your choice in soft pencil on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

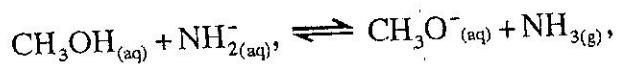
This question paper consists of 15 printed pages and 1 blank page.

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Section A

For each question there are four possible answers, A, B, C and D. Choose the one you consider to be correct.

1 For the reaction,



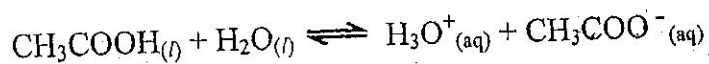
the conjugate acid-base pair is

- A NH_3 and CH_3O^{-} .
- B CH_3OH and CH_3O^{-} .
- C CH_3OH and NH_2^{-} .
- D NH_2^{-} and CH_3O^{-} .

2 Which statement is correct about real gases?

- A Van der Waals forces are significant at low pressure.
- B They approach ideality at high temperatures.
- C They approach ideality at low temperature.
- D They approach ideality at high pressure.

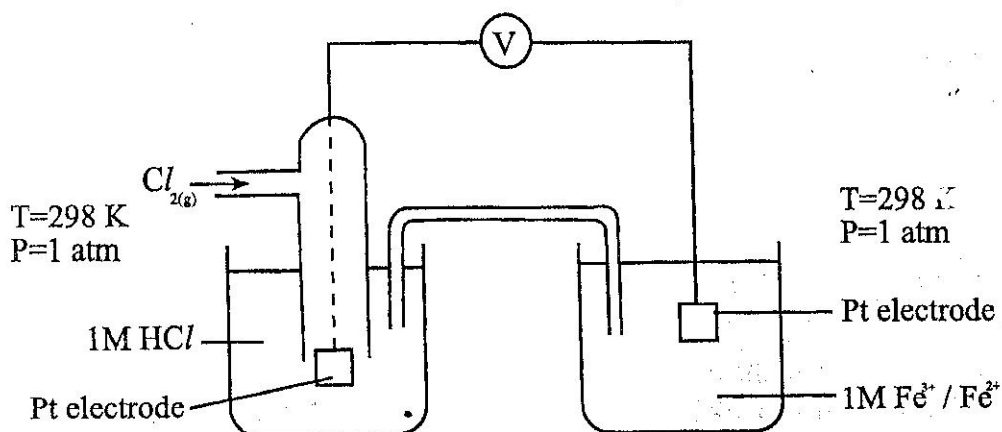
3 Ethanoic acid ionises according to the following equation:



What is the effect of adding sodium ethanoate to the system?

- A K_a remains constant
- B $[\text{CH}_3\text{COOH}]$ decreases
- C K_a increases
- D K_a decreases

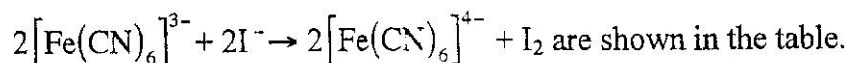
The diagram shows an electrochemical cell.



What is the direction of electron flow?

- A $\text{Fe}^{2+} \rightarrow \text{Cl}_2$
 B $\text{Fe}^{3+} \rightarrow \text{Cl}_2$
 C $\text{Cl}^- \rightarrow \text{Fe}^{2+}$
 D $\text{Cl}_2 \rightarrow \text{Fe}^{2+}$

5 Initial rates at 25 °C for various initial concentrations for the reaction



Rate $\text{mol dm}^{-3} \text{s}^{-1}$	$[\text{Fe}(\text{CN})_6]^{4-}$ mol/dm^3	$[\text{Fe}(\text{CN})_6]^{3-}$ mol/dm^3	$[\text{I}^-]$ mol/dm^3
1	1	1	1
4	1	2	1
1	2	1	1

What is the order of reaction with respect to, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Fe}(\text{CN})_6]^{3-}$ and I^- ?

	$[\text{Fe}(\text{CN})_6]^{4-}$	$[\text{Fe}(\text{CN})_6]^{3-}$	I^-
A	0	1	1
B	2	1	0
C	0	2	1
D	2	2	0

6 What is the pH of a buffer solution containing 0.1 M boric acid and 0.2 M borax?
 (K_a boric acid = $5.8 \times 10^{-10} \text{ mol dm}^{-3}$)

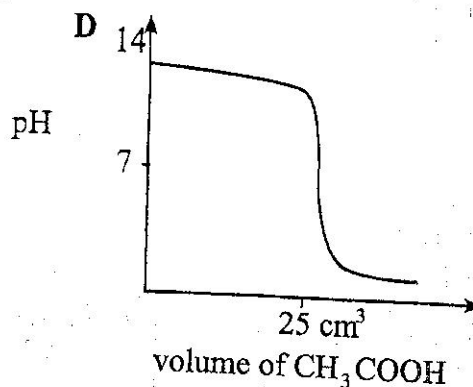
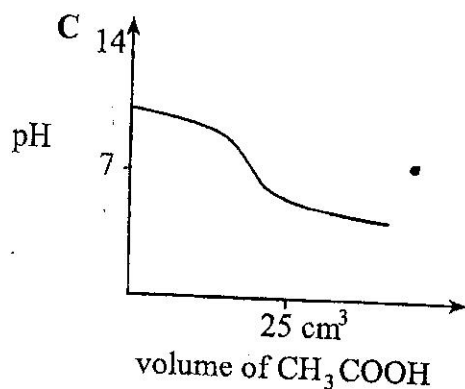
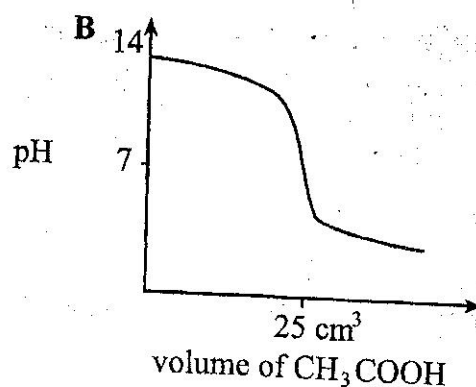
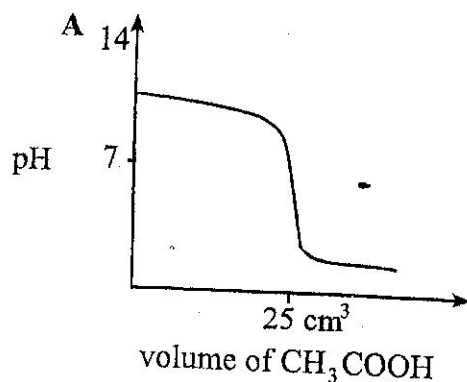
- A 9.5
 B 8.9
 C 7.9
 D 7.5

A silver ion solution is subjected to a current of 4 amperes for 1 hour 30 minutes.

How much silver is deposited on the cathode?

- A 0.40 g
- B 24.17 g
- C 39.71 g
- D 28 950 g

8 Which graph represents the pH change when 1 mol dm⁻³ ethanoic acid is added to 25 cm³ of 1 mol dm⁻³ sodium hydroxide?



9 A mass of 4.87 g of Na₂CO₃.nH₂O were dissolved in 250 cm³ of water. 25 cm³ of this solution required 34 cm³ of 0.1 M HCl for neutralisation.

The value of n is

- A 7.
- B 8.5.
- C 9.
- D 10.

Which electronic configuration shows the element which is isoelectronic with Fe^{3+} ?

- A $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$
- B $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$
- C $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^1$
- D $1s^2 2s^2 2p^6 3s^2 3p^6 4d^9 4s^2$

11 Which carbonate is most stable to heat?

- A barium carbonate
- B strontium carbonate
- C calcium carbonate
- D magnesium carbonate

12 Which statement is **not** true of typical transition elements?

- A all are weakly electropositive
- B may use penultimate shell for valency
- C all show variable valency
- D they form coloured compounds

13 Which is the correct trend for Group (II) metals?

- A Electrode potential increases down the group.
- B Reactivity with water decreases down the group.
- C First ionisation energy increases down the group.
- D Reactivity with oxygen increases down the group.

14 Which observations are correct when potassium chloride reacts with aqueous silver ions followed by aqueous ammonia?

- A off white precipitate, soluble in aqueous ammonia
- B white precipitate, soluble in aqueous ammonia
- C white precipitate, insoluble in aqueous ammonia
- D off white precipitate, insoluble in aqueous ammonia

15 Which is true about a catalyst?

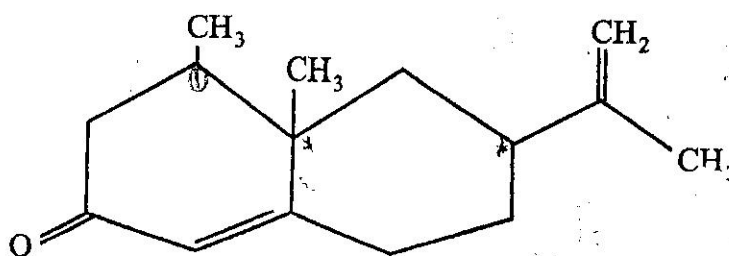
- A initiates the reaction
- B does not alter amounts of products formed
- C increases amounts of products formed
- D increases activation energy of existing path

16 The use of chlorofluorocarbons is being discouraged because they

- A are inert and cannot be broken down.
- B do not oxidise in the atmosphere.
- C decompose to produce chlorine atoms.
- D form oxides of chlorine.

- 17 The thermal stability of hydrogen halides depends on the
- A strength of Van der Waals forces.
 - B hydrogen bonding between molecules.
 - C lattice energy of the compound.
 - D bond dissociation enthalpy.
- 18 Which is true about Pb^{4+} ion?
- A reduces chlorine to chloride ions
 - B oxidises Sn^{4+}
 - C highly reducing
 - D oxidises chloride ions to chlorine
- 19 Which oxide is amphoteric
- A lead (II) oxide
 - B silicon (IV) oxide
 - C lead (IV) oxide
 - D tin (IV) oxide
- 20 Which compound can exhibit *cis-trans* isomerism?
- A $\text{C}_6\text{H}_5\text{CHCH}_2$
 - B $\text{C}_6\text{H}_5\text{CHCH}(\text{CH}_3)$
 - C $\text{CH}_3\text{CH}_2\text{CHC}(\text{CH}_3)\text{C}_6\text{H}_5$
 - D $\text{C}_6\text{H}_5\text{CHCH}(\text{CH}_2\text{CH}_2\text{CH}_3)$

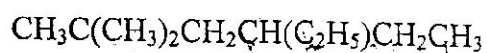
- 21 Nootkatone, a substance extracted from grapefruit oil has the following structure.



Nootkatone

How many chiral centres are in Nootkatone?

- A 5
 B 4
 C 3
 D 2
- 22 The IUPAC name of the following organic compound is

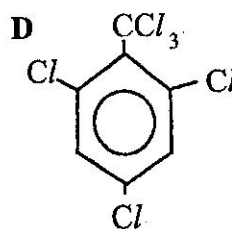
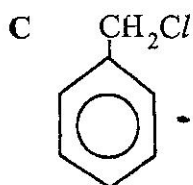
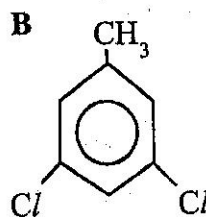
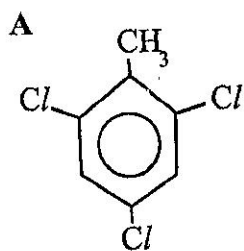


- A 2,2-dimethyl-4-ethylhexane
 B 4-ethyl-6,6-dimethylhexane
 C 2,2-dimethyl-4-propylhexane
 D 3-propyl-5,5-dimethylhexane
- 23 Which isomer has the highest boiling point?

- A $(\text{CH}_3)_3\text{CCH}_2\text{CH}_2\text{CH}_3$
 B $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$
 C $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
 D $\text{CH}_3\text{CH}_2\text{C}(\text{CH}_3)_2\text{CH}_2\text{CH}_3$

- 24 Dry chlorine is passed slowly into boiling methylbenzene which is irradiated with an ultraviolet light.

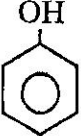



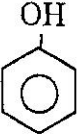

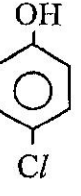

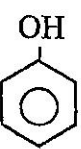


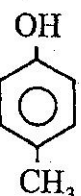
What is the structure of the main product?



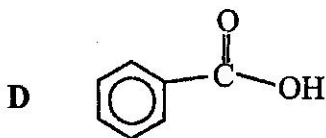
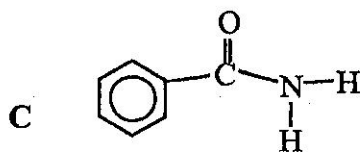
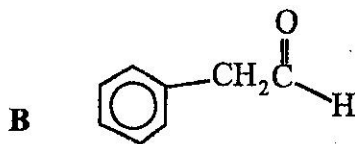
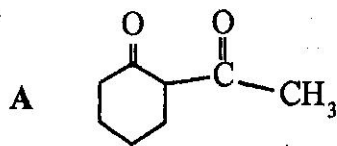
- 25 Which statement is true about amino acids?

- A They are neutral in aqueous solution.
- B In aqueous alkali, the zwitterion is cationic.
- C They are amphoteric.
- D In acidic media, the zwitterion is dipolar.

Which is the correct order of acidity of the three aromatic compounds?

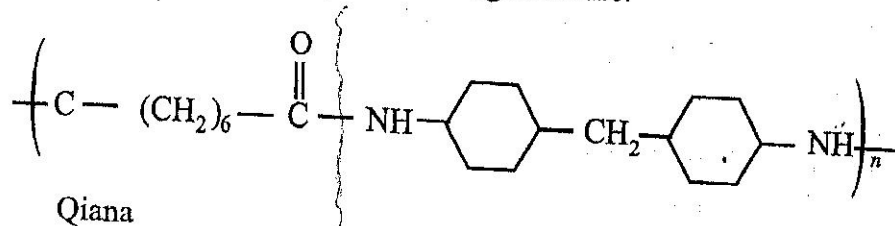
- least acidic** **most acidic**
- A**   
- B**   
- C**   
- D**   

27 Which compound reacts with 2,4-Dinitrophenylhydrazine, Fehlings solution and Tollen's reagent?

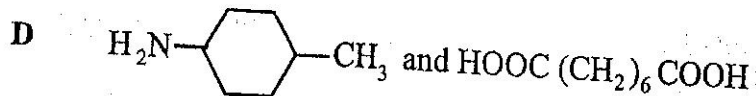
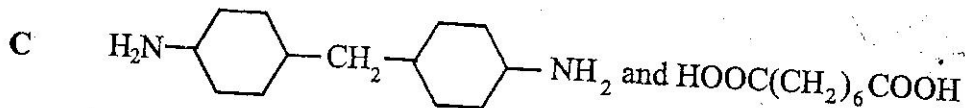
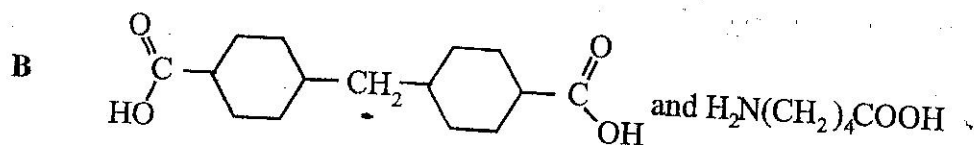
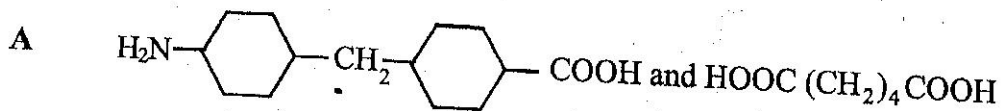


28

Qiana is a polyamide fibre with the following structure.



What are the monomer units used in its synthesis?



29 Ethanol was oxidised by an excess of hot acidified sodium dichromate (VI). The mixture was then distilled and aqueous sodium carbonate was added to the distillate.

The correct observations made were

- A a colourless distillate and gas bubbles.
- B a green distillate and gas bubbles.
- C a colourless distillate only.
- D a green distillate only.

30 Ethanoic acid boils at 118°C but its ethylester, ethyl-ethanoate, boils at 77°C .

Why is the boiling point of the acid higher though it has a lower molecular weight?

- A There are stronger Van der Waals forces in the acid.
- B There is hydrogen bonding in the acid.
- C There are weaker covalent bonds in the ester.
- D Esters are more volatile than acids.

Section B

For each of the questions in this section, one or more of the three numbered statements 1 to 3 may be correct.

Decide whether each of the statements is or is not correct. (You may find it helpful to put a tick against the statement(s) which you consider to be correct).

The responses A to D should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

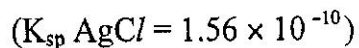
No other combination of statements is used as a correct response.

31 Which statement(s) represent(s) a sigma bond.

1. Overlap of two 1s orbitals from different atoms.
2. Overlap of 1s orbital and a 2p orbital of another atom.
3. Head-on overlap of two p orbitals from different atoms.

32 A volume of 500 cm³ of 0.002 M NaCl was added to 500 cm³ of 0.001 M AgNO₃.

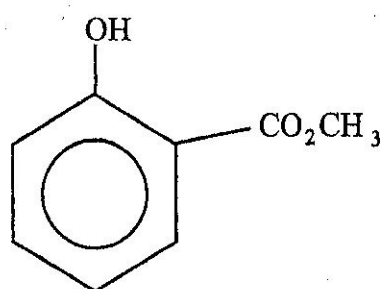
Which fact(s) is/are correct?



1. AgCl precipitates
2. $[\text{Ag}^+] = 0.001 \text{ M}$
3. $[\text{Ag}^+] \times [\text{Cl}^-] < K_{sp}$

- 33 Which molecule(s) has/have a pyramidal shape?
1. NH_3
 2. BF_3
 3. H_2O
- 34 The maximum oxidation state shown by a Group (VII) element is
1. equal to the valency electrons.
 2. the sum of s and p electrons.
 3. the same as group number.
- 35 Going down Group (IV),
1. basicity of elements increases.
 2. monoxides change from neutral to amphoteric.
 3. the stable oxidation state becomes +4.
- 36 In homogeneous catalysis
1. catalyst forms intermediate compound(s) which react(s) readily.
 2. catalysts are unchanged at the end of reaction.
 3. reactants adsorb onto the catalyst surface.
- 37 Which statement(s) is/are correct about the benzene molecule?
1. It is planar and symmetrical.
 2. Carbon Carbon bond angles are 120° .
 3. Carbon Carbon bond lengths are the same.
- 38 Which reagent(s) can be used to distinguish between ethanol and ethanoic acid?
1. alkaline aqueous iodine
 2. sodium hydrogen carbonate
 3. phosphorous pentachloride

39 Methylsalicylate is a compound with the following structure.

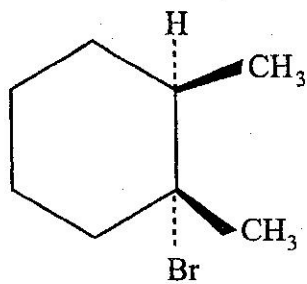


methylsalicylate

What type of reaction does it undergo?

1. nucleophilic substitution
2. hydrolysis
3. electrophilic substitution

40 Compound X is refluxed with ethanol to form Y.



Compound X

What structure(s) represent(s) Y?

