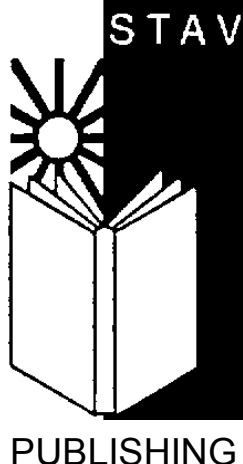


Student Name:



STAV ***Publishing*** **2002**

CHEMISTRY

Unit 1 Trial Examination

Total writing time: 1 hour 30 minutes

QUESTION AND ANSWER BOOK

Structure of book

<i>Section</i>	<i>Number of marks allocated</i>	<i>Style of questions</i>
A	20	Multiple choice
B	55	Written response

Directions to students

Materials

Question and answer book of 15 pages with a detachable Multiple Choice Answer Sheet inside the front cover and a detachable Data Sheet in the centre fold.

You should have at least one pencil and an eraser. An approved calculator may be used.

The task

Please ensure that you write your **name** in the space provided on the cover of this book and in the space provided on the Multiple Choice Answer Sheet.

This paper consists of two sections, Section A and Section B.

Answer **all** questions from Section A. Section A is worth 20 marks.

Section A questions should be answered in pencil on the Multiple Choice Answer Sheet provided.

Answer **all** questions from Section B. Section B is worth 55 marks.

Section B questions should be answered in ink or ball point pen in the spaces provided in this book.

There is a total of 75 marks available. Working space is provided throughout this book.

All written responses should be in English.

At the end of the task

Place the Multiple Choice Answer Sheet inside the front cover of this book.

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JUNE 2002

STAV Publishing

2002

CHEMISTRY

Unit 1 Trial Examination

MULTIPLE CHOICE ANSWER SHEET

STUDENT NAME:	
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INSTRUCTIONS:**USE PENCIL ONLY**

- Write your name in the space provided above.
- Use a **PENCIL** for **ALL** entries.
- If you make a mistake, **ERASE** it – **DO NOT** cross it out.
- Marks will **NOT** be deducted for incorrect answers.
- **NO MARK** will be given if more than **ONE** answer is completed for any question.
- Mark your answer by placing a **CROSS** through the letter of your choice.

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

SECTION A

Specific instructions for Section A

Section A consists of 20 multiple choice questions. Section A is worth approximately 27 per cent of the marks available. You should spend approximately 24 minutes on Section A.

Choose the response that is **correct** or **best answers the question**, and mark your choice on the multiple choice answer sheet according to the instructions on that sheet.

A correct answer is worth 1 mark, an incorrect answer is worth no marks. No mark will be given if more than one answer is shown for any question. Marks will **not** be deducted for incorrect answers. You should attempt every question.

Question 1

During the change from liquid to solid there is:

- A. a decrease in particle movement and a release of energy.
- B. a decrease in particle movement and an absorption of energy.
- C. an increase in particle movement and a release of energy.
- D. an increase in particle movement and an absorption of energy.

Question 2

The table lists information about two species, X and Y.

	Number of protons	Number of neutrons	Number of electrons
X	53	74	54
Y	55	72	54

Which **one** of the following statements is correct?

- A. X and Y represent the same atom.
- B. X is a positive ion represented by ${}^{127}_{53}\text{X}^{+}$.
- C. X and Y have the same mass number.
- D. X and Y are isotopes.

Question 3

An element towards the top right hand corner of the periodic table will tend to have:

- A. metallic character and a low electronegativity.
- B. metallic character and a high electronegativity.
- C. non-metallic character and a low electronegativity.
- D. non-metallic character and a high electronegativity.

Question 4 refers to the following information.

Element	Electron Configuration
R	2.8.8.2
S	2.8.4
T	2.4
U	2.2

Question 4

The element in Period 4 and Group II is:

- A. element R
- B. element S
- C. element T
- D. element U

Question 5

Metallic bonding may be best described as the electrostatic attraction of:

- A. positively charged metal ions and negatively charged non-metal ions.
- B. positively charged metal ions and negatively charged outershell electrons.
- C. positively charged nucleus and negatively charged outershell electrons.
- D. metallic atoms and non-metallic atoms.

Question 6

The atomic number of element X is 4 and that of element Y is 9. The formula of the ionic substance formed from X and Y is:

- A. XY
- B. XY₂
- C. X₂Y
- D. X₂Y₃

Questions 7 and 8 relate to the following table of data regarding certain *elements*.

Element	Melting point (°C)	Boiling point (°C)	Conduction when solid?
W	44	280	no
X	1083	2567	yes
Y	1410	2355	no
Z	114	184	no

Question 7

Which **one** of these elements is most likely to have a covalent network structure?

- A. W
- B. X
- C. Y
- D. Z

Question 8

Which **one** of these elements is likely to have delocalised electrons?

- A. W
- B. X
- C. Y
- D. Z

Question 9

Which **one** of the following occurs when crude oil is distilled?

- A. Covalent bonds break and form again.
- B. Covalent bonds break and dispersion forces form.
- C. Dispersion forces break and covalent bonds form.
- D. Dispersion forces break and form again.

Question 10

The third member of the **alkene** homologous series has the formula:

- A. C_3H_6
- B. C_3H_8
- C. C_4H_8
- D. C_4H_{10}

Question 11

What type of bonds are broken when ice melts?

- A. Ionic
- B. Intramolecular
- C. Hydrogen
- D. Non-polar covalent

Questions 12 and 13 refer to the following list of compounds.

I	CH_2CHCl
II	C_8H_{18}
III	CH_3F
IV	CH_3OH

Question 12

The substance(s) that contain(s) molecules that are attracted to each other by hydrogen bonds is (are):

- A. III.
- B. III and IV.
- C. II, III and IV.
- D. IV.

Question 13

The substance that relies on dispersion forces **alone** for attraction between its molecules is:

- A.** I.
- B.** II.
- C.** III.
- D.** IV.

Question 14

Which **one** of the following compounds consists of non-polar molecules?

- A. HBr
- B. CO₂
- C. H₂O
- D. CH₃Cl

Question 15

Some physical properties of four solvents are provided in the table below.

Name	Formula	Boiling Point (°C)
octane	C ₈ H ₁₈	126
2-pentanol	C ₅ H ₁₁ OH	120
water	H ₂ O	100
trichloromethane	CHCl ₃	62

From the data provided, it may be concluded that the attractive forces between the molecules of the solvent are strongest in:

- A. octane
- B. 2-pentanol
- C. water
- D. trichloromethane

Question 16

Oleic acid is the main constituent of peanut oil. It is used in the manufacture of margarine. Like most fatty acids it is insoluble in water but readily dissolves in non-polar solvents such as hexane.

The semi-structural formula for oleic acid in which the hydrophilic part of the molecule is underlined is:

- A. CH₃(CH₂)₇CH=CH(CH₂)₇COOH
- B. CH₃(CH₂)₇CH=CH(CH₂)₇COOH
- C. CH₃(CH₂)₇CH=CH(CH₂)₇COOH
- D. CH₃(CH₂)₇CH=CH(CH₂)₇COOH

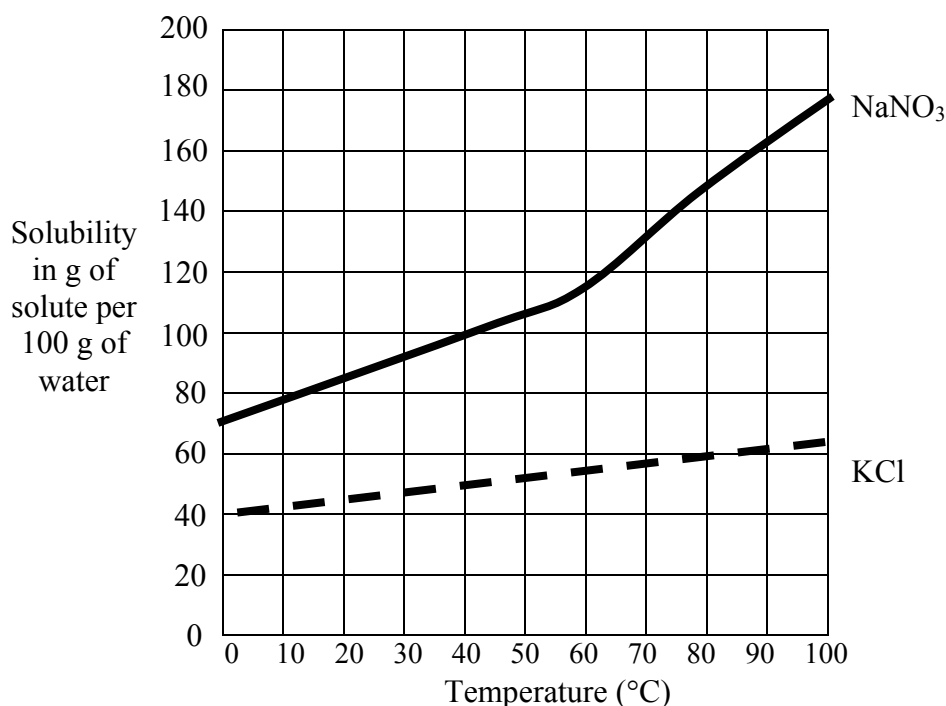
Question 17

Which **one** of the following molecules is **unable** to form an addition polymer?

- A. CH_2CHCl
- B. HOCHCHOH
- C. CH_2ClCH_3
- D. CH_2CHCH_3

Questions 18 and 19 refer to the following information.

The graph shows the solubility curves for two salts, sodium nitrate (NaNO_3) and potassium chloride (KCl).

**Question 18**

The temperature required to dissolve 100 g of sodium nitrate in 100 g of water is:

- A. 80 $^{\circ}\text{C}$
- B. 60 $^{\circ}\text{C}$
- C. 40 $^{\circ}\text{C}$
- D. 20 $^{\circ}\text{C}$

Question 19

An estimate of the extra mass of potassium chloride that could be dissolved in 50 g of water at 50 $^{\circ}\text{C}$, if 5.0 g of the compound has already been dissolved is:

- A. 50 g

B. 40 g

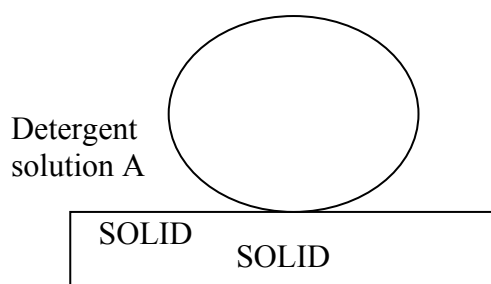
C. 20 g

D. 10 g

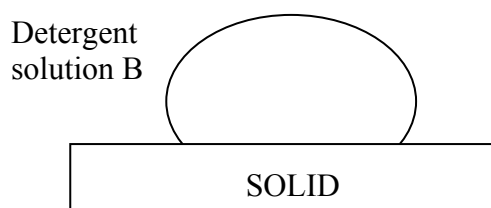
Question 20

Some students conducted an experiment to determine which of four commercial detergents A, B, C or D is the least effective. They placed a drop of each detergent solution onto identical greasy surfaces. They drew the following diagrams labelled A to D to record their observations. Select the diagram that shows the **least** effective detergent.

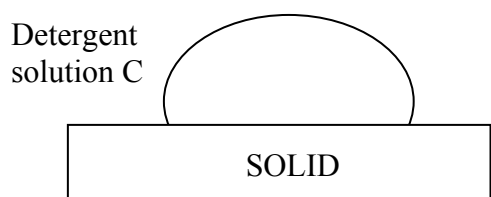
A.



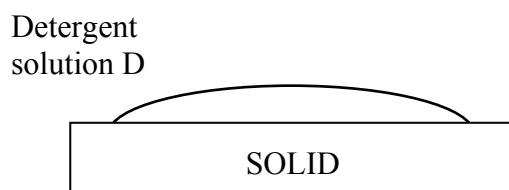
B.



C.



D.



END OF SECTION A**SECTION B****Specific instructions for Section B**

Section B consists of nine short answer questions numbered 1 to 9; you must answer all of these questions. This section is worth 55 marks which is approximately 73 per cent of the total. You should spend approximately 66 minutes on this section.

The marks allotted to each question and the suggested times are shown at the end of each question.

Questions must be answered in the spaces provided in this book.

To obtain full marks for your response you should

- give simplified answers with an appropriate number of significant figures for all numerical questions; unsimplified answers will not be given full marks.
- show all working in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.
- make sure all chemical equations are balanced and that the formulas for individual substances include an indication of state (for example, $\text{H}_2(\text{g})$; $\text{NaCl}(\text{s})$).

Question 1

The following table lists statements (labelled A to F) that could be used to describe different substances.

A	Conducts electricity
B	Very soluble in water
C	Exhibits covalent bonding
D	Network lattice structure
E	Exhibits hydrogen bonding
F	Dispersion forces exist

- a) Identify the statement(s) which are **most** applicable to diamond.

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- b) Identify the statement(s) that can be applied to an ammonia molecule but not a methane molecule.

--	--	--	--	--	--

- c) Identify the statement(s) that are **most** applicable to samples of the gases hydrogen and carbon dioxide.

--	--	--	--	--	--

2 + 2 + 2 = 6 marks
(Suggested time: 7 minutes)

Question 2

- a) Draw the valence structure (structural formula) for each of the following molecules and in each case name the shape of the molecule.

Molecule	Valence Structure	Shape
NH ₃		
CO ₂		
SiH ₄		
OF ₂		

- b) In each case, state whether the molecule is polar or non-polar and briefly justify your choice.

NH₃ _____

CO₂ _____

SiH₄ _____

OF₂ _____

8 + 4 = 12 marks
(Suggested time: 14 minutes)

Question 3

Write balanced chemical equations for each of the following.

- a) Liquid octane burns in a plentiful supply of air to form carbon dioxide gas and water vapour.

- b) Magnesium burns in air to produce magnesium oxide.

- c) Aqueous solutions of $\text{Ba}(\text{NO}_3)_2$ and Na_2SO_4 react to form a precipitate.

2 + 2 + 2 = 6 marks
(Suggested time: 7 minutes)

Question 4

Potassium chloride may be used as a substitute for table salt.

- a) Write a balanced chemical equation for the dissociation of potassium chloride in water.

- b) Draw a diagram to show the arrangement of water molecules around the cations in an aqueous solution of potassium chloride.

- c) Name the bonds that form between the water molecules and the ions.

1 + 2 + 1 = 4 marks
(Suggested time: 5 minutes)

Question 5

A teenager worried about acne and minor skin infections wished to purchase a medicated antiseptic skin wash. Two recommended brands of face wash contained the same active ingredient, triclosan. Unsure of which product to purchase, the teenager decided to buy the product that gave more active ingredient for the lowest price. The table below provides information about the two products.

Brand Name	Concentration of active ingredient (triclosan)		Volume of container (mL)	Cost of product
	% m/v	mg mL ⁻¹		
pHexzone	1.00	10.0	185	\$7.13
Removderm	0.50	5.0	250	\$6.32

a) What mass, in gram, of triclosan is contained in the:

(i) pHexzone product?

(ii) Removderm product?

b) Determine the product the teenager should have purchased. Explain your reasoning.

2 + 2 = 4 marks
(Suggested time: 5 minutes)

Question 6

The molecular formula $C_4H_{10}O$ has several possible structural isomers.

- a) Give a definition of the term **isomers**.

- b) (i) In the two boxes below, write the semi-structural formula for **two** “straight” chain compounds with the molecular formula $C_4H_{10}O$ which also contain the hydroxyl functional group.

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- (ii) Give a specific name for each of the molecules you have indicated in (i).

- c) In which homologous series do the molecules referred to in b) above, belong?

1 + 4 + 1 = 6 marks
(Suggested time: 7 minutes)

Question 7

Name the following organic compounds.

- a) $CH_3CH_2CH_2CH_2CH_3$

- b) CH_3CH_2COOH

- c) C_3H_6

- d) $CH_3CH_2CH_2CHClCH_3$

4 marks
(Suggested time: 5 minutes)

Question 8

This question is concerned with the important industrial chemical ethene.

- a) Give the molecular formula of ethene.

- b) Give two physical properties of ethene.

- c) Ethene is an example of an unsaturated hydrocarbon. What is meant by the term “unsaturated”?

- d) Draw a structural formula for ethene.

- e) Ethene polymerises to form polyethene.

- (i) What type of polymerisation forms polyethene from ethene?

- (ii) Draw the structure of a section of polyethene.

- f) There are two main forms of polyethene, HDPE (high density polyethene) and LDPE (low density polyethene). Which of these two types of polymer would have the higher melting point? Explain your answer.

1 + 1 + 1 + 1 + 2 + 2 = 8 marks

(Suggested time: 10 minutes)

Question 9

Ice-cream and margarine can both be classified as emulsions.

- a) Explain what is meant by the term “emulsion”.

- b) Ice-cream is a different type of emulsion to margarine. Explain this difference.

- c) Emulsions such as ice cream and margarine normally require an emulsifier to stabilise them. What are the chemical characteristics needed for a substance to act as an emulsifier?

1 + 2 + 2 = 5 marks
(Suggested time: 6 minutes)

END OF QUESTION AND ANSWER BOOKLET