CSE CENTRE FOR STRATEGIC EDUCATION
Leading educational thinking and practice

IARTV

STUDENT:	TEACHER:

CSE TEST – MAY 2008

YEAR 12 CHEMISTRY

Written examination 1

Reading time: 15 minutes
Writing time: 1 hour 30 minutes

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	20	20	20
B	8	8	50
			Total 70

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied

- Question and answer book of 12 pages.
- Data book
- Answer sheet for multiple-choice questions.

Instructions

- Write your **name** and that of your teacher in the space provided above on this page AND on the answer sheet for multiple-choice questions.
- All written responses must be in English

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple choice questions

Instructions for Section A

Answer all questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is correct or that best answers the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will not be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

When 5.65 g of pure magnesium carbonate is reacted with excess dilute hydrochloric acid, the volume of dry carbon dioxide gas produced at 101.3 kPa and 25.0°C is

A. 1.50 L

B. 1.64 L

C. 3.28 L

D. 138 L

Question 2

The mass of one molecule of decane is

A. 8.55×10^{25} g

B. 1.42×10^{-23} g

C. 2.36×10^{-22} g

D. 142 g

Question 3

A sample of commercial ammonia has a label claim of 5.0% w/v concentration of NH_4OH. This concentration could **not** be expressed as

A. 1.4 mol L^{-1}

B. 5.0×10^4 mg L^{-1}

C. 50 g L^{-1}

D. 5.0×10^3 □g mL^{-1}

Question 4

An organic compound consisting only of carbon and bromine contains 7% carbon by mass. A possible molecular formula is

A. CBr_2

B. CBr_4

C. C_2Br_2

D. C_2Br_4

Question 5

10.0 mL of 0.100 mol L^{-1} NaOH solution is diluted by addition of 990 mL of distilled water. The resulting pH is

A. 1

B. 3

C. 11

D. 13

Question 6

The bromate ion BrO_3^- is a strong oxidant. If bromine forms as a result of a reaction with a reductant, the half-equation for the reduction is

A. $2BrO_3^-(aq) + 12H^+(aq) + 10e^- \rightarrow Br_2(aq) + 6H_2O(l)$

B. $2BrO_3^-(aq) + 12H^+(aq) \rightarrow 2Br^-(aq) + 6H_2O(l) + 10e^-$

C. $BrO_3^-(aq) + 6H^+(aq) + 6e^- \rightarrow Br_2(aq) + 3H_2O(l)$

D. $BrO_3^-(aq) + 6H^+(aq) + 5e^- \rightarrow Br_2(aq) + 3H_2O(l)$

Question 7

The reaction between 2-chloropropane and sodium hydroxide solution can be classified as

A. addition.

B. substitution.

C. neutralisation.

D. condensation.

Question 8

How many possible structural isomers are there for the molecule C_3H_6FCl?

A. 2

B. 3

C. 4

D. 5

Question 9

In chromatography a particular component is adsorbed onto the stationary phase very strongly. This means that the component will have a

A. high R_f value and a low R_t value.

B. high R_f value and a high R_t value.

C. low R_f value and a high R_t value.

D. low R_f value and a low R_t value.

Question 10

There are a number of chromatographic techniques available to the analytical chemist. Caffeine, $C_8H_{10}N_4O_2$, is an additive in some sports drinks. The best instrumental analysis to measure the caffeine content is

A. paper chromatography.

B. thin layer chromatography.

C. gas chromatography.

D. high performance liquid chromatography.

Question 11

A particular polysaccharide consists of 20 glucose monomers. The molar mass of the polysaccharide will be

A. 180 g

B. 3240 g

C. 3258 g

D. 3600 g

Question 12

If the ester propyl butanoate is hydrolysed using a catalyst, the products are

A. $C_4H_9COOH + C_3H_7OH$

B. $C_3H_7COOH + C_3H_7OH$

C. $C_3H_7COOH + C_4H_9OH$

D. $C_2H_5COOH + C_4H_9OH$

Question 13

The formation of a polysaccharide from a monosaccharide involves an enzyme-catalysed

A. condensation reaction.

B. hydrogenation.

C. redox reaction.

D. hydrolysis reaction.

Question 14

Myristic acid is a fatty acid. It can be described as

A. polar and saturated.

B. polar and unsaturated.

C. non-polar and saturated.

D. non-polar and unsaturated.

Question 15

Two pure solutions of ethanol and ethanoic acid have lost their labels. The most appropriate instrumental analysis to use to distinguish and determine the concentrations of the organic molecules is

A. GC.

B. ^{1}H NMR spectroscopy.

C. IR spectroscopy.

D. AAS.

Question 16

Which of the following instrumental techniques does **not** use an applied magnetic field?

A. ^{1}H NMR

B. ^{13}C NMR

C. Mass spectrometry

D. AAS

Question 17

Which of the following instrumental techniques is **not** associated with the properties of isotopes of an element?

A. ^{1}H NMR

B. ^{13}C NMR

C. Mass spectrometry

D. Infrared spectroscopy

Question 18

Infrared spectroscopy is based on the fact that

A. the nuclei of different atoms are affected by the nuclei of adjoining atoms.

B. the bonds between atoms in molecules absorb different wavelengths of energy.

C. the bonds between different atoms in a molecule emit different wavelengths of light when excited.

D. the bonds between different hydrogen atoms in a molecule absorb differing wavelengths of light.

Question 19

The number of phosphate groups in a DNA sample

A. equals the number of purine bases.

B. equals the number of nitrogenous bases.

C. is twice the number of nitrogenous bases.

D. is twice the number of pentose sugar molecules.

Question 20

When comparing two fragments of DNA, fragment A has a higher melting point than fragment B. This is because fragment A has a higher percentage of

A. GC base pairs.

B. AT base pairs.

C. phosphate units.

D. pentose units.

END OF SECTION A

SECTION B – Short answer questions

Instructions for Section B

Answer **all** questions in the spaces provided.

To obtain full marks for your responses you should

- give simplified answers with an appropriate number of significant figures to 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 chemical equations are balanced and that the formulas for individual substances include an indication of state; for example, $H_2(g)$; NaCl(s)

Question 1

A sample of pure aluminium metal is completely dissolved in 20.00 mL of 1.15 mol L^{-1} hydrochloric acid. The excess acid is titrated with 0.0993 mol L^{-1} sodium hydroxide solution, requiring 15.55 mL for neutralisation. States and significant figures are required in the solving of this problem.

a. Write a balanced full equation for the dissolving of the aluminium in the hydrochloric acid solution.

1 mark

b. Calculate the amount, in mol, of the hydrochloric acid used to dissolve the aluminium metal.

1 mark

c. Calculate the amount, in mol, of sodium hydroxide solution that reacted with the hydrochloric acid.

1 mark

d. Calculate the amount, in mol, of hydrochloric acid solution that reacted with the aluminium metal.

1 mark

e. Calculate the mass of the original aluminium sample.

2 marks

Total 6 marks

Question 2

In a titration to find the concentration of ethanoic acid in vinegar, dilute sodium hydroxide solution is to be standardised and then titrated against samples of the vinegar.

Five acid-base indicators are available for use:

bromophenol blue
bromothymol blue
methyl red
phenol red
thymol blue

a. The standardisation of the sodium hydroxide solution is to be completed using potassium hydrogen phthalate, a weak acid. Explain briefly which indicator is the most suitable for the standardisation of the sodium hydroxide solution.

2 marks

b. Explain briefly which indicator would be the most suitable for the titration of the vinegar.

1 mark

c. Sodium hydroxide can be suitable for preparing a standard solution but is not recommended as a primary standard. Why is this?

2 marks

Total 5 marks

Question 3

a. Draw the structure of proline as it exists at pH 2.

1 mark

b. Explain what is meant by the tertiary structure of a protein.

2 marks

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YEAR 12 CHEMISTRY

Written test 1

DATA Book

Directions to students

This databook is for your reference.
Any writing, notes, drawings or jottings you make on this data book will **not** be considered in the marking.
You may keep this data book.

Periodic table of the elements

1 **H** 1.0 Hydrogen																	2 **He** 4.0
3 **Li** 6.9	4 **Be** 9.0											5 **B** 10.8	6 **C** 12.0	7 **N** 14.0	8 **O** 16.0	9 **F** 19.0	10 **Ne** 20.2
11 **Na** 23.0	12 **Mg** 24.3											13 **Al** 27.0	14 **Si** 28.1	15 **P** 31.0	16 **S** 32.1	17 **Cl** 35.5	18 **Ar** 39.9
19 **K** 39.1	20 **Ca** 40.1	21 **Sc** 44.9	22 **Ti** 47.9	23 **V** 50.9	24 **Cr** 52.0	25 **Mn** 54.9	26 **Fe** 55.9	27 **Co** 58.9	28 **Ni** 58.7	29 **Cu** 63.6	30 **Zn** 65.4	31 **Ga** 69.7	32 **Ge** 72.6	33 **As** 74.9	34 **Se** 79.0	35 **Br** 79.9	36 **Kr** 83.8
37 **Rb** 85.5	38 **Sr** 87.6	39 **Y** 88.9	40 **Zr** 91.2	41 **Nb** 92.9	42 **Mo** 95.9	43 **Tc** 98.1	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 **La** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.8	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 197.0	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89 **Ac** (227)	104 **Rf** (261)	105 **Db** (262)	106 **SgB** (263)	107 **Bh** (264)	108 **Hs** (265)	109 **Mt** (268)	110 **Ds** (271)	111 **Rg** (272	112 **Uub**	113	114 **Uuq**	115	116 **Uuh**	117	118 **Uuo**

58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (145)	62 **Sm** 150.3	63 **Eu** 152.0	64 **Gd** 157.2	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0	

90 **Th** 232.0	91 **Pa** 231.0	92 **U** 238.0	93 **Np** 237.1	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (254)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)	

The electrochemical series

	$E^{\ominus}$ in volt
$F_2(g) + 2e^- \rightleftharpoons 2F^-(aq)$	+2.87
$H_2O_2(aq) + 2H^+(aq) + 2e^- \rightleftharpoons 2H_2O(l)$	+1.77
$Au^+(aq) + e^- \rightleftharpoons Au(s)$	+1.68
$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightleftharpoons Mn^{2+}(aq) + 4H_2O(l)$	+1.50
$Cl_2(g) + 2e^- \rightleftharpoons 2Cl^-(aq)$	+1.36
$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6e^- \rightleftharpoons 2Cr^{3+}(aq) + 7H_2O(l)$	+1.33
$O_2(g) + 4H^+(aq) + 4e^- \rightleftharpoons 2H_2O(l)$	+1.23
$Br_2(g) + 2e^- \rightleftharpoons 2Br^-(aq)$	+1.09
$NO_3^-(aq) + 4H^+(aq) + 3e^- \rightleftharpoons NO(g) + 2H_2O(l)$	+0.96
$Ag^+(aq) + e^- \rightleftharpoons Ag(s)$	+0.80
$Fe^{3+}(aq) + e^- \rightleftharpoons Fe^{2+}(aq)$	+0.77
$O_2(g) + 2H^+(aq) + 2e^- \rightleftharpoons H_2O_2(l)$	+0.68
$I_2(s) + 2e^- \rightleftharpoons 2I^-(aq)$	+0.54
$O_2(g) + 2H_2O(l) + 4e^- \rightleftharpoons 4OH^-$	+0.40
$Cu^{2+}(aq) + 2e^- \rightleftharpoons Cu(s)$	+0.34
$Sn^{4+}(aq) + 2e^- \rightleftharpoons Sn^{2+}(aq)$	+0.15
$S(s) + 2H^+(aq) + 2e^- \rightleftharpoons H_2S(g)$	+0.14
$2H^+(aq) + 2e^- \rightleftharpoons H_2(g)$	0.00
$Pb^{2+}(aq) + 2e^- \rightleftharpoons Pb(s)$	-0.13
$Sn^{2+}(aq) + 2e^- \rightleftharpoons Sn(s)$	-0.14
$Ni^{2+}(aq) + 2e^- \rightleftharpoons Ni(s)$	-0.23
$Co^{2+}(aq) + 2e^- \rightleftharpoons Co(s)$	-0.28
$Cd^{2+}(aq) + 2e^- \rightleftharpoons Cd(s)$	-0.40
$Fe^{2+}(aq) + 2e^- \rightleftharpoons Fe(s)$	-0.44
$Cr^{3+}(aq) + 3e^- \rightleftharpoons Cr(s)$	-0.71
$Zn^{2+}(aq) + 2e^- \rightleftharpoons Zn(s)$	-0.76
$2H_2O(l) + 2e^- \rightleftharpoons H_2(g) + 2OH^-(aq)$	-0.83
$Mn^{2+}(aq) + 2e^- \rightleftharpoons Mn(s)$	-1.03
$Al^{3+}(aq) + 3e^- \rightleftharpoons Al(s)$	-1.67
$Mg^{2+}(aq) + 2e^- \rightleftharpoons Mg(s)$	-2.34
$Na^+(aq) + e^- \rightleftharpoons Na(s)$	-2.71
$Ca^{2+}(aq) + 2e^- \rightleftharpoons Ca(s)$	-2.87
$K^+(aq) + e^- \rightleftharpoons K(s)$	-2.93
$Li^+(aq) + e^- \rightleftharpoons Li(s)$	-3.02

Physical constants

1 atm = 101 325 Pa = 760 mmHg

0°C = 273 K

Avogadro's constant (Na = 6.02 × 10^{-23} mol^{-1}

Charge on one electron = 1.60 × 10^{-19} C

Faraday constant (F) = 96 500 C mol^{-1}

Ionic product for water (K_w) = 1.00 × $10^{-14}$$mol^2$ L^{-2} at 298 K (Self ionisation constant)

Gas constant (R) = 8.31 J K^{-1} mol^{-1}

Molar volume (V_m) of an ideal gas at 273 K, 101.3 kPa (STP) = 22.4 L mol^{-1}

Molar volume (V_m) of an ideal gas at 298 K, 101.3 kPa (SLC) = 24.5 L mol^{-1}

Specific heat capacity (c) of water = 4.18 J g^{-1} K^{-1}

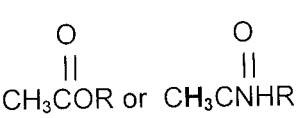
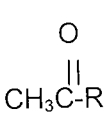
Density (d) of water at 25°C = 1.00 g mL^{-1}

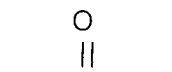
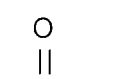
SI prefixes, their symbols and values

SI prefix	Symbol	Value
giga	G	10^9
mega	M	10^6
kilo	k	10^3
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

^{1}H NMR data

Typical proton shift values relative to Tetramethylsilane = 0
These can differ slightly in different solvents. Where more than one proton environment is shown in the formula, the shift refers to the ones in bold letters.

Type of proton	Chemical shift (ppm)
R-CH_3	0.9
R-CH_2-R	1.3
R-CH = CH-$C\mathbf{H_3}$	1.7
R_3-CH	2.0
	2.0
	2.1
R-CH_2-X (X = halogen)	3-4
R-$C\mathbf{H_2}$-OH	3.6

	3.2
$R\text{-}O\text{-}CH_3$ or $R\text{-}O\text{-}CH_2\text{-}R$	3.3
$C_6H_5\text{-}O\text{-}CO\text{-}CH_3$	4.1
	4.1
R-O-H	1-6 (varies considerably under different conditions)
$R\text{-}NH_2$	1-5
$RCH{=}C\mathbf{H_2}$	4.6-6.0
$C_6H_5\text{-}O\text{-}\mathbf{H}$	7.0
$C_6H_5\text{-}H$	7.3
	8.1
	9-10
	11.5

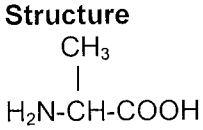
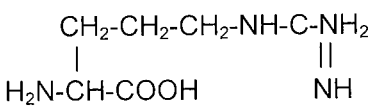
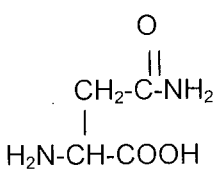
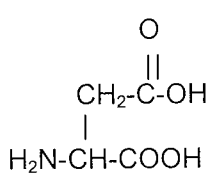
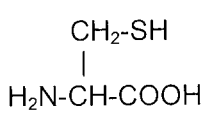
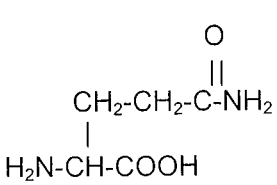
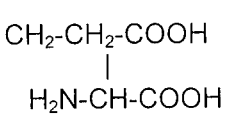
^{13}C NMR data

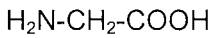
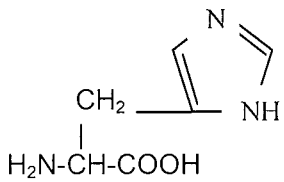
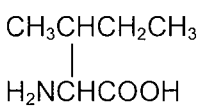
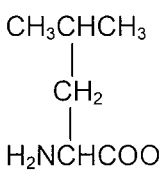
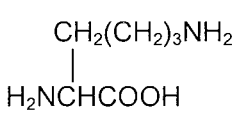
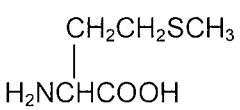
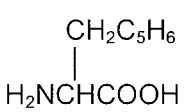
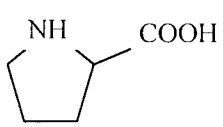
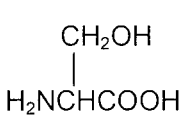
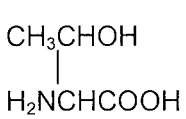
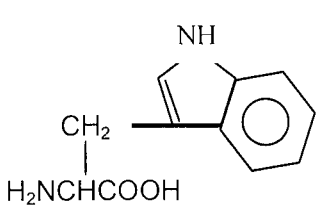
Type of carbon	**Chemical shift (ppm)**
$R\text{-}CH_3$	8-25
$R\text{-}CH_2\text{-}R$	20-45
$R_3\text{-}CH$	40-60
$R_4\text{-}C$	36-45
$R\text{-}CH_2\text{-}X$	15-80
$R\text{-}C\text{-}NH_2$	35-70
$R\text{-}CH_2\text{-}OH$	50-90
$RC{\equiv}CR$	75-95
$RC{=}CR$	110-150
RCOOH	160-185

Infrared absorption data
Characteristic range for infrared absorption

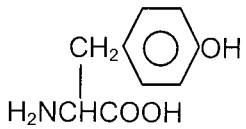
Bond	Wave number (cm^{-1})
C-Cl	700-800
C-C	750-1100
C-O	1000-1300
C=C	1610-1680
C=O	1670-1750
O-H (acids)	2500-3300
C-H	2850-3300
O-H (alcohols)	3200-3550
N-H (primary amines)	3350-3500

2-amino acids (α-amino acids)

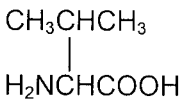
Name	Symbol	Structure
alanine	Ala	
arginine	Arg	
asparagine	Asn	
aspartic acid	Asp	
cysteine	Cys	
glutamine	Gln	
glutamic acid	Gln	

glycine	Gly	
histidine	His	
isoleucine	Ile	
leucine	Leu	
lysine	Lys	
methionine	Met	
phenylalanine	Phe	
proline	Pro	
serine	Ser	
threonine	Thr	
tryptophan	Trp	

tyrosine Tyr



valine Val

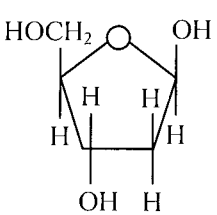


Common Fatty Acids

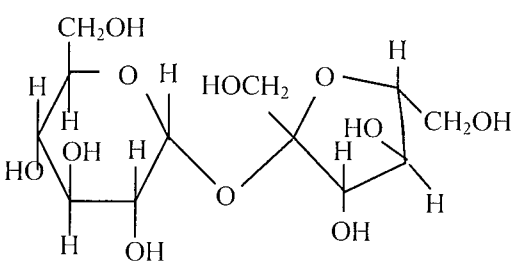
Name	Formula	Name	Formula
Lauric	$C_{11}H_{23}COOH$	Oleic	$C_{17}H_{33}COOH$
Myristic	$C_{13}H_{27}COOH$	Linoleic	$C_{17}H_{31}COOH$
Palmitic	$C_{15}H_{31}COOH$	Linolenic	$C_{17}H_{29}COOH$
Palmitoleic	$C_{15}H_{29}COOH$	Arachidic	$C_{19}H_{39}COOH$
Stearic	$C_{17}H_{35}COOH$	Arachidonic	$C_{19}H_{31}COOH$

Common Structural Formulae

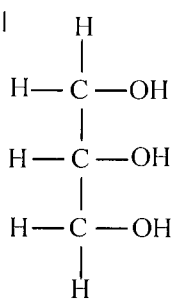
deoxyribose

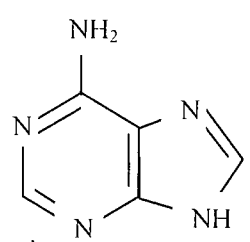


sucrose

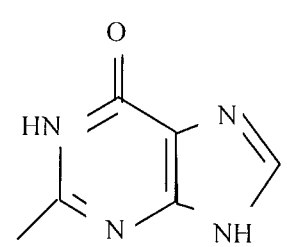


glycerol

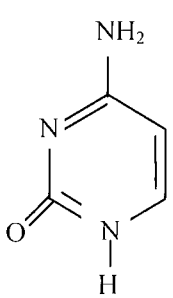




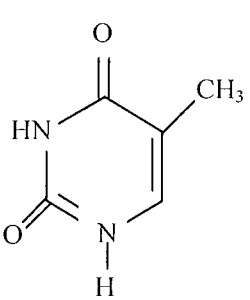
adenine



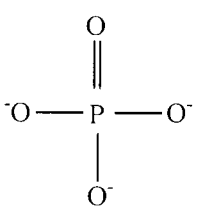
guanine



cytosine



thymine



phosphate

Acid-base indicators

Name	pH range	Acid	Base	Ka
thymol blue	1.2-2.8	red	yellow	2×10^{-2}
methyl orange	3.1-4.4	red	yellow	2×10^{-4}
bromophenol blue	3.0-4.6	yellow	blue	6×10^{-5}
methyl red	4.2-6.3	red	yellow	8×10^{-6}
bromothymol blue	6.0-7.6	yellow	blue	1×10^{-7}
phenol red	6.8-8.4	yellow	red	1×10^{-8}
phenolphthalein	8.3-10.0	colourless	red	5×10^{-10}

Acidity constants,

K_a

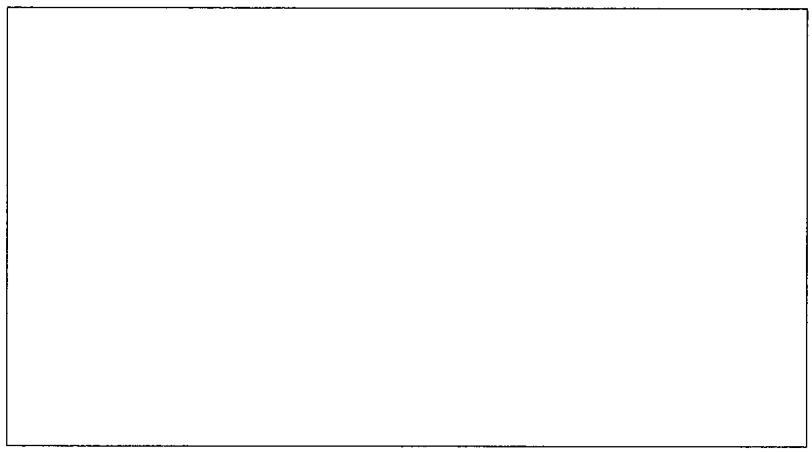
Name	Formula	K_a
ammonium ion	NH_4^+	5.6×10^{-10}
benzoic	C_6H_5COOH	6.4×10^{-5}
boric	H_3BO_3	5.8×10^{-10}
ethanoic	CH_3COOH	1.7×10^{-5}
hydrocyanic	HCN	6.3×10^{-10}
hydrofluoric	HF	7.6×10^{-4}
hypobromous	HOBr	2.4×10^{-9}
hypochlorous	HOCl	2.9×10^{-8}
lactic	$CH_3CH(OH)COOH$	1.4×10^{-4}
methanoic	HCOOH	1.8×10^{-4}
nitrous	HNO_2	7.2×10^{-4}
propanoic	CH_3CH_2COOH	1.3×10^{-5}

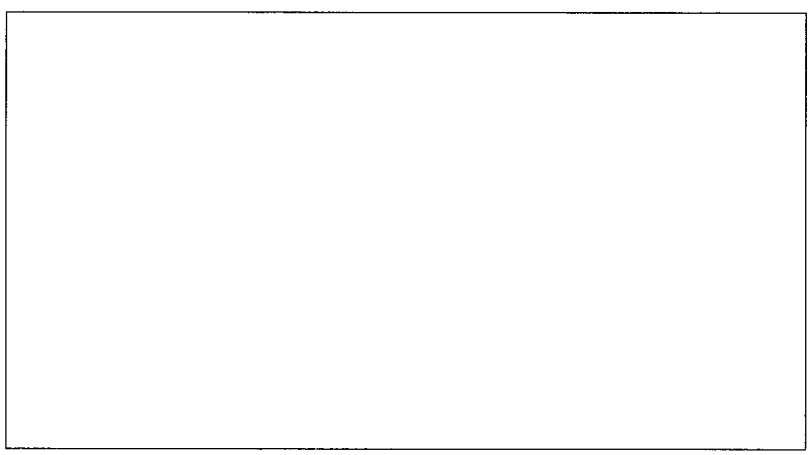
Molar enthalpy of combustion of common fuels at STP.

Substance	Formula	State	ΔH_c (kJ mol^{-1})
hydrogen	H_2	g	-286
carbon (graphite)	C	s	-394
methane	CH_4	g	-889
ethane	C_2H_6	g	-1557
propane	C_3H_8	g	-2217
butane	C_4H_{10}	g	-2874
pentane	C_5H_{12}	l	-3509
hexane	C_6H_{14}	l	-4158
octane	C_8H_{18}	l	-5464
ethene	C_2H_4	g	-1409
methanol	CH_3OH	l	-725
ethanol	C_2H_5OH	l	-1364
propan-1-ol	$CH_3CH_2CH_2OH$	l	-2016
propan-2-ol	$CH_3CHOHCH_3$	l	-2003
glucose	$C_6H_{12}O_6$	s	-2816

END OF DATA BOOK

c. Glycine and methionine can form two different dipeptides. Draw the two dipeptide structures in the boxes below.





2 marks

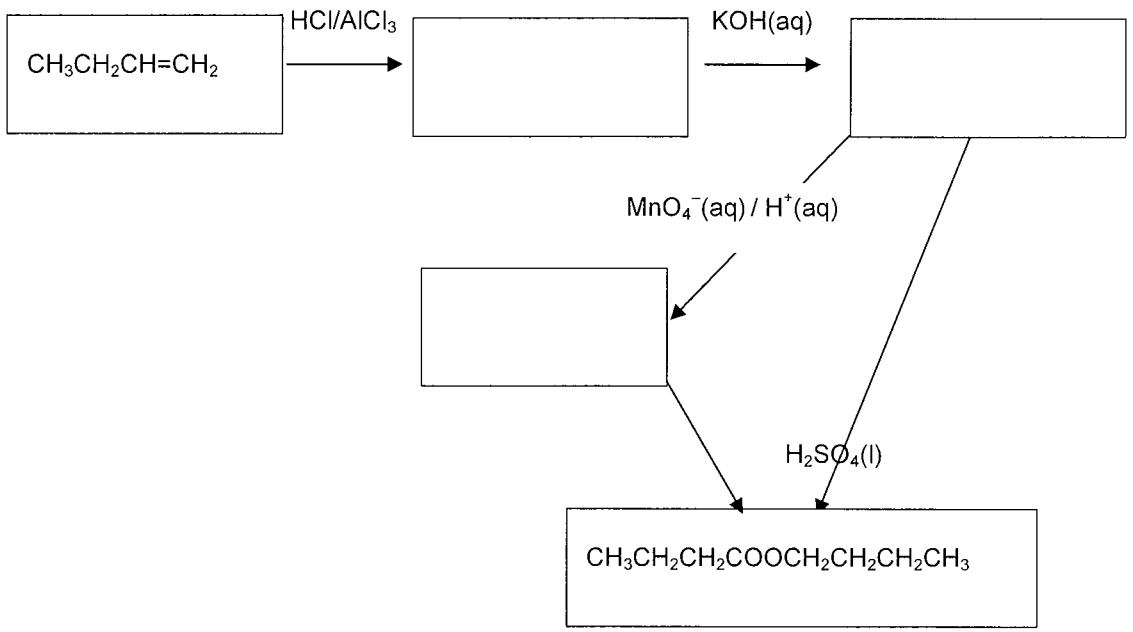
d. Explain why polypeptides containing cysteine are capable of forming more stable tertiary structures than polypeptides containing glycine?

1 mark

Total 6 marks

Question 4

a. Complete the flowchart below for the formation of butyl butanoate by writing the appropriate semi-structural formulas in the boxes.



3 marks

b. Referring to the flow chart above, complete the following table

Reagent	Type of chemical reaction
$HCl/AlCl_3$	
$MnO_4^-(aq) / H^+(aq)$	
$H_2SO_4(l)$	

3 marks

c. Another isomer could be formed in the first step of the reaction between but-1-ene and the HCl. Draw the structural formula of this isomer.

1 mark

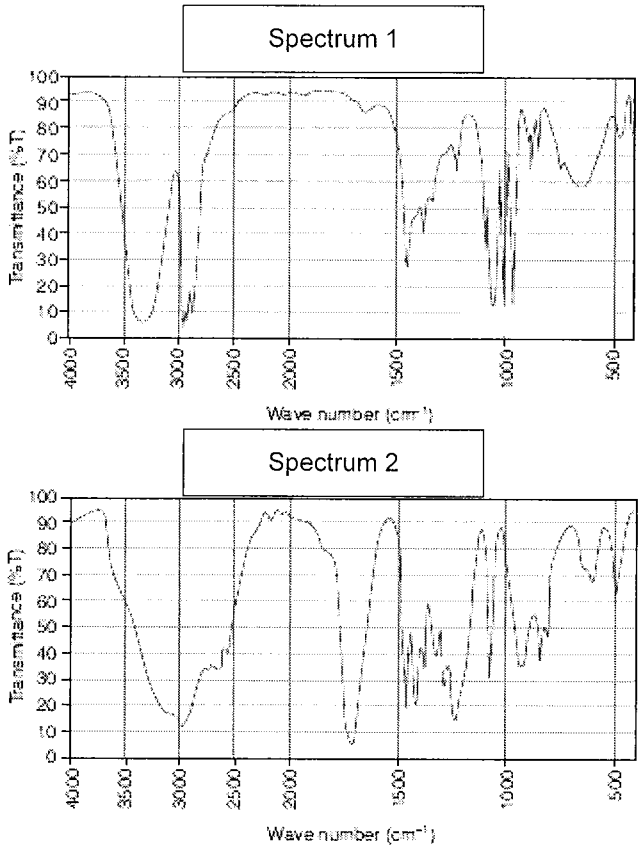
d. What practical technique could be used to separate the mixture of products arising from the reaction between hydrochloric acid and but-1-ene?

1 mark

Total 8 marks

Question 5

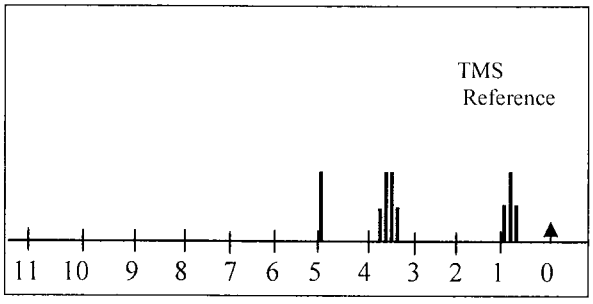
Below is the infrared spectra of two unknown organic molecules, compound 1 and compound 2.
Compound 1, with a molecular formula of $C_2H_6O_1$, produced the infrared spectrum 1.
Compound 2, with a molecular formula of $C_2H_4O_2$, produced the infrared spectrum 2.



a. Which peak wave number in spectrum 2 could be used to identify a functional group present in compound 2 but absent in compound 1?

1 mark

b. The ^1H NMR spectrum (calibrated in ppm) for compound 1 is given below.



c. What type of alkyl group is represented by the triplet splitting pattern centred at 0.9 ppm?

1 mark

d. What type of alkyl group is represented by the quartet splitting pattern centred at 3.6 ppm?

1 mark

e. How many peaks would be expected for a ^{13}C NMR spectrum of compound 1?

1 mark

f. Draw the structural formula of compound 1.

1 mark

g. In spectrum 2 above, what functional group produced the 2500-3200 cm^{-1} wave number?

1 mark

h. Write the semi-structural formula of compound 2.

1 mark

i. Compound 2 was tested by reacting it with a carbonate solution. Carbon dioxide bubbles were observed. List two mass to charge ratios you would expect to see in a mass spectrum of this compound.

1 mark

j. If compound 1 reacts with compound 2 to form compound 3, what characteristic physical property will compound 3 exhibit?

1 mark

Total 9 marks

Question 6

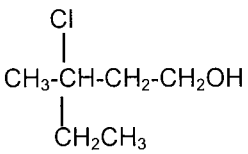
Give the systematic name for the following:

a. $CH_3CH_2CH_2NH_2$

b. $CH_3CH_2COOCH_2CH_2CH_3$

c. $CH_3CH_2CClCH_2$

d.



e. $(CH_3)_2CH(CH_2)_3CH_3$

Total 5 marks

Question 7

Complete the two boxes and name the **type** of reaction

Type of reaction

a. $CH_3CH_2CH_3 + Cl_2 \xrightarrow{\text{light}} CH_3CH_2CH_2Cl +$ ☐ _____

b. $C_2H_4 \xrightarrow{\text{pressure}} (C_2H_4)_n$ _____

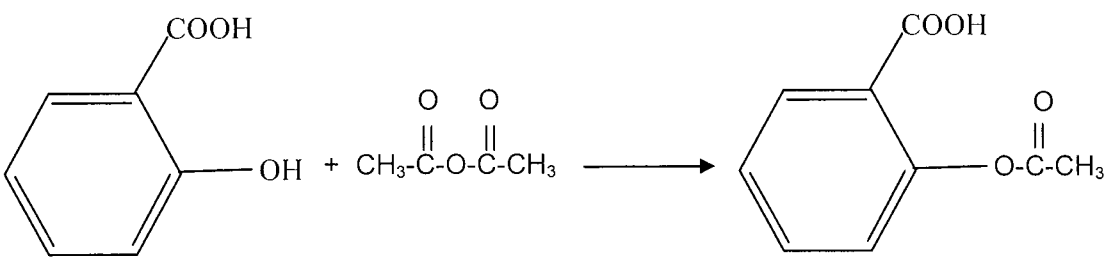
c. $CH_3CH_2Cl + NH_3 \rightarrow CH_3CH_2NH_2 +$ ☐ _____

d. $HCOOCH_3 + H_2O \rightarrow HCOOH + CH_3OH$ _____

Total 6 marks

Question 8

Aspirin is formed from the reaction of salicylic acid and acetic anhydride. It is easily absorbed by the lipid-based compounds of cell membranes and chemically binds with enzymes that cause pain symptoms and inhibits their action.



a. What is the empirical formula of salicylic acid? _____

1 mark

b. Circle the ester group in aspirin.

1 mark

c. The above reaction occurs with a 90.0% yield. What mass of salicylic acid would be required to produce 10.00 g of aspirin?

3 marks

Total 5 marks

END OF QUESTION AND ANSWER BOOK

CENTRE FOR STRATEGIC EDUCATION – YEAR 12 CHEMISTRY 2008
Written Test 1 – May

ANSWER SHEET

STUDENT NAME:

INSTRUCTIONS:

Use a **PENCIL** for **ALL** entries. For each question, shade the box which indicates your answer.
All answers must be completed like **THIS** example:
Marks will not be deducted for incorrect answers.
NO MARK will be given if more than **ONE** answer is completed for any question.
If you make a mistake, **ERASE** the incorrect answer – **DO NOT** cross it out.

	ONE ANSWER PER LINE					ONE ANSWER PER LINE				
1	A	B	C	D	11	A	B	C	D	
2	A	B	C	D	12	A	B	C	D	
3	A	B	C	D	13	A	B	C	D	
4	A	B	C	D	14	A	B	C	D	
5	A	B	C	D	15	A	B	C	D	
6	A	B	C	D	16	A	B	C	D	
7	A	B	C	D	17	A	B	C	D	
8	A	B	C	D	18	A	B	C	D	
9	A	B	C	D	19	A	B	C	D	
10	A	B	C	D	20	A	B	C	D	