

STUDENT NUMBER

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CHEMISTRY

Written examination

Wednesday 8 November 2023

Reading time: 9.00 am to 9.15 am (15 minutes)

Writing time: 9.15 am to 11.45 am (2 hours 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	30	30	30
B	9	9	90
			Total 120

- 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 correction fluid/tape.

Materials supplied

- Question and answer book of 35 pages
- Data book
- Answer sheet for multiple-choice questions

Instructions

- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- 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.
- You may keep the data 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.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

SECTION B**Instructions for Section B**

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

Give simplified answers to all numerical questions, with an appropriate number of significant figures; unsimplified answers will not be given full marks.

Show all working in your answers to numerical questions; no marks will be given for an incorrect answer unless it is accompanied by details of the working.

Ensure chemical equations are balanced and that the formulas for individual substances include an indication of state, for example, $\text{H}_2(\text{g})$, $\text{NaCl}(\text{s})$.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

SAMPLE
Number of questions and mark allocations
may vary from the information indicated.

**Victorian Certificate of Education
2023**

CHEMISTRY
Written examination

DATA BOOK

Instructions

This data book is provided for your reference.
A question and answer book is provided with this data book.

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

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1. Periodic table of the elements

1 H 1.0 hydrogen		79 Au 197.0 gold										2 He 4.0 helium							
3 Li 6.9 lithium		symbol of element										10 Ne 20.2 neon							
4 Be 9.0 beryllium		name of element										9 F 19.0 fluorine							
11 Na 23.0 sodium		atomic number										18 Ar 39.9 argon							
12 Mg 24.3 magnesium		relative atomic mass										36 Kr 83.8 krypton							
19 K 39.1 potassium	20 Ca 40.1 calcium	21 Sc 45.0 scandium	22 Ti 47.9 titanium	23 V 50.9 vanadium	24 Cr 52.0 chromium	25 Mn 54.9 manganese	26 Fe 55.8 iron	27 Co 58.9 cobalt	28 Ni 58.7 nickel	29 Cu 63.5 copper	30 Zn 65.4 zinc	31 Ga 69.7 gallium	32 Ge 72.6 germanium	33 As 74.9 arsenic	34 Se 79.0 selenium	35 Br 79.9 bromine	53 I 126.9 iodine	85 At (210) astatine	117 Ts (294) tennessine
37 Rb 85.5 rubidium	38 Sr 87.6 strontium	39 Y 88.9 yttrium	40 Zr 91.2 zirconium	41 Nb 92.9 niobium	42 Mo 96.0 molybdenum	43 Tc (98) technetium	44 Ru 101.1 ruthenium	45 Rh 102.9 rhodium	46 Pd 106.4 palladium	47 Ag 107.9 silver	48 Cd 112.4 cadmium	49 In 114.8 indium	50 Sn 118.7 tin	51 Sb 121.8 antimony	52 Te 127.6 tellurium	84 Po (210) polonium	126 Lv (293) livermorium	118 Og (294) ognesson	
55 Cs 132.9 caesium	56 Ba 137.3 barium	57-71 lanthanoids	72 Hf 178.5 hafnium	73 Ta 180.9 tantalum	74 W 183.8 tungsten	75 Re 186.2 rhenium	76 Os 190.2 osmium	77 Ir 192.2 iridium	78 Pt 195.1 platinum	79 Au 197.0 gold	80 Hg 200.6 mercury	81 Tl 204.4 thallium	82 Pb 207.2 lead	83 Bi 209.0 bismuth	84 Po (210) polonium	114 Fl (289) flerovium	115 Mc (289) moscovium	116 Lv (293) livermorium	118 Og (294) ognesson
87 Fr (223) francium	88 Ra (226) radium	89-103 actinoids	104 Rf (261) rutherfordium	105 Db (262) dubnium	106 Sg (266) seaborgium	107 Bh (264) bohrium	108 Hs (267) hassium	109 Mt (268) meitnerium	110 Ds (271) darmstadtium	111 Rg (272) roentgenium	112 Cn (285) copernicium	113 Nh (280) nihonium	114 Fl (289) flerovium	115 Mc (289) moscovium	116 Lv (293) livermorium	117 Ts (294) tennessine	118 Og (294) ognesson		

57 La 138.9 lanthanum	58 Ce 140.1 cerium	59 Pr 140.9 praseodymium	60 Nd 144.2 neodymium	61 Pm (145) promethium	62 Sm 150.4 samarium	63 Eu 152.0 europium	64 Gd 157.3 gadolinium	65 Tb 158.9 terbium	66 Dy 162.5 dysprosium	67 Ho 164.9 holmium	68 Er 167.3 erbium	69 Tm 168.9 thulium	70 Yb 173.1 ytterbium	71 Lu 175.0 lutetium
89 Ac (227) actinium	90 Th 232.0 thorium	91 Pa 231.0 protactinium	92 U 238.0 uranium	93 Np (237) neptunium	94 Pu (244) plutonium	95 Am (243) americium	96 Cm (247) curium	97 Bk (247) berkelium	98 Cf (251) californium	99 Es (252) einsteinium	100 Fm (257) fermium	101 Md (258) mendelevium	102 No (259) nobelium	103 Lr (262) lawrencium

The value in brackets indicates the mass number of the longest-lived isotope.

2. Electrochemical series

Reaction	Standard electrode potential (E^0) in volts at 25 °C
$F_2(g) + 2e^- \rightleftharpoons 2F^-(aq)$	+2.87
$H_2O_2(aq) + 2H^+(aq) + 2e^- \rightleftharpoons 2H_2O(l)$	+1.77
$Au^+(aq) + e^- \rightleftharpoons Au(s)$	+1.68
$Cl_2(g) + 2e^- \rightleftharpoons 2Cl^-(aq)$	+1.36
$O_2(g) + 4H^+(aq) + 4e^- \rightleftharpoons 2H_2O(l)$	+1.23
$Br_2(l) + 2e^- \rightleftharpoons 2Br^-(aq)$	+1.09
$Ag^+(aq) + e^- \rightleftharpoons Ag(s)$	+0.80
$Fe^{3+}(aq) + e^- \rightleftharpoons Fe^{2+}(aq)$	+0.77
$O_2(g) + 2H^+(aq) + 2e^- \rightleftharpoons H_2O_2(aq)$	+0.68
$I_2(s) + 2e^- \rightleftharpoons 2I^-(aq)$	+0.54
$O_2(g) + 2H_2O(l) + 4e^- \rightleftharpoons 4OH^-(aq)$	+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
$Ni^{2+}(aq) + 2e^- \rightleftharpoons Ni(s)$	-0.25
$Co^{2+}(aq) + 2e^- \rightleftharpoons Co(s)$	-0.28
$Cd^{2+}(aq) + 2e^- \rightleftharpoons Cd(s)$	-0.40
$Fe^{2+}(aq) + 2e^- \rightleftharpoons Fe(s)$	-0.44
$Zn^{2+}(aq) + 2e^- \rightleftharpoons Zn(s)$	-0.76
$2H_2O(l) + 2e^- \rightleftharpoons H_2(g) + 2OH^-(aq)$	-0.83
$Mn^{2+}(aq) + 2e^- \rightleftharpoons Mn(s)$	-1.18
$Al^{3+}(aq) + 3e^- \rightleftharpoons Al(s)$	-1.66
$Mg^{2+}(aq) + 2e^- \rightleftharpoons Mg(s)$	-2.37
$Na^+(aq) + e^- \rightleftharpoons Na(s)$	-2.71
$Ca^{2+}(aq) + 2e^- \rightleftharpoons Ca(s)$	-2.87
$K^+(aq) + e^- \rightleftharpoons K(s)$	-2.93
$Li^+(aq) + e^- \rightleftharpoons Li(s)$	-3.04

3. Chemical relationships

Name	Formula
number of moles of a substance	$n = \frac{m}{M}; \quad n = cV; \quad n = \frac{V}{V_m}$
universal gas equation	$pV = nRT$
calibration factor (CF) for bomb calorimetry	$CF = \frac{VI t}{\Delta T}$
heat energy released in the combustion of a fuel	$q = mc\Delta T$
enthalpy of combustion	$\Delta H = \frac{q}{n}$
electric charge	$Q = It$
number of moles of electrons	$n(e^-) = \frac{Q}{F}$
% atom economy	$\frac{\text{molar mass of desired product}}{\text{molar mass of all reactants}} \times \frac{100}{1}$
% yield	$\frac{\text{actual yield}}{\text{theoretical yield}} \times \frac{100}{1}$

4. Physical constants and standard values

Name	Symbol	Value
Avogadro constant	N_A or L	$6.02 \times 10^{23} \text{ mol}^{-1}$
charge on one electron (elementary charge)	e	$-1.60 \times 10^{-19} \text{ C}$
Faraday constant	F	$96\,500 \text{ C mol}^{-1}$
molar gas constant	R	$8.31 \text{ J mol}^{-1} \text{ K}^{-1}$
molar volume of an ideal gas at SLC (25 °C and 100 kPa)	V_m	24.8 L mol^{-1}
specific heat capacity of water	c	$4.18 \text{ kJ kg}^{-1} \text{ K}^{-1}$ or $4.18 \text{ J g}^{-1} \text{ K}^{-1}$
density of water at 25 °C	d	997 kg m^{-3} or 0.997 g mL^{-1}

5. Unit conversions

Measured value	Conversion
0 °C	273 K
100 kPa	750 mm Hg or 0.987 atm
1 litre (L)	1 dm ³ or 1 × 10 ⁻³ m ³ or 1 × 10 ³ cm ³ or 1 × 10 ³ mL

6. Metric (including SI) prefixes

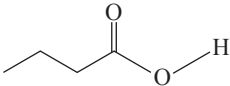
Metric (including SI) prefixes	Scientific notation	Multiplying factor
giga (G)	10 ⁹	1 000 000 000
mega (M)	10 ⁶	1 000 000
kilo (k)	10 ³	1000
deci (d)	10 ⁻¹	0.1
centi (c)	10 ⁻²	0.01
milli (m)	10 ⁻³	0.001
micro (μ)	10 ⁻⁶	0.000001
nano (n)	10 ⁻⁹	0.000000001
pico (p)	10 ⁻¹²	0.000000000001

7. Acid-base indicators

Name	pH range	Colour change from lower pH to higher pH in range
thymol blue (1st change)	1.2–2.8	red → yellow
methyl orange	3.1–4.4	red → yellow
bromophenol blue	3.0–4.6	yellow → blue
methyl red	4.4–6.2	red → yellow
bromothymol blue	6.0–7.6	yellow → blue
phenol red	6.8–8.4	yellow → red
thymol blue (2nd change)	8.0–9.6	yellow → blue
phenolphthalein	8.3–10.0	colourless → pink

8. Representations of organic molecules

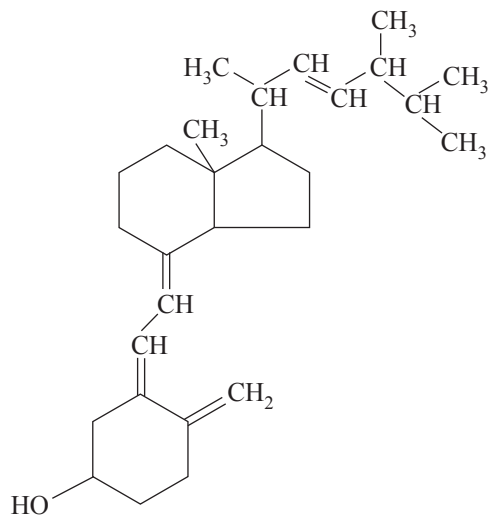
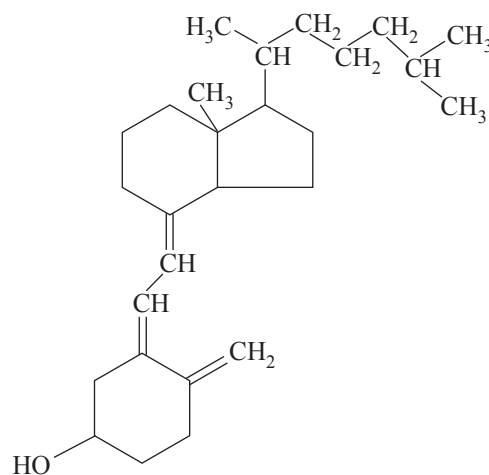
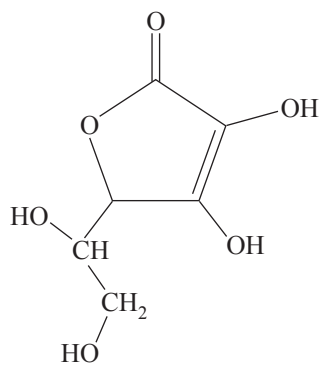
The following table shows different representations of organic molecules, using butanoic acid as an example.

Formula	Representation
molecular formula	$C_4H_8O_2$
structural formula	$ \begin{array}{ccccccc} & H & H & H & & O & \\ & & & & & // & \\ H & -C & -C & -C & -C & & \\ & & & & & \backslash & \\ & H & H & H & & O-H & \end{array} $
semi-structural (condensed) formula	$CH_3CH_2CH_2COOH$ or $CH_3(CH_2)_2COOH$
skeletal structure	

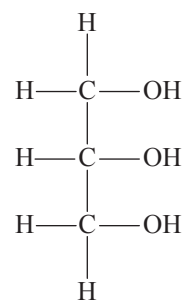
9. Formulas of some fatty acids

Name	Formula	Semi-structural formula
lauric	$C_{11}H_{23}COOH$	$CH_3(CH_2)_{10}COOH$
myristic	$C_{13}H_{27}COOH$	$CH_3(CH_2)_{12}COOH$
palmitic	$C_{15}H_{31}COOH$	$CH_3(CH_2)_{14}COOH$
palmitoleic	$C_{15}H_{29}COOH$	$CH_3(CH_2)_4CH_2CH=CHCH_2(CH_2)_5CH_2COOH$
stearic	$C_{17}H_{35}COOH$	$CH_3(CH_2)_{16}COOH$
oleic	$C_{17}H_{33}COOH$	$CH_3(CH_2)_7CH=CH(CH_2)_7COOH$
linoleic	$C_{17}H_{31}COOH$	$CH_3(CH_2)_4(CH=CHCH_2)_2(CH_2)_6COOH$
linolenic	$C_{17}H_{29}COOH$	$CH_3CH_2(CH=CHCH_2)_3(CH_2)_6COOH$
arachidic	$C_{19}H_{39}COOH$	$CH_3(CH_2)_{17}CH_2COOH$
arachidonic	$C_{19}H_{31}COOH$	$CH_3(CH_2)_4(CH=CHCH_2)_3CH=CH(CH_2)_3COOH$

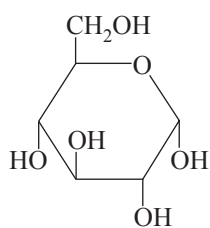
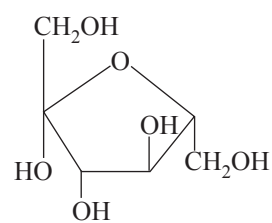
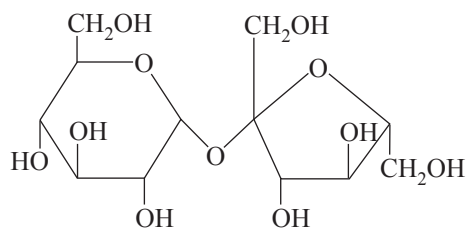
10. Formulas of some biomolecules

vitamin D₂ (ergocalciferol)vitamin D₃ (cholecalciferol)

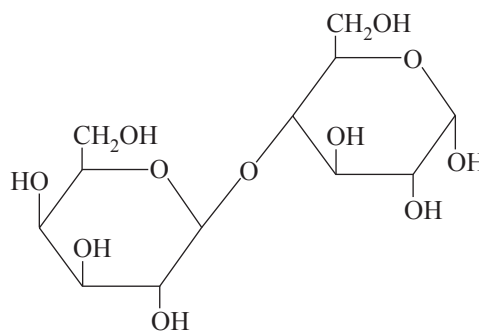
vitamin C (ascorbic acid)

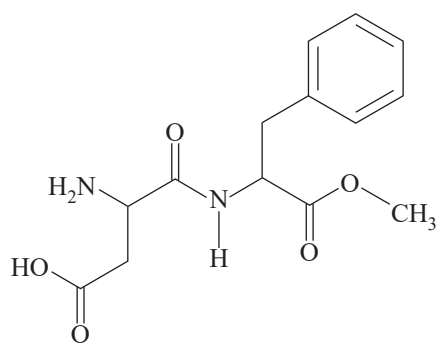


glycerol

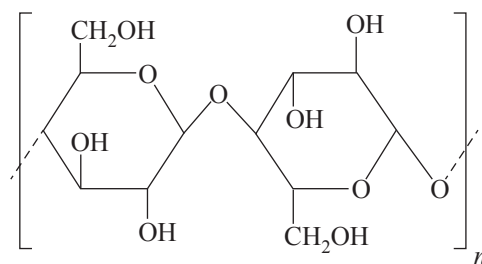
 α -glucose β -fructose

sucrose

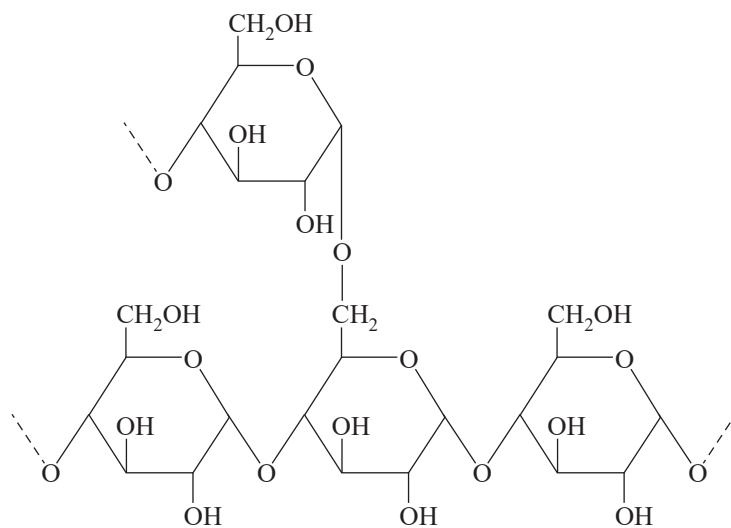
 α -lactose



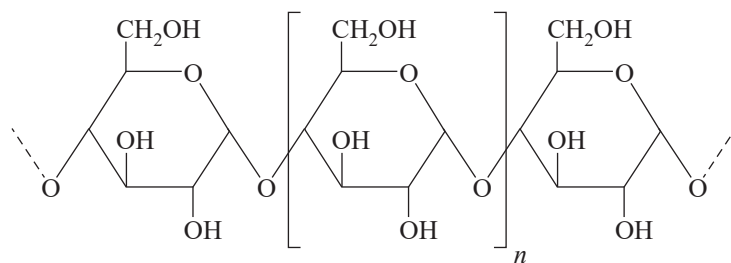
aspartame



cellulose



amylopectin (starch)



amylose (starch)

11. Heats of combustion of common fuels

The heats of combustion in the following table are calculated at SLC (25 °C and 100 kPa) with combustion products being CO₂ and H₂O. Heat of combustion may be defined as the heat energy released when a specified amount of a substance burns completely in oxygen and is, therefore, reported as a positive value, indicating a magnitude. Enthalpy of combustion, ΔH , for the substances in this table would be reported as negative values, indicating the exothermic nature of the combustion reaction.

Fuel	Formula	State	Heat of combustion (kJ g ⁻¹)	Molar heat of combustion (kJ mol ⁻¹)
hydrogen	H ₂	gas	141	282
methane	CH ₄	gas	55.6	890
ethane	C ₂ H ₆	gas	51.9	1560
propane	C ₃ H ₈	gas	50.5	2220
butane	C ₄ H ₁₀	gas	49.7	2880
octane	C ₈ H ₁₈	liquid	47.9	5460
ethyne (acetylene)	C ₂ H ₂	gas	49.9	1300
methanol	CH ₃ OH	liquid	22.7	726
ethanol	C ₂ H ₅ OH	liquid	29.6	1360

12. Heats of combustion of common blended fuels

Blended fuels are mixtures of compounds with different mixture ratios and, hence, determination of a generic molar enthalpy of combustion is not realistic. The values provided in the following table are typical values for heats of combustion at SLC (25 °C and 100 kPa) with combustion products being CO₂ and H₂O. Values for heats of combustion will vary depending on the source and composition of the fuel.

Fuel	State	Heat of combustion (kJ g ⁻¹)
kerosene	liquid	46.2
diesel	liquid	45.0
natural gas	gas	54.0

13. Energy content of food groups

Food	Heat of combustion (kJ g ⁻¹)
fats and oils	37
protein	17
carbohydrate	16

14. Characteristic ranges for infra-red absorption

Bond	Wave number (cm ⁻¹)	Bond	Wave number (cm ⁻¹)
C–Cl (chloroalkanes)	600–800	C=O (ketones)	1680–1850
C–O (alcohols, esters, ethers)	1050–1410	C=O (esters)	1720–1840
C=C (alkenes)	1620–1680	C–H (alkanes, alkenes, arenes)	2850–3090
C=O (amides)	1630–1680	O–H (acids)	2500–3500
C=O (aldehydes)	1660–1745	O–H (alcohols)	3200–3600
C=O (acids)	1680–1740	N–H (amines and amides)	3300–3500

15. ¹³C NMR data

Typical ¹³C shift values relative to TMS = 0

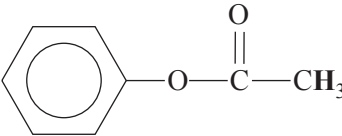
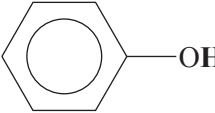
These can differ slightly in different solvents.

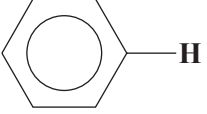
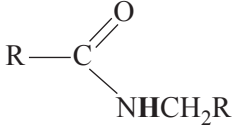
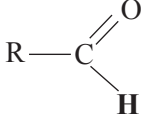
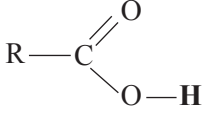
Type of carbon	Chemical shift (ppm)
R–CH ₃	8–25
R–CH ₂ –R	20–45
R ₃ –CH	40–60
R ₄ –C	36–45
R–CH ₂ –X	15–80
R ₃ C–NH ₂ , R ₃ C–NR	35–70
R–CH ₂ –OH	50–90
RC≡CR	75–95
R ₂ C=CR ₂	110–150
RCOOH	160–185
$\begin{array}{l} \text{R} \\ \diagdown \\ \text{C}=\text{O} \\ \diagup \\ \text{RO} \end{array}$	165–175
$\begin{array}{l} \text{R} \\ \diagdown \\ \text{C}=\text{O} \\ \diagup \\ \text{H} \end{array}$	190–200
R ₂ C=O	205–220

16. ^1H NMR data

Typical proton shift values relative to TMS = 0

These can differ slightly in different solvents. The shift refers to the proton environment that is indicated in bold letters in the formula.

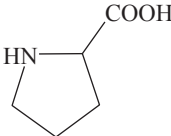
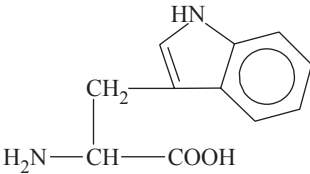
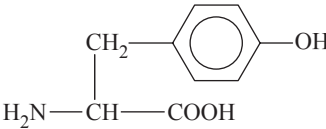
Type of proton	Chemical shift (ppm)
$\text{R}-\text{CH}_3$	0.9–1.0
$\text{R}-\text{CH}_2-\text{R}$	1.3–1.4
$\text{RCH}=\text{CH}-\text{CH}_3$	1.6–1.9
R_3-CH	1.5
$\begin{array}{ccc} \text{CH}_3-\text{C} & \text{or} & \text{CH}_3-\text{C} \\ // & & // \\ \text{O} & & \text{O} \\ & & \\ \text{OR} & & \text{NHR} \end{array}$	2.0
$\begin{array}{c} \text{R} \quad \text{CH}_3 \\ \diagdown \quad / \\ \text{C} \\ \\ \text{O} \end{array}$	2.1–2.7
$\text{R}-\text{CH}_2-\text{X}$ (X = F, Cl, Br or I)	3.0–4.5
$\text{R}-\text{CH}_2-\text{OH}$, $\text{R}_2-\text{CH}-\text{OH}$	3.3–4.5
$\begin{array}{c} \text{O} \\ // \\ \text{R}-\text{C} \\ \\ \text{NHCH}_2\text{R} \end{array}$	3.2
$\text{R}-\text{O}-\text{CH}_3$ or $\text{R}-\text{O}-\text{CH}_2\text{R}$	3.3–3.7
	2.3
$\begin{array}{c} \text{O} \\ // \\ \text{R}-\text{C} \\ \\ \text{OCH}_2\text{R} \end{array}$	3.7–4.8
$\text{R}-\text{O}-\text{H}$	1–6 (varies considerably under different conditions)
$\text{R}-\text{NH}_2$	1–5
$\text{RHC}=\text{CHR}$	4.5–7.0
	4.0–12.0

Type of proton	Chemical shift (ppm)
	6.9–9.0
	8.1
	9.4–10.0
	9.0–13.0

17. 2-amino acids (α -amino acids)

The table below provides simplified structures to enable the drawing of zwitterions, the identification of products of protein hydrolysis and the drawing of structures involving condensation polymerisation of amino acid monomers.

Name	Symbol	Structure
alanine	Ala	$\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
arginine	Arg	$\begin{array}{c} \text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}-\overset{\text{NH}}{\parallel}{\text{C}}-\text{NH}_2 \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
asparagine	Asn	$\begin{array}{c} \text{O} \\ \\ \text{CH}_2-\text{C}-\text{NH}_2 \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
aspartic acid	Asp	$\begin{array}{c} \text{CH}_2-\text{COOH} \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
cysteine	Cys	$\begin{array}{c} \text{CH}_2-\text{SH} \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
glutamic acid	Glu	$\begin{array}{c} \text{CH}_2-\text{CH}_2-\text{COOH} \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
glutamine	Gln	$\begin{array}{c} \text{O} \\ \\ \text{CH}_2-\text{CH}_2-\text{C}-\text{NH}_2 \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
glycine	Gly	$\text{H}_2\text{N}-\text{CH}_2-\text{COOH}$
histidine	His	$\begin{array}{c} \text{N} \\ // \quad \backslash \\ \text{CH}_2-\text{C} \quad \text{N}-\text{H} \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$
isoleucine	Ile	$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_3 \\ \\ \text{H}_2\text{N}-\text{CH}-\text{COOH} \end{array}$

Name	Symbol	Structure
leucine	Leu	$\begin{array}{c} \text{CH}_3\text{---CH---CH}_3 \\ \\ \text{CH}_2 \\ \\ \text{H}_2\text{N---CH---COOH} \end{array}$
lysine	Lys	$\begin{array}{c} \text{CH}_2\text{---CH}_2\text{---CH}_2\text{---CH}_2\text{---NH}_2 \\ \\ \text{H}_2\text{N---CH---COOH} \end{array}$
methionine	Met	$\begin{array}{c} \text{CH}_2\text{---CH}_2\text{---S---CH}_3 \\ \\ \text{H}_2\text{N---CH---COOH} \end{array}$
phenylalanine	Phe	$\begin{array}{c} \text{CH}_2\text{---} \langle \text{benzene ring} \rangle \\ \\ \text{H}_2\text{N---CH---COOH} \end{array}$
proline	Pro	
serine	Ser	$\begin{array}{c} \text{CH}_2\text{---OH} \\ \\ \text{H}_2\text{N---CH---COOH} \end{array}$
threonine	Thr	$\begin{array}{c} \text{CH}_3\text{---CH---OH} \\ \\ \text{H}_2\text{N---CH---COOH} \end{array}$
tryptophan	Trp	
tyrosine	Tyr	
valine	Val	$\begin{array}{c} \text{CH}_3\text{---CH---CH}_3 \\ \\ \text{H}_2\text{N---CH---COOH} \end{array}$



VCE CHEMISTRY
Written Examination
ANSWER SHEET – 2023

STUDENT NAME: JOHN STUDENT

STUDENT NUMBER

9	9	1	2	3	4	5	6	A
0	0	0	0	0	0	0	0	
1	1		1	1	1	1	1	E
2	2	2		2	2	2	2	F
3	3	3	3		3	3	3	G
4	4	4	4	4		4	4	J
5	5	5	5	5	5		5	L
6	6	6	6	6	6	6		R
7	7	7	7	7	7	7	7	T
8	8	8	8	8	8	8	8	W
		9	9	9	9	9	9	X

INSTRUCTIONS: **USE PENCIL ONLY**

SIGN HERE IF YOUR NAME AND NUMBER ARE PRINTED CORRECTLY.

SIGNATURE: J. Student

If your name or number on this sheet is incorrect, notify the Supervisor.
Use a **PENCIL** for **ALL** entries. For each question, shade the box which indicates your answer.
All answers must be completed like **THIS** example:

A		C	D
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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.

SUPERVISOR USE ONLY

USE PENCIL ONLY

Shade the **"ABSENT"** box if the student was absent from the examination.

ABSENT

SUPERVISOR'S INITIALS

OFFICE USE ONLY

	ONE ANSWER PER LINE	ONE ANSWER PER LINE	ONE ANSWER PER LINE
1	A B C D	11 A B C D	21 A B C D
2	A B C D	12 A B C D	22 A B C D
3	A B C D	13 A B C D	23 A B C D
4	A B C D	14 A B C D	24 A B C D
5	A B C D	15 A B C D	25 A B C D
6	A B C D	16 A B C D	26 A B C D
7	A B C D	17 A B C D	27 A B C D
8	A B C D	18 A B C D	28 A B C D
9	A B C D	19 A B C D	29 A B C D
10	A B C D	20 A B C D	30 A B C D