Cambridge International AS & A Level

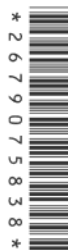| **CHEMISTRY**	**9701/11**
Paper 1 Multiple Choice	**May/June 2021**
	1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)
Data booklet

INSTRUCTIONS
- There are **forty** questions on 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION
- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **16** pages. Any blank pages are indicated.

[Turn over

Section A

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

Use of the Data Booklet may be appropriate for some questions.

1   Which contains the largest number of hydrogen atoms?   *[handwritten: 6.02×10^{23} atoms / mol of an element]*

   [handwritten: C_5H_{12}]

   A 0.10 mol of pentane   *[handwritten: $0.1 \times 12 \times 6.02 \times 10^{23}$]*

   [handwritten: C_4H_8]

   B 0.20 mol of but-2-ene   *[handwritten: $0.2 \times 8 \times 6.02 \times 10^{23}$]*

   (C) 1.00 mol of hydrogen molecules   *[handwritten: $6.02 \times 10^{23} \times 2 = 1.204 \times 10^{24}$ atoms]*

   D 6.02×10^{23} hydrogen atoms

2   In which pair of species do both species have only ==one unpaired p electron==?

   A Ar^+ and C^- **B** B and Ti^+ **(C)** F and Ga   **D** Se^- and Si^-

[handwritten: $1s^2 2s^2 2p^6 3s^2 3p^4$ (2 unpaired p electrons)]   *[handwritten: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$ (no unpaired p electron)]*   *[handwritten: $1s^2 2s^2 2p^6 3s^2 3p^3$ (3 unpaired p) electrons]*

3   Phosphorus forms two chlorides. Phosphorus(III) chloride, PCl_3, is a covalent liquid.

   [handwritten: PCl_5]

Phosphorus(V) chloride is an ionic solid. One of the ions present is $[PCl_4]^+$.

[handwritten: just like NH_4^+ which is of tetrahedral shape & 109.5°]

What is the shape of the PCl_3 molecule and the ==$[PCl_4]^+$ ion==?

	PCl_3	$[PCl_4]^+$
A	pyramidal ✓	square planar *[handwritten: for complex ions]*
(B)	pyramidal ✓	tetrahedral
~~**C**~~	tetrahedral *[handwritten: CH_4]*	square planar
~~**D**~~	trigonal planar *[handwritten: of BF_3]*	tetrahedral

[handwritten diagram: Cl–P–Cl with Cl, dots shown]   *[handwritten: just like so 107° & pyramidal]*   *[handwritten: $H–N–H$ with H, dots shown]*
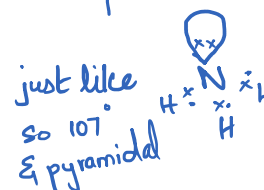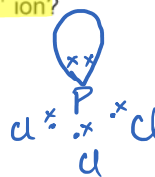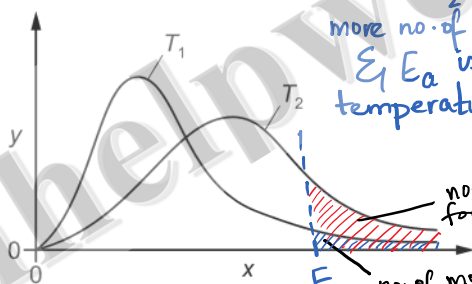
4 $\Delta H_1^\ominus$ is the standard enthalpy of formation of methane. *energy change when 1 mol of methane forms*

$\Delta H_2^\ominus$ is the standard enthalpy of combustion of carbon. *energy change when 1 mol of C completely burns*

$\Delta H_3^\ominus$ is the standard enthalpy of combustion of hydrogen. *energy change when 1 mol of H completely burns*

$$CH_4(g) + 2O_2(g) \xrightarrow{\Delta H_c^\ominus} CO_2(g) + 2H_2O(l)$$

$\Delta H_c^\ominus$ is energy change when 1 mol of CH_4 completely combusts

Which expression is equivalent to $\Delta H_c^\ominus$?

$\Delta H_1^\ominus$ *$\Delta H_2^\ominus$* *($\Delta H_3^\ominus \times 2$)*

$C(s) + 2H_2(g) + 2O_2(g)$
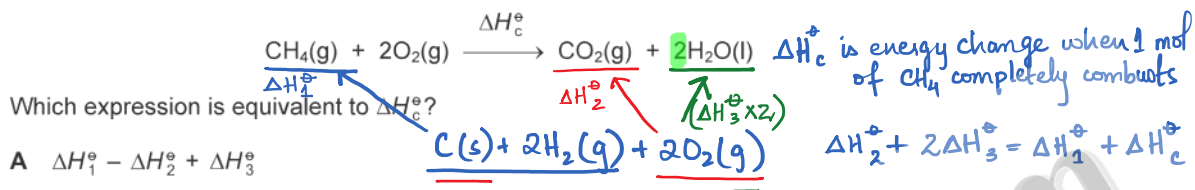
$\Delta H_2^\ominus + 2\Delta H_3^\ominus = \Delta H_1^\ominus + \Delta H_c^\ominus$

A $\Delta H_1^\ominus - \Delta H_2^\ominus + \Delta H_3^\ominus$

B $\Delta H_1^\ominus - 2\Delta H_3^\ominus - \Delta H_2^\ominus$

C $\Delta H_2^\ominus - \Delta H_3^\ominus + \Delta H_1^\ominus$

(D) $\Delta H_2^\ominus + 2\Delta H_3^\ominus - \Delta H_1^\ominus$

5 The diagram shows the Boltzmann distribution for the same gas at two different temperatures, T_1 and T_2.
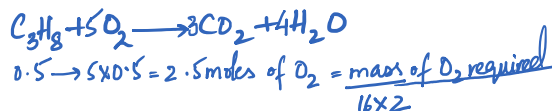
where $T_2 > T_1$ because this way more no. of molecules have energy $> E_a$ & E_a is unchanged in case of increasing temperature

no. of molecules for T_2 that have $E > E_a$

no. of molecules for T_1 that have $E > E_a$

What is plotted on the y-axis and which line represents the higher temperature?

	plotted on y-axis	higher temperature
~~A~~	number of molecules	T_1
(B)	number of molecules	T_2
~~C~~	molecular energy	T_1
D	molecular energy	T_2

6 What is the minimum mass of oxygen required to ensure the complete combustion of $12\,dm^3$ of propane measured under room conditions?

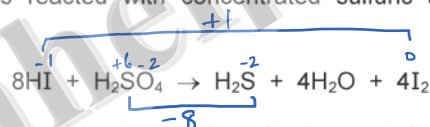*0.5 moles*

A 60 g   **(B)** 80 g   C 120 g   D 160 g

$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

$0.5 \rightarrow 5 \times 0.5 = 2.5$ moles of $O_2 = \dfrac{\text{mass of } O_2 \text{ required}}{16 \times 2}$

7 Why is the first ionisation energy of oxygen [$1s^2 2s^2 2p^4$] less than that of nitrogen [$1s^2 2s^2 2p^3$]?

~~A~~ The nitrogen atom has its outer electron in a ~~different~~ [same] subshell.

~~B~~ The nuclear charge on the oxygen atom is greater than that on the nitrogen atom.

(C) The oxygen atom has a pair of electrons in one p orbital that repel one another. [so less external energy is required for electron removal]

~~D~~ There is more shielding in an oxygen atom. [same shell so same shielding effect]

8 Which gas would behave most like an ideal gas under room conditions?

(A) helium [lightest in mass in comparison with others]

B nitrogen

~~C~~ ammonia [intermolecular forces are present]

D krypton

9 When hydrogen iodide is reacted with concentrated sulfuric acid, several reactions occur, including:

$$8HI + H_2SO_4 \rightarrow H_2S + 4H_2O + 4I_2$$

[annotations: $8\overset{-1}{HI} + H_2\overset{+6 -2}{SO_4} \rightarrow H_2\overset{-2}{S} + 4H_2O + 4\overset{0}{I_2}$; +1 ; −8]

Which row gives the change in oxidation number of iodine and of sulfur in this reaction?

	change in oxidation number of iodine	change in oxidation number of sulfur
A	−1	+6
B	−1	+8
C	+1	−6
(D)	+1	−8

10 The diagram represents the <mark>Haber process</mark> for the manufacture of ammonia from nitrogen and hydrogen.
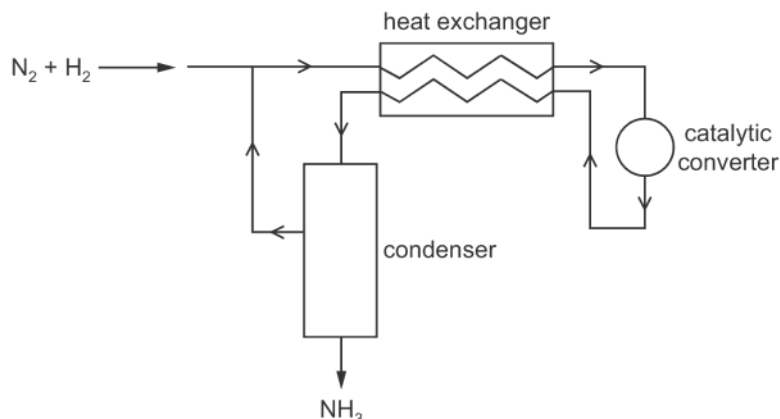
What is the purpose of the heat exchanger?

~~A~~ to cool the incoming gas mixture to avoid overheating the catalyst

~~B~~ to cool the reaction products and separate the NH_3 from unused N_2 and H_2

C to warm the incoming gas mixture and ~~shift the equilibrium~~ to give more NH_3

(D) to warm the incoming gas mixture and speed up the reaction

Catalyst only speeds up reaction leaving yield of NH_3 unchanged

11 Which statement about catalysts is correct?

~~A~~ They change the reaction pathway by ~~increasing~~ the activation energy. *Ea*

~~B~~ They increase the rate of reaction by lowering the ~~enthalpy change of the reaction~~.

(C) They increase the number of particles that have sufficient energy to react. ✓

~~D~~ Heterogeneous catalysts are in the ~~same~~ state as the reactant. *diff.*

Na, Mg, Al, Si, P, S, Cl   *$Na_2O, MgO, Al_2O_3, SiO_2, P_4O_{10}$ NOT SO_2/SO_3*

12 Element X is in Period 3. Element X forms a <mark>solid</mark> oxide Y.

Y must be an amphoteric oxide (Al_2O_3)

Y reacts with <mark>hot concentrated hydrochloric acid</mark>. Y reacts with hot aqueous sodium hydroxide to form a compound <mark>in which X is part of an anion</mark>.

(AlO_2^-)   *$Al_2O_3 + NaOH \longrightarrow NaAlO_2 + H_2O$*

How many p electrons does one atom of X have in its outer shell?

A 0   (B) 1   C 2   D 3   *Al — $1s^2 2s^2 2p^6 3s^2$ <mark>$3p^1$</mark>*

13 The gaseous products of heating a mixture of $Ca(OH)_2$ and NH_4Cl are passed through solid CaO. A single gaseous product, W, is collected.

[annotation: NH₃ above "gaseous products"; base above "solid CaO"; NH₃ above "gaseous product, W"]

A sample of W reacts with $Cl_2(g)$ to produce two gases, X and Y.

X is an element. Y is acidic.

Y reacts with W to produce Z.

What are X and Z?

[handwritten working:]
$$Ca(OH)_2 + NH_4Cl \longrightarrow NH_3(g) + CaCl_2(aq) + H_2O(l)$$
$$NH_3(g) + CaO(s) \longrightarrow NH_3(g) \;\;(W)$$
$$NH_3 + Cl_2 \longrightarrow NH_4Cl\,(Y) + N_2\,(X)$$
$$NH_4Cl + NH_3 \longrightarrow NH_4Cl\,(Z) + \ldots$$

	X	Z
A	N_2	$CaCl_2$
B	N_2	NH_4Cl
C	O_2	$CaCl_2$
D	O_2	NH_4Cl

[B is circled; A and B ticked; C and D crossed out]

14 Q is a mixture of a Group 2 oxide and a Group 2 sulfate. Q contains equal amounts of the two compounds.

Q is shaken with water and the resulting mixture filtered; a solid residue is obtained. There is no reaction when the solid residue is shaken with $HCl(aq)$. Shaking the filtrate with $H_2SO_4(aq)$ produces a white precipitate.

[annotation: $BaSO_4$ cant be $MgSO_4$ bcz it does NOT form white ppt.]

What could be Q?

A $BaO + BaSO_4$
[annotation: $+H_2O \longrightarrow Ba(OH)_2(aq) + BaSO_4(s) + H_2SO_4(aq) \longrightarrow [SO_4^{2-}]$ is high so white ppt. due to $BaSO_4$]

B $BaO + MgSO_4$
[annotation: $+H_2O \longrightarrow Ba(OH)_2(aq) + Mg(OH)_2(s) + H_2SO_4(aq) \longrightarrow MgSO_4(aq)$ so NO ppt.]

C $MgO + BaSO_4$

D $MgO + MgSO_4$

[A is circled; C and D crossed out]

15 Which substance will **not** be a product of the thermal decomposition of hydrated magnesium nitrate?

A dinitrogen monoxide
[annotation: N₂O crossed; $Mg(NO_3)_2 \longrightarrow MgO + NO_2 + O_2$]

B magnesium oxide *[ticked]*

C oxygen *[ticked]*

D steam

[A is circled]

16 A 5 cm³ sample of 0.05 mol dm⁻³ sodium chloride is mixed with a 5 cm³ sample of 0.05 mol dm⁻³ potassium iodide. 10 cm³ of acidified 0.05 mol dm⁻³ silver nitrate is then added, followed by concentrated ammonia solution.

What is seen after the addition of an excess of concentrated ammonia solution?

A   a cream precipitate

B   a white precipitate

C   a yellow precipitate

D   no precipitate

Handwritten annotations: $NaCl + KI \longrightarrow KCl + NaI$ Cl being more reactive than I replaces it from solution. $+ \; AgNO_3$. soluble in (NH_3) conc $\longrightarrow AgCl + AgI \longrightarrow NH_{3(conc.)} \longrightarrow AgI + \ldots$ insoluble so its ppt. remains visible

17 The volatility of the Group 17 elements, chlorine, bromine and iodine, decreases down the group.

What is responsible for this trend?

A   bond length in the halogen molecule

B   bond strength in the halogen molecule

C   electronegativity of the halogen atom

D   number of electrons in the halogen atom

Handwritten annotation: increase which result in more intermolecular forces & more energy required to break them.

18 Acid rain is a dilute solution of sulfuric acid. $H_2SO_4 (aq)$

Which pollutant also contributes to the formation of acid rain?

A   carbon monoxide

B   carbon dioxide

C   nitrogen dioxide

D   hydrocarbons

Handwritten annotation: $NO_2 + H_2O \longrightarrow HNO_3 + NO$

19 R is an oxide of Period 3 element T. 5.00 g of R contains 2.50 g of T.

Handwritten annotation: $MgO, Al_2O_3, SiO_2, SO_2$

What is T?

A   magnesium

B   aluminium

C   silicon

D   sulfur

Handwritten annotations: Mr of SO_2 = 64.1. 5.00 g of $SO_2 \longrightarrow 2.50$ g of S. 64.1 g of $SO_2 \longrightarrow 32.05$ g of S (which is right according to the formula)

$C_2H_5Br + CN^- \longrightarrow C_2H_5CN + Br^-$ *(handwritten)*

 (handwritten mechanism top right)

**20** Bromoethane reacts with cyanide ions, producing propanenitrile.
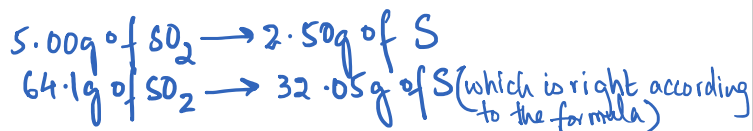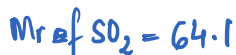
Which statement about the S_N2 mechanism of this reaction is correct?

A The lone pair of electrons on C of CN^- attacks the carbon atom of the C–Br bond. *bcz of +ve charge (handwritten)*

B The lone pair of electrons on C of CN^- attacks the carbocation formed when the C–Br bond breaks. *there is no carbocation forming here bcz it isn't stable enough thus this reaction proceeds through SN2 mechanism (handwritten)*

C The lone pair of electrons ~~on N~~ of CN^- attacks the carbon atom of the C–Br bond.

D The lone pair of electrons ~~on N~~ of CN^- attacks the carbocation formed when the C–Br bond breaks.

21 Which compound would produce two different carboxylic acids when treated with hot, concentrated, acidified manganate(VII) ions?
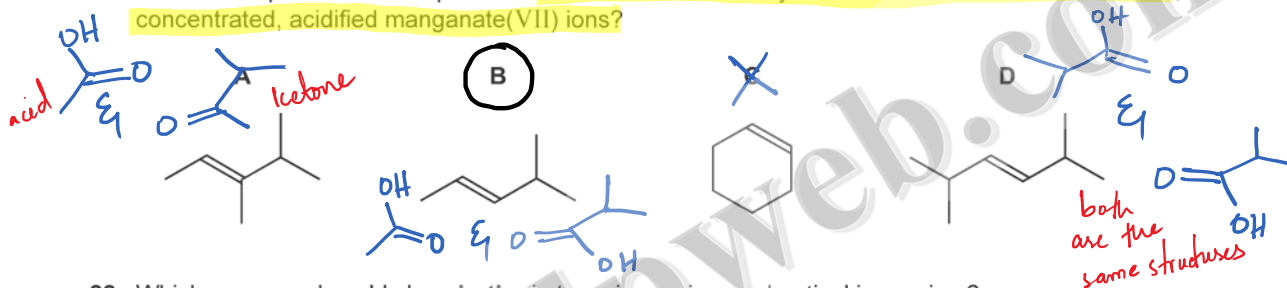
22 Which compound could show **both** *cis-trans* isomerism and optical isomerism?
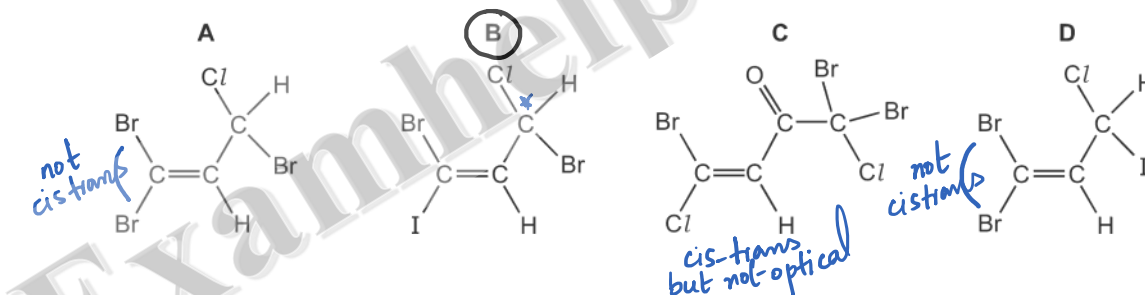
23 Limonene is a hydrocarbon found in the rind of citrus fruits.

limonene
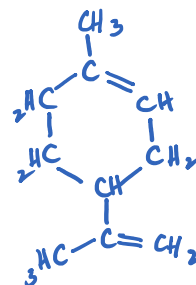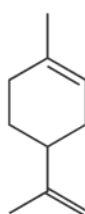
What is the molecular formula of limonene?

A $C_{10}H_{12}$ **B** $C_{10}H_{14}$ **C** $C_{10}H_{16}$ **D** $C_{10}H_{18}$

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24 The compound cetyl palmitate, $C_{15}H_{31}CO_2C_{16}H_{33}$, is a waxy solid.

[handwritten: ester linkage]

Cetyl palmitate is heated under reflux with an excess of aqueous sodium hydroxide.

[handwritten: ester hydrolisis with NaOH would give alcohol + salt]

Which products will be formed?

[handwritten: $C_{15}H_{31}CO_2C_{16}H_{33} \xrightarrow{+(NaOH)} C_{15}H_{31}(COOH) + C_{16}H_{33}OH \longrightarrow C_{15}H_{31}CO_2Na$]
[handwritten: acid group + NaOH]
[handwritten: + $C_{16}H_{33}OH$]

A $C_{15}H_{31}ONa$ and $C_{16}H_{33}CO_2Na$

B $C_{15}H_{31}CO_2Na$ and $C_{16}H_{33}ONa$

C $C_{15}H_{31}OH$ and $C_{16}H_{33}CO_2Na$

(D) $C_{15}H_{31}CO_2Na$ and $C_{16}H_{33}OH$
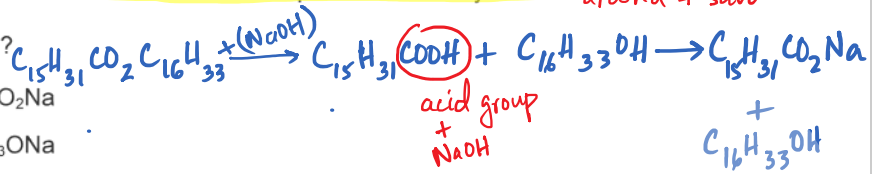
25 When an organic compound is oxidised, any oxygen atom gained by the organic molecule is considered to be from a water molecule also producing $2H^+ + 2e^-$. Any hydrogen atom lost may be considered to be lost as $H^+ + e^-$.

[handwritten: oxidation]
[handwritten: H_2 is also formed] *[handwritten: oxidation]*

These changes can be represented by the following two equations.

$$H_2O \rightarrow [O] + 2H^+ + 2e^-$$ *[handwritten: (include this only when there is gain of oxygen)]*

$$[H] \rightarrow H^+ + e^-$$ *[handwritten: (include this only when there is loss of hydrogen)]*

Compound X is oxidised by heating under reflux with hot, acidified potassium dichromate(VI) for one hour. The half-equation for the reduction reaction is shown.

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$$

[handwritten: propanal to propanoic acid $C_2H_5CHO \longrightarrow C_2H_5CO_2H$]

Under these conditions, one mole of potassium dichromate(VI) oxidises three moles of X.

[handwritten: there is only gain of oxygen & no change in hydrogen]

What could X be?

[handwritten: $C_2H_5CHO + 2[O] + 2H^+ + 2\bar{e} \longrightarrow C_2H_5CO_2H + H_2O$]

(A)   propanal

[handwritten: Now to balance the no. of hydrogens, we'll add H_2O molecule to the right. Then combine this half equation for the oxidation reaction with that of reduction reaction.]
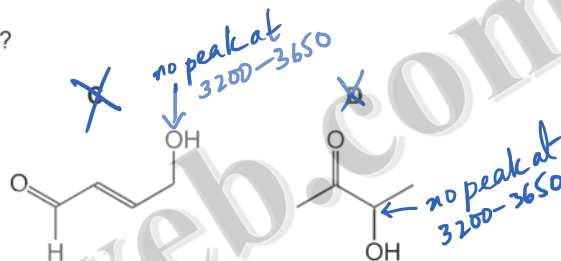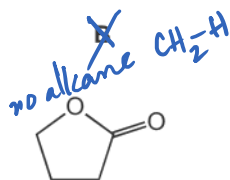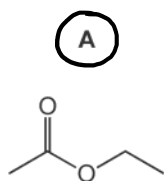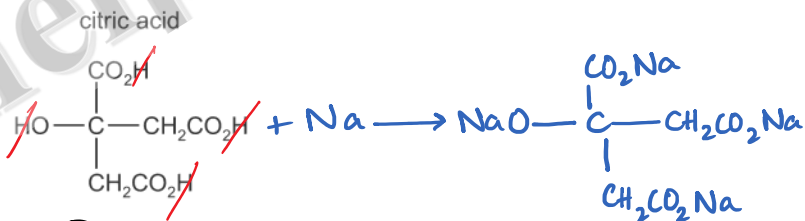
B   propan-1-ol

C   propan-1,2-diol

D   propan-1,3-diol

[handwritten: $3 \times (C_2H_5CHO + 2[O] + 2H^+ + 2\bar{e} \longrightarrow C_2H_5CO_2H + H_2O)$]
[handwritten: $1Cr_2O_7^{2-} + 20H^+ + 3C_2H_5CHO \longrightarrow 2Cr^{3+} + 10H_2O + 3C_2H_5CO_2H$]

26 Compound X has the empirical formula C_2H_4O. Its infra-red spectrum is shown.

transmittance/%

[handwritten annotations on spectrum: "cant be COOH nor OH group bcz of peak below 3200 so its", "C–H", "–C=O", "a lot of strong peaks below 1500 which means C–O"]

wavenumber/cm⁻¹
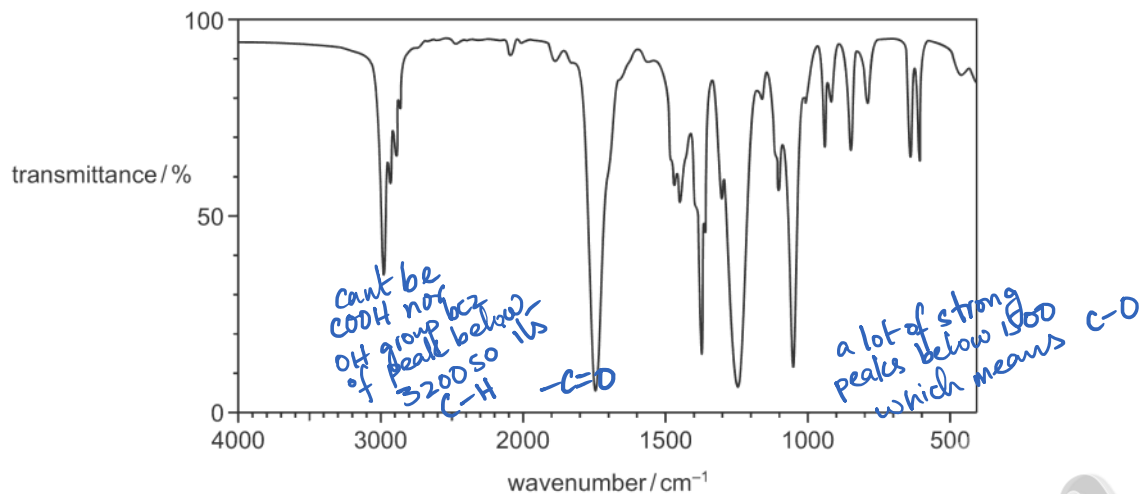
What could be the skeletal formula of compound X?

A *(circled)*

B *[handwritten: "no alkane CH₂–H"]*

C *[handwritten: "no peak at 3200–3650", "OH"]*

D *[handwritten: "no peak at 3200–3650"]*

27 How many ==moles of hydrogen, H_2==, are evolved when an excess of sodium metal is added to one mole of citric acid?

citric acid

$$HO-\underset{\underset{CH_2CO_2H}{|}}{\overset{\overset{CO_2H}{|}}{C}}-CH_2CO_2H \;+\; Na \longrightarrow NaO-\underset{\underset{CH_2CO_2Na}{|}}{\overset{\overset{CO_2Na}{|}}{C}}-CH_2CO_2Na$$

A 0.5   B 1.5   C *(circled)* 2   D 4   *[handwritten: "4 moles of hydrogen, H so 2 moles of hydrogen, H₂"]*

28 Which statement is correct for the ==reaction of carbonyl compounds with HCN==?

A *[crossed out]* The reaction is catalysed by concentrated H_2SO_4.

B *(circled)* Pentan-2-one and HCN react to give a chiral product.

C *[crossed out]* The reaction is a condensation reaction.

D *[crossed out]* The reaction is nucleophilic ~~substitution~~. *[handwritten: "addition"]*

[handwritten mechanism to the right showing nucleophilic addition of CN⁻ to carbonyl carbon]
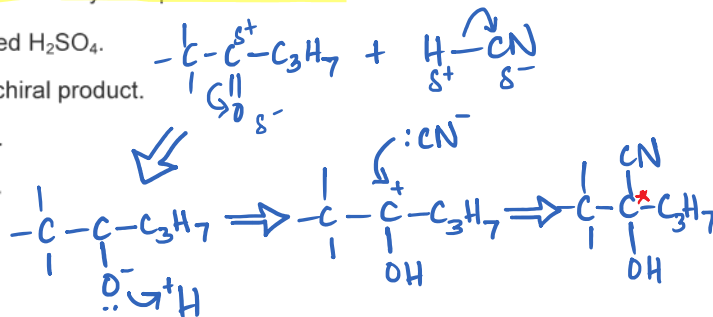
29 The table describes four reactions of propene. [handwritten: $C=C-C-$ structure]
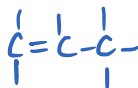
Which row is correct?

	reagent used	name of main organic product
A	aqueous bromine	1, 2-bromopropane
B	cold acidified aqueous potassium manganate(VII)	propane-1,3-diol
C	hydrogen chloride	2-chloropropane
D	steam	propan-1-ol

[handwritten annotations: +C_3H_6; di; various structures with Br Br, OH OH, Cl, OH; "more stable"]

30 Butanoic acid is prepared from 1-bromopropane. [handwritten: 1 carbon increase so a reaction with CN^- is involved]

This synthesis requires a sequence of two reactions.

Which compound is prepared in the first stage of the synthesis?

A 1-aminopropane

B propan-1-ol

C butanal

D butanenitrile

[handwritten: $C-C-C-Br + KCN$ (ethanolic) $\rightarrow C-C-C-C\equiv N$; HCl (dilute) $\downarrow$ $C-C-C-CO_2H$]

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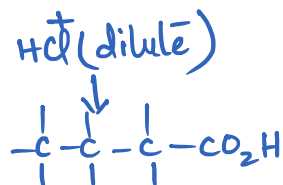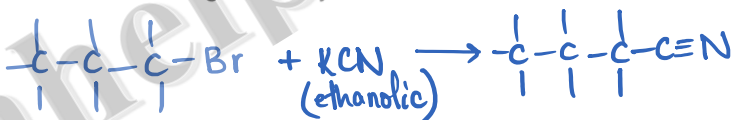
Section B

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 statements that 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.

Use of the Data Booklet may be appropriate for some questions.

31 Ethanol combines with ethanoic acid to form ethyl ethanoate according to the following reaction.

$$C_2H_5OH(l) + CH_3CO_2H(l) \rightleftharpoons CH_3CO_2C_2H_5(l) + H_2O(l) \qquad \Delta H^\circ = -6\ kJ\ mol^{-1}$$

[handwritten: 0.2 mol   0.2 mol   0.1 mol]

[handwritten: increase in temp means equilibrium shifts to the left]

9.2 g ethanol, 12 g ethanoic acid and 8.8 g ethyl ethanoate are mixed and allowed to stand at 298 K, until equilibrium is reached.
(M_r: C_2H_5OH, 46; CH_3CO_2H, 60; $CH_3CO_2C_2H_5$, 88)

The resulting equilibrium mixture is found to contain 4.8 g ethanoic acid.

[handwritten: 0.08 mol]

[handwritten table:]

	$C_2H_5OH + CH_3CO_2H \rightleftharpoons CH_3CO_2C_2H_5$		
Initial	0.2	0.2	0.1
Change	−0.12	−0.12	+0.12
Equil.	0.08	0.08	0.22

The experiment is repeated at 323 K.

Which statements are correct? *[handwritten: A]*

[handwritten: If moles of 1 reactant decrease, that of other reactant should also decrease but of products increase]

✓ 1   There are 0.22 moles of ethyl ethanoate in the mixture at equilibrium at 298 K.

✓ 2   The equilibrium mixture at 323 K will contain more than 4.8 g of ethanoic acid. *[handwritten: equilibrium on the left]*

✓ 3   If a small amount of water is added at the start of either experiment the value of K_c would not be affected. *[handwritten: bcz it only depends on temperature change.]*
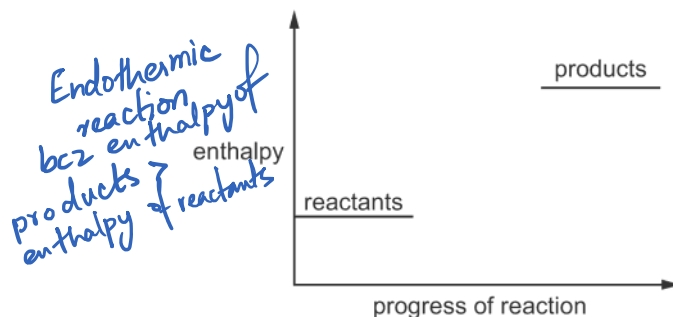
32 The diagram shows an incomplete energy profile diagram for a reaction.

Endothermic reaction bcz enthalpy of products > enthalpy of reactants
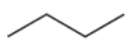
Which reactions could this diagram refer to? *A*

1 ✓ $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ *thermal decomposition is endothermic*

2 ✓ $H_2(g) \rightarrow 2H(g)$ *atomisation is also +ve enthalpy change*

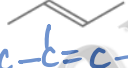3 ✓ $Cl^-(aq) \rightarrow Cl^-(g) + aq$ *evaporation is all about input of energy so endothermic*

33 A gaseous hydrocarbon has a density of $2.42\,g\,dm^{-3}$ under room conditions. *2.42g per dm³ of volume* *T=298K & P = 101.325 kPa*

What could be the skeletal formula of this hydrocarbon? *D*

PV = nRT
where n = $\frac{mass}{molar\,mass}$ so $1dm^3 = 10^{-3}m^3$
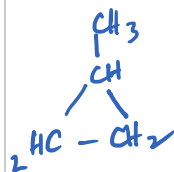
1 *mass = 58g*

2 *mass = 56g*

3 *mass = 56g*

CH_3, CH, $_2HC - CH_2$

$_3HC - C = C - CH_3$

molar mass = $\frac{2.42g \times 8.314 \times 298}{101.325 \times 10^3 \times 10^{-3}}$ = 59 g/mol so its nearest to ①

34 Which molecules contain at least one bond angle of 120°? *B*

1 ✓ C_2H_4 *C=C due to sp2 hybridisation*

2 ✓ PF_5 *120° & 90°*

3 ✗ NCl_3 *only 107°*

35 Which statements are correct going across Period 3 from sodium to chlorine? *D*

1 ✓ The charge on the nucleus increases, pulling the electrons closer to it. *no. of protons increase in the same shell* *also bcz of constant shielding*

2 ✗ The radius of the most common ion of each element decreases. *from Na^+ to Si^{+4}, anions have greater ionic radii*

3 ✗ The shielding caused by inner electrons decreases, so the outer electrons are pulled closer to the nucleus. *shielding only changes when electron is being to different shell which is going down or up a group NOT across period*

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.

36 Which statements are correct? *A*

✓ 1 Magnesium carbonate decomposes at a lower temperature than calcium carbonate. *CaCO₃ is more stable than MgCO₃ bcz CO₃²⁻ is less distorted with Ca²⁺*

✓ 2 Calcium hydroxide is more soluble in water than magnesium hydroxide. *hydroxide solubility ↑ down group 2*

✓ 3 Calcium is a stronger reducing agent than magnesium. *bcz Ca can more easily lose electrons than Mg.*

37 Which statements are correct? *A*

✓ 1 1,1-difluoroethane is less reactive than 1,1-dichloroethane. *C–F is stronger than C–Cl*

✓ 2 1,1-difluoroethane is polar. *Due to C–F bond where there is diff. in electronegativity*

✓ 3 The C–F bond is stronger than the C–Cl bond. *bcz of shorter bond length in C–F*

38 Which pairs of compounds may be distinguished by testing with alkaline aqueous iodine? *B*

✓ 1 butanal and butanone *only butanone gives yellow ppt.*

2 pentan-2-one and pentan-3-ol *pentan-3-ol wont give yellow ppt bcz it doesnt have methyl group attached to C with OH*

3 propanone and propan-2-ol *both react*
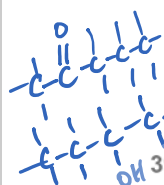
39 Which reactions have a coloured organic product? *D*

1 ethanal + 2,4-dinitrophenylhydrazine reagent *orange ppt which is 2,4 dinitrophenylhadrazone*

2 ethanol + acidified potassium dichromate(VI) *color change is orange to green but green color is not of ethanoic acid*

3 ethene + cold dilute acidified potassium manganate(VII) *purple to colourless*

40 Propanoic acid is reacted with an excess of lithium aluminium hydride. *reducing agent LiAlH₄ propan-1-ol* The organic product of this reaction is reacted with ethanoic acid in the presence of concentrated sulfuric acid, forming product X.

propan-1-ol + ethanoic acid ↓ propyl ethanoate (X) ester

What are major commercial uses of X? *C*
ester

✗ 1 fuel

✓ 2 solvent

✓ 3 flavouring

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