edexcel

Edexcel GCE

Chemistry (Nuffield)

6252/01

June 2006

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Results Mark Scheme

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SECTION A

1. (a) (i) Add silver nitrate (solution) **(1)** *ACCEPT correct formula*
(pale) yellow **precipitate**/solid**(1)**

OR
Add chlorine (solution)/bromine (solution) **and** hydrocarbon solvent **(1)**
Solvent goes purple/pink/violet **(1)**
2nd mark is dependent on 1st **(2 marks)**

(ii) Iodine/I and sulphur/S identified **(1)** - *NOT* I_2 /I^-/iodide
Iodine
initial (+)5 final –1 **(1)**
Sulphur
initial (+)4 final (+)6 **(1)**
ACCEPT as roman numerals
ACCEPT +/– on either side/sub or superscript
ACCEPT as words **(3 marks)**

(iii) $1 \times -6 = -6$, $3 \times +2 = +6$ *ALLOW TE from (ii)*
OR total change in oxidation number of +6 for S, -6 for I
ACCEPT justification in terms of electrons **(1 mark)**

(b) (i) pipette
ALLOW burette
NOT measuring cylinder **(1 mark)**

(ii) Starch (solution) **(1)**

blue/dark blue/blue-black/black to colourless **(1)**
ALLOW **max 1** *if candidate states* "no indicator needed/self-indicating" with colour change brown/yellow to colourless
If no indicator given but correct colour change **1 (out of 2)** **(2 marks)**

(iii) $\frac{24.0}{1000} \times 0.010 = 2.4(0) \times 10^{-4}$ *OR* 0.00024 (mol)
The mark is for the answer **(1 mark)**

(iv) $\frac{2.40 \times 10^{-4}}{2} = 1.2(0) \times 10^{-4}$ (mol) *OR* 0.00012 (mol)
ALLOW TE from (iii)
The mark is for the answer **(1 mark)**

(v) $1.2 \times 10^{-4} \times 100 = 0.012(0)$ (mol dm^{-3})
ALLOW TE from (iv)
The mark is for the answer **(1 mark)**

Total12 marks

2 (a) (i) H(g) + O(g) + Cl(g) *in top RH box*

$^1/_2H_2(g)$ + $^1/_2O_2(g)$ + $^1/_2Cl_2(g)$ *in lower box*
Brackets around the state symbols are not required **(1 mark)**

(ii) 589 – 667 = **–78** (kJ mol^{-1})
ALLOW final answer on its own **(1 mark)**

(iii) 667 – 464 = (+)**203** ($kJmol^{-1}$)
ALLOW final answer on its own **(1 mark)**

(b) (i)

(1) **(1)** *ALLOW* **(1)** **(1)**

ALLOW all dots/crosses
ALLOW **1 max** *if electrons are correct but atoms are not identified*
If ionic dot and cross diagram **(0)** **(2 marks)**

(ii) 100 – 106 ^{o} **(1)**

as lone/non-bonding pairs take up **more** space/repel **more strongly** than bonded pairs **(1)**
NOT bonds being repelled/H and Cl being repelled **(2 marks)**

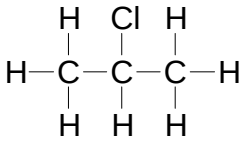
(c) No change **(1)**

as number of **gaseous** reactant molecules = number of **gaseous** product molecules **(1)**

ALLOW **1 max** *if candidates state or imply a very small change with correct justification*
eg "hardly changes"
"doesn't change much"
"very little effect/change" **(2 marks)**

Total 9 marks

3 (a) (i) 2(-)chloropropane



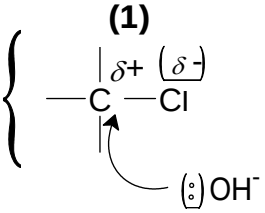
No internal TE from name to structure

MUST be fully displayed **(2 marks)**

(ii)

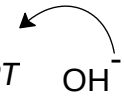
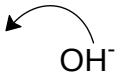
(1)

IGNORE rest of molecule



(1)

Mark independently
Must attack the carbon
ALLOW attack by oxygen or negative charge or lone pair

ACCEPT  *NOT* 

NOT C^+ **(2 marks)**

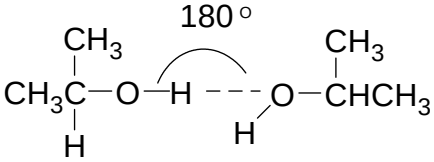
(b) (i) Elimination
NOT in conjunction with additional incorrect information
e.g. "nucleophile" **(1 mark)**

(ii) Sodium hydroxide/NaOH/potassium hydroxide/KOH **(1)**
Any additional incorrect reagent **(0)**
NOT alkali on its own for 1st mark

Alcoholic solution/ethanolic solution **and** heat/warm/reflux **(1)**
2nd mark is dependent on mention of correct reagent or "alkali"
"aqueous" negates 2nd mark e.g. KOH(aq) + heat **(1)** – *ie reagent mark*
NaOH(alc) + heat **(2)** **(2 marks)**

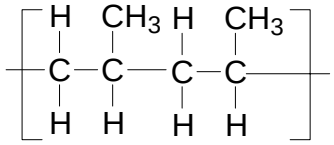
(c) (i) Hydrogen/H bonding **(1 mark)**

(ii)



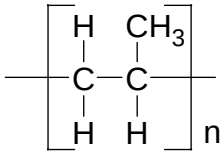
H-bond and rest of molecule **(1)**
angle must be between 3 atoms for a correct H bond **(1)**
ALLOW HOH 106-108 ° **(2 marks)**

(d) (i)



IGNORE any "n" in this diagram

Brackets optional but continuation must be shown
4 carbon chain with 6Cs overall in structure **(1)**
methyl groups can be on C_1 and C_3, C_1 and C_4, C_2 and C_4, C_2 and C_3 **(1)**



1 max

(2 marks)

(ii) (big molecule) so large number of electrons **(1)**

Hence **large/strong van der Waals'** forces (to be overcome to change state) **(1)** **(2 marks)**

(iii) low water absorbency/ non biodegradable (OWTTE)/greater (tensile) strength (for same mass)/more hard wearing
For strength mark there needs to be a comparison
NOT cost **(1 mark)**

15 marks

4 (a) (i) (2-)methylbut(a)-1,3 -diene

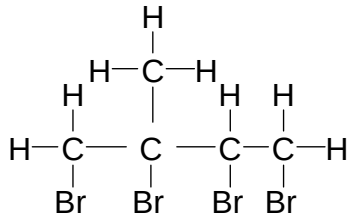
(1) (1)

IGNORE punctuation
ALLOW 1 max if correct answer is pre-fixed by cis/trans **(2 marks)**

(ii) From orange/yellow/brown to colourless **(1)**
NOT red *NOT* clear **(1 mark)**

(iii) addition **(1)**
electrophilic **(1)**
in either order **(2 marks)**

(iv)



Methyl group need not be displayed **(1 mark)**

b (i) Van der Waals' (forces)
ACCEPT Van der Walls
NOT vdw **(1 mark)**

(ii) Q because (unbranched) so greater area of **contact**/**closer packing** (between molecules) **(1)**

hence greater Van der Waals/vdw forces **(1)**
2nd mark dependent on 1st
Incorrect isomer chosen **(0)**
Fully correct reverse argument **(2)** **(2 marks)**

Total 9 Marks

SECTION B

5 (a) Sodium chlor**ate**(I) **(1 mark)**

(b) Species/particle/entity/group/atom/molecule with an unpaired/odd electron *OR* …with an uneven/odd number of electrons **(1 mark)**

(c) Provides an alternative mechanism/route/different transition state **(1)**

of lower activation energy **(1)**

Mark independently **(2 marks)**

(d) A process that:

- uses materials from renewable resources/OWTTE
- consumes minimal **energy** (resources) *NOT* use a lower temperature
- does not release polluting end products/OWTTE

3 → **2**
2→ **1**
1→ **0** **(2 marks)**

(e) (Accumulation in food chain) may mean dioxins reach high/ toxic/poisonous/harmful/carcinogenic/hazardous levels. **(1 mark)**

(f) Examiners will need to consider each answer for (i) key points and (ii) style and use of English. Candidates should have recorded their word total at the end of their answer, and this should be checked.

up to 105 words: no penalty
106 – 115 words: -1
116 – 125 words: -2
126 – 135 words: -3

and at a rate of –1 penalty for every 5 words excess thereafter, up to a maximum penalty equal to the number of key points included by the answer.

Note that words appearing in the title to the summary do not count in the word total. Normally hyphenated words, numbers and chemical formulae count as one word. The question does not ask for equations in the summary, but if included they should be counted in the word total.

Sub headings do not count in the word total.
TAML = 1 word
H_2O_2 **=** 2 words
NaOCl **=** 2 words

Marking for key points

One mark should be awarded for **every** key point clearly identified in an answer.

Key points minus word penalty = maximum 6 marks

To gain the mark for a key point the wording used by the candidate must make clear the essential chemistry of the point.

Key Points

1	Stain removers contain (solid) **percarbonates** or **perborates**	**(1)**
2	which **produce hydrogen peroxide** on reaction with **water**	**(1)**
3	which **decomposes** /**breaks down** producing (free) **radicals**	**(1)**
4	that can oxidise stain molecules **and** change/alter their colour	**(1)**
		MAX 3

5	produce no **organochlorine** pollutants	**(1)**

6	(but can be unselective as) other molecules are exposed to free radicals resulting in unwanted reactions	**(1)**
7	and require longer reaction/wash time/higher temperatures/pressures *Any two*	
	OR higher costs for **energy**, **equipment** and **labour**	**(1)**
		MAX 1

8	used in (pulp and) paper/textile /laundry industries *Any two*	**(1)**

6 max (from 8 possible points)

To score 6, candidates need to get:
- *three from points 1-4*
- *point 5*
- *one from points 6-7*
- *point 8*

Quality of Written Communication

These should *be impression* marked on a scale 2-1-0, and the mark out of 2 should be recorded in the body of the script at the end of the answer. This mark can not be lost as a result of a word penalty.

Candidates are expected to:
- show clarity of expression;
- construct and present coherent argument;
- demonstrate effective use of grammar punctuation and spelling.

The aspects to be considered are:
- use of technical terms; the answer should convey a correct understanding by the writer of the technical terms used in the passage which are involved in the key points.
- articulate expression; the answer should be well-organised in clear, concise English, without ambiguity. It should read fluently, with the links between key points in the original maintained.
- legible handwriting; the reader should be able to read the answer without difficulty at normal reading pace, with only the occasional difficulty with a word.
- points must be in a logical order.

Good style and use of English, with only infrequent minor faults, no use of formulae **(2)**
Frequent minor or a few major faults in style and use of English **(1)**
Very poor style and use of English **(0)**

NB: The quality of written communication mark cannot be lost through word penalties.

(2 marks)

Total for Section B:15 marks

Total for paper: 60 marks