

- M1.** (a) (i) **M1** (yellow precipitate is) silver iodide OR AgI (which may be awarded from the equation)

M2 $\text{Ag}^+ + \text{I}^- \rightarrow \text{AgI}$ (Also scores M1 unless contradicted)

M3 sodium chloride OR NaCl

For M2

Accept multiples

Ignore state symbols

Allow crossed out nitrate ions, but penalise if not crossed out

3

- (ii) The silver nitrate is acidified to

- react with / remove ions that would interfere with the test
- prevent the formation of other silver precipitates / insoluble silver compounds that would interfere with the test
- remove (other) ions that react with the silver nitrate
- react with / remove carbonate / hydroxide / sulfite (ions)
Ignore reference to “false positive”

1

- (iii) **M1 and M2 in either order**

M1 Fluoride (ion) OR F⁻

- M2**
- Silver fluoride / AgF is soluble / dissolves (in water)
 - no precipitate would form / no visible / observable change
- Do not penalise the spelling “fluoride”,
Penalise “fluride” once only
Mark M1 and M2 independently*

2

- (b) **M1** $\text{Ba}^{2+} + \text{SO}_4^{2-} \rightarrow \text{BaSO}_4$

(or the ions together)

M2 white precipitate / white solid / white suspension

M3 Barium meal or (internal) X-ray or to block X-rays

M4 BaSO₄ / barium sulfate is insoluble (and therefore not toxic)

For M1, ignore state symbols

Allow crossed out sodium ions, but penalise if not crossed out

For M2, ignore “milky”

If BaSO₃ OR BaS used in M1 and M4, penalise once only

For M3 Ignore radio-tracing

For M4 NOT barium ions

NOT barium

NOT barium meal

NOT “It” unless clearly BaSO₄

4

(c) **M1** 2(12.00000) + 4(1.00794) = 28.03176

M2 Ethene and CO or “they” have an imprecise **M_r** of 28.0 / 28

OR

Ethene and CO or “they” have the same M_r to one d.p.

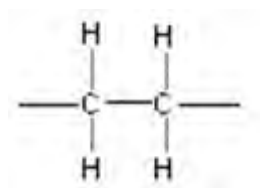
OR

These may be shown by two clear, simple sums identifying both compounds

M3 $C_2H_4 + 2O_2 \rightarrow 2CO + 2H_2O$

(H₂C=CH₂)

M4 Displayed formula



M5 Type of polymer = Addition (polymer)

M1 must show working using 5 d.p. for hydrogen

Penalise "similar" or "close to", if this refers to the imprecise value in M2, since this does not mean "the same"

For M3, accept $\text{CH}_2=\text{CH}_2$ OR CH_2CH_2

For M4, all bonds must be drawn out including those on either side of the unit.

Penalise "sticks"

Ignore brackets around **correct** repeating unit but penalise "n"

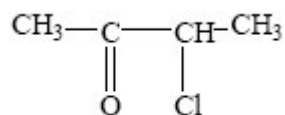
Penalise "additional"

5

[15]

- M2.** (a) GLC or distillation 1
- (b) $\text{C}=\text{O}$ 1
- (c) (i) Cl has two isotopes 1
- (ii) $\text{CH}_3 \overset{+}{\text{C}} = \text{O}$ 1
- $\text{C}_4\text{H}_7\text{ClO}^+ \rightarrow \text{CH}_3 \overset{+}{\text{C}} = \text{O} + \text{C}_2\text{H}_4\text{Cl}^+$ 1
- (d) (i) e.g. CDCl_3 or CCl_4 1
- (ii) $\text{Si}(\text{CH}_3)_4$ 1
- (e) 0 and 3 1

(f)



1

(g) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCl}$ or $(\text{CH}_3)_2\text{CHCOCl}$

1

[10]

M3. (a) Functional group (isomerism)

1

(b)

M1 Tollens' (reagent)
(Credit ammoniacal silver nitrate OR
a description of making Tollens')
(Ignore either AgNO_3 or $[\text{Ag}(\text{NH}_3)_2]^+$
or "the silver mirror test" on their
own, but mark M2 and M3)

M1 Fehling's (solution) or
Benedict's solution
(Ignore $\text{Cu}^{2+}(\text{aq})$ or
 CuSO_4 on their own, but mark on
to M2 and M3)

M2 silver mirror

M2 Red solid/precipitate
(Credit orange or brown solid)

OR

black solid/precipitate
(NOT silver precipitate)

M3 (stays) colourless
or no change or no reaction

M3 (stays) blue
or no change or no reaction

Mark on from an incomplete/incorrect attempt at the correct reagent, penalising M1

No reagent, CE=0

Allow the following alternatives

M1 (acidified) potassium dichromate(VI) (solution)

M2 (turns) green

M3 (stays) orange/no change

OR

M1 (acidified) potassium manganate(VII) (solution)

M2 (turns) colourless

M3 (stays) purple/no change

For M3
Ignore "nothing (happens)"
Ignore "no observation"

3

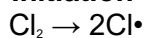
(c) (Both have) C=O **OR** a carbonyl (group)

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(d) (i) (Free-) radical substitution ONLY
Penalise "(free) radical mechanism"

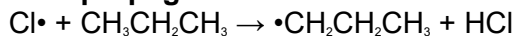
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(ii) **Initiation**



Penalise absence of dot once only.

First propagation

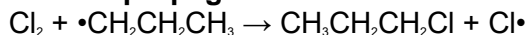


OR C_3H_8

Penalise incorrect position of dot on propyl radical once only.

Penalise $\text{C}_3\text{H}_7\cdot$ once only

Second propagation

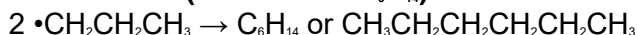


OR



Accept $\text{CH}_3\text{CH}_2\text{CH}_2\cdot$ with the radical dot above/below/to the side of the last carbon.

Termination (must make C_6H_{14})



Use of the secondary free radical might gain 3 of the four marks

4

(e) $M_r = 44.06352$ (for propane)
 $M_r = 43.98982$ (for carbon dioxide)

Mark independently

M1 a correct value for both of these M_r values.

M2 a statement or idea that two peaks appear (in the mass spectrum)

OR

two molecular ions are seen (in the mass spectrum).

