Question 30 (Answer: **D**)

- The C–I bond is the weakest carbon–halogen bond, so it hydrolyses first.
- Silver iodide is a *yellow* precipitate (AgCl is white and AgBr cream).
- So the first organic product has the iodine replaced by OH, with both chlorines still in place.

Question 31 (Answer: **A**)

- Ethanolic NaOH causes elimination rather than substitution.
- With a bromine at each end both eliminate, giving buta-1,3-diene, C_4H_6.
- $M_r = 4(12.0) + 6(1.0) = 54$.

Question 30 (Answer: **A**)

- KCN in ethanol substitutes CN for the halogen, giving a nitrile.
- Ammonia in ethanol gives an amine instead.
- 2,4-DNPH is a test for a carbonyl, and a carboxylic acid with ammonia gives an ammonium salt.

Question 31 (Answer: **C**)

- S_N1 goes through a carbocation, so it needs a *tertiary* halogenoalkane.
- Both C and D use 2-chloro-2-methylpropane, but KOH in *ethanol* causes elimination, not substitution.
- KCN in ethanol does substitute, so C is the S_N1 reaction.

Question 31 (Answer: **D**)

- The rate of hydrolysis is decided by the carbon–halogen *bond enthalpy*, not by the bond polarity.
- C–Br is weaker than C–Cl, so it breaks more easily.
- So 2-bromopropane reacts faster – the C–Cl bond is more polar but stronger.

Question 32 (Answer: **A**)

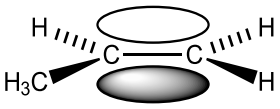
- Replacing each Br with OH gives the alcohol Y.
- The bromine on a carbon bonded to two other carbons becomes a *secondary* alcohol group.
- Oxidising a secondary alcohol gives a ketone, so both statements hold.

Question 38 (Answer: **B**)

- The solvent decides the outcome: *aqueous* NaOH substitutes, *ethanolic* NaOH eliminates.
- Here the reagent is in ethanol, so HBr is eliminated to give ethene.
- That is elimination, not substitution.

4(a)(i)	free-radical substitution

4(a)(ii)	**M1** $C_3H_8 + Cl\bullet \rightarrow CH_3CH_2CH_2\bullet + HCl$ **OR** $C_3H_8 + Cl\bullet \rightarrow C_3H_7\bullet + HCl$ **M2** $CH_3CH_2CH_2\bullet + Cl_2 \rightarrow CH_3CH_2CH_2Cl + Cl\bullet$ **OR** $C_3H_7\bullet + Cl_2 \rightarrow C_3H_7Cl + Cl\bullet$ etc **M3** $CH_3CH_2CH_2\bullet + Cl\bullet \rightarrow CH_3CH_2CH_2Cl$ **OR** $C_3H_7\bullet + Cl\bullet \rightarrow CH_3CH_2CH_2Cl$
4(a)(iii)	homolytic
4(a)(iv)	1,2-dichloropropane
4(a)(v)	**M1** (type of structural isomerism) positional **M2** (type of stereoisomerism) optical
4(b)	sodium hydroxide **AND** water
4(c)(i)	orange to green
4(c)(ii)	$CH_3CH_2CH_2OH + 2[O] \rightarrow CH_3CH_2COOH + H_2O$
4(d)(i)	condensation
4(d)(ii)	**M1** absorption labelled at approx. 1750 cm^{-1} identified as C=O **M2** absorption labelled at approx. 1650 cm^{-1} identified as C=C **M3** absorption labelled at approx. 1170 cm^{-1} identified as C—O
4(d)(iii)	(0.31 / 4.7 × 100 / 1.1) = 6 carbon atoms

3(a)(i)	
3(a)(ii)	yellow precipitate
3(a)(iii)	elimination
3(a)(iv)	
3(b)(i)	$(CH_3)_2CHOH + Na \rightarrow (CH_3)_2CHO^{(-)}Na^{(+)} + \frac{1}{2}H_2$
3(b)(ii)	**M1** correct dipole on $^{\delta+}C—Br^{\delta-}$ **AND** curly arrow from C—Br bond to Br **M2** intermediate  **M3** curly arrow from lone pair of $(CH_3)_2CHO^-$ to C^+
3(b)(iii)	**M1** rate would decrease **M2** C—Br is weaker (than C—Cl, so breaks more easily)
3(b)(iv)	$C_6H_{14}O + 9O_2 \rightarrow 6CO_2 + 7H_2O$