1 **(a) (i)** correct -O- linkage; [1]
correct unit and continuation -O-□- (minimum); [1]

(ii) any name or correct formula of a (strong) acid / H^+; [1]

(iii) contain carbon hydrogen and oxygen /C, H and O; [1]

(b) (i) glucose → ethanol + carbon dioxide [1]

(ii) yeast is catalyst / provides enzymes / speeds up reaction / too slow without yeast; [1]
yeast cells grow / multiply / reproduce / undergo budding / breed; [1]

(iii) heat or high temperature would kill yeast (cells) / heat or high temperature denatures enzymes; [1]
not: enzyme killed / denatures yeast
reduces rate of reaction / slows reaction / (yeast or enzyme) no longer catalyses / no catalyst / stops reaction / no more product; [1]

(c) (i) would produce carbon dioxide or carboxylic or organic acids (if oxygen is present) / to prevent aerobic respiration / so products are not oxidised / anaerobic bacteria can't live with oxygen; [1]

(ii) fossil fuels have a reduced need / conserved / no need to import / will last longer / cracking hydrocarbons to make methane no longer required;
(methane) is renewable / carbon neutral;
reduce pollution of water or sea / prevents visual pollution / prevents need for waste disposal or accumulation (**accept:** any methods of waste disposal) / so that waste is recycled; **any two** [2]

2 **(a) (i)** rate of reaction; [1]
influenced by light / only happens in light; [1]
or:
turns light into chemical energy = [2]
accept: light is catalyst = [1]

(ii) reduction of silver halides; [1]
they are reduced to silver / $2AgCl \rightarrow 2Ag + Cl_2$; [1]
appropriate importance given; [1]
or:
photosynthesis;
correct comment about chemistry carbon dioxide to carbohydrates / carbon dioxide to oxygen;
anything sensible e.g. its role in the food chain or decrease greenhouse effect or oxygen for respiration;
or:
chlorination;
making chloroalkanes;
appropriate importance given;

(b) (i) pressure would move position of equilibrium to right / increase yield of $COCl_2$; [1]
increase pressure favours side with less (gas) molecules / smaller volume; [1]

(ii) increase temperature favours endothermic reaction; [1]
so less products / reduce yield; [1]

(iii) keeps rate high / increase rate at lower temperatures; [1]

(c) each chlorine 1 bp and 3 nbps; [1]
4 e between carbon atom and oxygen atom; [1]
2 nbps on oxygen atom; [1]

[Total: 13]

3 **(a)** addition – polymer only product / only one product [1]
accept monomer has C=C
accept monomer and polymer have same empirical formula
accept no loss of material in polymerisation
not only one monomer

condensation – polymer and water / small molecule formed [1]

(b) -CH_2 – CCl_2-
repeat unit correct [1]
COND continuation [1]

(c) CH_2=$CHOOCCH_3$ [1]

(d) -$OC(CH_2)_4CONH(CH_2)_6NH$-
COND amide correct linkage [1]
correct repeat units [1]
continuation [1]
not NH_2 **or** COOH endings

[Total: 80]

4 (a) **(i)** molecule / unit / simple compound / building block **and** used to make a [1]
polymer / big molecule / long chain / macromolecule

formation of a polymer / big molecule / long chain / macromolecule **or** joining of monomers **and** elimination / removal / formation of a simple or small molecule / H_2O / HCl [1]
note: two points needed for 1 mark in both parts

(ii) -O- linkage [1]
three correct monomer units [1]
continuation [1]

(b) (catalyst **and** from living organism [1]
accept: biological catalyst / protein catalyst

(ii) enzyme denatured / destroyed [1]

(iii) chromatography [1]
locating agent / description of locating agent [1]
measure R_f / compare with standards [1]

5 **(a)** **(i)** many (simple) molecules form one (large) molecule / monomer molecules form one polymer molecule [1]

(ii) addition - polymer is the only product [1]
accept - nX → Xn
condensation polymer and simpler molecules formed [1]
accept nX → Xn + nHC*l* / H_2O

(b) $C_{12}H_{26} \rightarrow C_8H_{18} + 2C_2H_4$ [1]
/ any other correct version

(ii) ethane and chlorine give range of products [1]
/ ethene more readily available than ethane
/ waste half chlorine as hydrogen chloride
/ ethene more reactive than ethane

(iii) electrolysis [1]
aqueous sodium chloride [1]

(iv) must have **three** correct units [1]
cond continuation [1]
accept –(CH2–CH(C*l*))n–

[Total: 9]

6 **(a (i)** lighter / light / lightweight / lower density [1]
does not corrode / rust / oxidised [1]
ignore cheaper / easier to mould

(ii) credit any two sensible suggestions e.g. rope / clothing / netting / string / carpets / fishing line / fishing nets / parachutes / tyres / tents / bottles / thread / umbrellas / curtains / toothbrushes / cassettes / video tapes [2]

(iii) non-biodegradeable / do not rot / do not decompose / persist for years / accumulate
landfill sites limited / getting filled up
visual pollution
danger to fish / animals
(burn to form) toxic gases / harmful gases / pollutant gases / acidic gases / CO / HC*l* / HF / HCN
not oxides of nitrogen / sulfur
any three [3]

(b) (propene / propylene [1]
accept prop-1-ene
not prop-2-ene
CH_3-CH=CH_2 [1]
double bond must be shown

(ii) correct repeat unit (one or more **whole** repeat units must be given) [1]
cond continuation [1]

(c) (amide / peptide / polypeptide [1]

(ii) protein / polypeptide [1]

(iii) $H_2N(CH_2)_6NH_2$ [1]
$HOOC(CH_2)_8COOH$

[Total: 15]