1 **(a) (i)** enzymes are proteins / come from living organisms / biological (catalysts) [1]
not enzymes are living or natural

(ii) carbohydrates have 2H:1O ratio [1]
contain elements of water [1]

contain water = [1]
unless they state that carbohydrates contain water, this response scores 2 or 0

(b) correct -O- linkage [1]
cond same correct monomer (this mark is lost if 2 different boxes are shown) [1]
cond continuation (i.e. bonds at **both** ends) [1]

(c) (i) (concentration or amount or mass etc.) of starch decreases (with time) [1]
(concentration etc.) of starch becomes zero / all starch gone [1]
colour (intensity) indicates how much starch is present (can be inferred) [1]

(ii) enzyme <u>denatured / destroyed</u> [1]
not enzymes killed / don't work / saliva denatured

2 **(a** biodegradable or breaks down naturally
made from a renewable source **or** does not use up petroleum

reduce visual pollution **or** reduces need for landfill sites **or** less danger to wildlife
any **TWO** [2]
ignore mention of toxic gases

(b) ester [1]
accept polyester **or** fat **or** lipid **or** vegetable oil **or** carboxylic acid

(ii) acid **or** carboxylic acid **or** alkanoic acid [1]
alcohol **or** hydroxyl **or** alkanol
NOT formulae **NOT** hydroxide

(iii) condensation [1]
COND because water is formed in reaction
or monomer does not have C=C bond [1]

(c) lactic acid $\rightarrow$ acrylic acid + water [1]

(ii) add bromine (water) or bromine in an organic solvent [1]
remains brown/orange/yellow [1]
goes colourless **NOT** clear [1]
If mark 1 near miss e.g. bromide allow marks 2 and 3
Colour of reagent must be shown somewhere for [3] otherwise max [2]

OR acidified potassium manganate(VII)
purple/pink to colourless

OR alkaline potassium manganate(VII)
purple/pink to green
or purple/pink to brown precipitate

(iii) reagent [1]
observable result [1]

suitable named metal (**NOT** sodium, lead, any metal below magnesium etc.)
if un-named metal [0] result can score [1]
hydrogen evolved or bubbles/effervescence/fizzing

insoluble metal oxide
colour change or dissolves

any carbonate or bicarbonate
gas/carbon dioxide/bubbles/effervescence/fizzing

sodium hydroxide or alkali
temperature increase **or** accept indicator to show neutralisation
unspecified base scores [1] only
NOT alcohol

[Total: 13]

3 **(a)** (fine powder) large surface area [1]
high/faster/collision rate/more collisions/fast collisions
(between solid and oxygen in air) [1]

(ii) carbohydrate + oxygen → carbon dioxide + water [1]
ACCEPT flour

(b) rate depends on light
more light more silver **or** blacker
thicker card less light [3]

(c) **(i)** biological catalyst [1]
accept protein catalyst

(ii) production of energy (from food) [1]
by living "things" **or** by cells, etc. [1]

(iii) "kill" yeast **or** denature enzymes (due to increase in temperature) [1]

(iv) all glucose used up [1]
yeast "killed" **or** denatured **or** damaged by ethanol/alcohol [1]

(v) filter **or** centrifuge [1]
fractional distillation [1]

[Total: 14]

4 **(a)** **(i)** Correct equation [2]
For giving correct formula of alkane and alkene [1] only
Accept alkene and hydrogen

(ii) chlorine [1]
COND light **or** 200°C **or** heat **or** lead tetraethyl
or high temperature MAX 1000°C [1]
ignore comment 'catalyst'

(b) **(i)** same molecular formula [1]
different structures **or** structural formulae [1]

(ii) but-2-ene or cyclobutane [1]
corresponding structural formula [1]
NOT 2-butene

(c) butanol ignore numbers [1]
butane ignore numbers [1]
dibromobutane ignore numbers [1]

(d) **(i)** propene [1]

$CH_3—CH==CH_2$ [1]

(ii) Correct structure of repeat unit [1]
ignore point of attachment of ester group
COND upon repeat unit
shows continuation [1]
If chain through ester group [0] out of [2]

(iii) do not decay or non-biodegradable
shortage of sites or amount of waste per year
visual pollution
forms methane
Any TWO [2]

(iv) form poisonous **or** toxic gases **or** named gas CO, HC*l* HCN [1]
NOT carbon dioxide, harmful, sulphur dioxide

TOTAL = 18

5	(a)	(i)	40	[1]
			80 **or** 40	[1]
			1	[1]
		(ii)	particles have more energy **or** moving faster	[1]
			collide more frequently	
			or collide with more energy	[1]
		(iii)	greater surface area	[1]
		(iv)	flour mills **or** coal mines **or** metal powders	[1]
			or fireworks **or** gunpowder	
	(b)	(i)	collect and measure volume of oxygen	[1]
			or mass **or** count bubbles	
			time	[1]
		(ii)	measure rate in different light levels and comment	[1]
			accept if dark no reaction	
	(c)	(i)	$+6O_2$	[2]
			not balanced that is just O_2 **ONLY** [1]	
		(ii)	linkage ---O----	[1]
			chain	[1]
			minimum to be accepted	

TOTAL = 14