1 **(a) (i)** Any bond t **[1]**

Bond that is formed C=O **or** O-H
Do not insist on double bonds **[1]**

(ii) More energy is released forming bonds **[1]**
than is used breaking bonds **[1]**
For just - more energy released than used [1]
For - energy is released forming bonds and it is used breaking bonds [1]

(b) (i) U **[1]**
235 **[1]**

(ii) treatment of cancer, autoradiographs, tracer, sterilising food, surgical equipment, measuring thickness, checking welds **[1]**

(c) (i) reductant zinc **[1]**
oxidant hydrogen (ions) **[1]**

(ii) magnesium instead of zinc **or** increase concentration of acid **or** copper instead of iron **[1]**

(iii) sacrificial protection **or** stop iron/steel rusting **or** galvanising **[1]**

(d) pink **or** purple **[1]**
to colourless **or** decolourised **[1]**
NOT red **NOT** clear

(ii) $2I^- - 2e = I_2$ **[2]**
unbalanced **ONLY** [1]

[TOTAL = 15]

Question	Answer	Marks
2(a)	any 2 from: carbon dioxide; nitrogen; any named noble gas;	**2**
(b)	any 6 from: carbon monoxide; from incomplete combustion (of carbon-containing fuel); sulfur dioxide; from burning fossil fuels / roasting ores which contain sulphur / volcanoes; oxides of nitrogen; nitrogen reacting with oxygen in car engines / lightning; methane; from anaerobic decomposition / anaerobic decay;	**6**

Question	Answer	Marks
3(a)	CO_2;	**4**
	solid;	
	poor conductor / non-conductor;	
simple molecular / simple (covalent);		
3(b)(i)	cov	**1**

Question	Answer	Marks
3(b)(ii)	all bonds are (very) strong or bonds; **or** bonds need a lot of energy or heat to break; **or** (there are) no weak bonds / no (weak) intermolecular forces;	**1**
3(b)(iii)	weak forces between molecules; **or** weak intermolecular forces or weak van der Waals' forces; **or** low amount of energy needed to break intermolecular / van der Waals' forces;	**1**
3(b)(iv)	no (moving) ions / no mobile or moving electrons / all electrons used in bonding / made of uncharged molecules;	**1**
3(c)	$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$ **or** $NaOH + CO_2 \rightarrow NaHCO_3$ formula of Na_2CO_3 / $NaHCO_3$; whole equation correct;	**2**
3(d)(i)	(com combustion / burning;	**1**
3(d)(ii)	photosyn	**1**
3(d)(iii)	resp	**1**

4 **(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]