

Question	Expected Answers	Marks	Additional Guidance
1	<p>(a) little / very little, increase up to 1850 all have increases ; coal from around 1850 ; petroleum from 1920 / gas from late 1940s ; coal reached a peak in 1990s ; coal only one showing decrease ; oil decreased in 1970s ;</p> <p>steep increase in use from 1950s ;</p> <p>comparative data quotes ;;</p>	[max 5]	
	<p>(b) <i>hydrocarbons to max 3</i> produce carbon dioxide ; greenhouse gas ; carbonic acid / acid rain ; smoke / particles ;</p> <p><i>compounds of sulfur</i> produce sulfur dioxide ; sulfuric acid / acid rain ;</p>	[max 4]	allow acid rain once in answer
	<p>(c) fossil fuels are, non-renewable / AW ; conserve for future generations ; more efficient ways of using them in the future ; alternatives are, expensive / not reliable ; AVP ;</p>	[max 2]	
		[Total: 11]	

2	(a)	(i)	amylase A carbohydrase	[1]	lg odd spelling
		(ii)	<ol style="list-style-type: none"> 1 starch is not soluble / large /complex 2 fungus does not, secrete / produce, amylase 3 for absorption (of glucose) / AW 4 ref to, respiration / growth, (of fungus) 5 as nutrient, for fungus / fermentation / AW 	[max 2]	Mpt 2 A ecf from (i) / carbohydrase / enzyme to digest starch
	(b)		<ol style="list-style-type: none"> 1 other fungi / bacteria / virus / other microorganisms 2 compete for nutrients 3 reduce productivity / yield / quality 4 contaminate the product / produce toxic or harmful product / ORA 5 stop the process (early) and sterilise fermenter 	[max 2]	R contaminate unqualified

2	(c)	<p>energy is lost, between / within, trophic levels / along food chain</p> <p>2 animals are, at second trophic level / primary consumers OR plants are, autotrophs / producers / first trophic level</p> <p>3 (energy lost) in animal respiration / heat / (named) metabolic process / movement</p> <p>4 ref to (more) material that is inedible / not digestible (in longer food chains)</p> <p>5 ref to 10% energy transfer / ORA</p> <p>6 less pollution (from farm animal waste)</p>	[max 3]	<p>Ig ref to healthy diet</p> <p>ref to 100→10→1</p> <p>Mpt 6 A plants use CO₂</p>
	(d)	<p>1 cheaper</p> <p>2 requires less energy as less is lost along food chain</p> <p>3 mycoprotein can be made anywhere / less land (in fermenters)</p> <p>4 less (animal) waste</p> <p>5 better for animal welfare / more ethical</p> <p>6 lower in fat / lowers risk of <u>heart</u> disease</p> <p>7 suitable for, vegetarians / vegans</p> <p>8 AVP e.g. quicker, contains fibre, disease free</p>	[max 3]	<p>Note: Use list rule</p> <p>R longer shelf life, help food shortages, more protein, more nutrients, easier to digest</p>
	(e)	<p>1 mycoprotein / fungus production requires supply of corn (starch)</p> <p>2 this comes from crop plants</p> <p>3 (fungus) still need to be grown</p> <p>4 (manufacture) requires energy</p> <p>5 rate of food supply cannot keep up due to overpopulation</p> <p>6 AVP e.g. does not contain all nec nutrients, may be consumer resistance to eating mycoprotein foods / needs flavourings / unbalanced diet</p>	[max 3]	<p>R required machinery</p>
[Total: 14]				

3	(a)	(i)	$(80 - 30 = 50)$ $50 / 30 \times 100$ OR $\text{max} - \text{min} / \text{original} \times 100 = 167 / 166.7 (\%)$	[2]	<i>two marks for the correct answer (167)</i> <i>if answer incorrect, allow one mark for the correct working / formula</i> R 166, lg sig figs
		(ii)	1 increase in human population / more people to feed 2 more crops being grown / higher yield 3 less land available for farming (land lost to housing etc) 4 farming has become more intensive / technological / less subsistence / AW 5 less use of crop rotation / less land left fallow / monoculture / less use of legumes 6 prevents soil becoming depleted of nitrogen 7 (compounds) 8 new varieties of crop plants have high demand AVP e.g. cheap, easy	[max 3]	
	(b)	(i)	1 protein (in manure) broken down / decompose to amino acids 2 by (named) decomposers, in context 3 amino acids / proteins, deaminated 4 deamination described 5 urea converted to ammonia 6 ammonia / ammonium ions, to nitrite / nitrate ions 7 nitrite to nitrate ions 8 nitrification / nitrifying bacteria, in context	[max 4]	
		(ii)	1 legumes contain nitrogen-fixing bacteria / rhizobium 2 in root nodules 3 nitrogen fixation / convert nitrogen (in atmosphere) to ammonia / amino acids / organic forms of N 4 transferred to legume for making protein 5 increases N (in soil) for <u>next</u> crop 6 reduces need to use chemical fertilisers 7 legumes are good source of protein 8 crop rotation reduces effects of, pests / diseases	[max 3]	

3	(c)	<p><i>waters</i></p> <p>1 <u>eutrophication</u></p> <p>2 growth of algae / algal bloom</p> <p>3 light blocked / toxic substances released by algae</p> <p>4 (fixed) water plants die</p> <p>5 algae / plants, decayed by bacteria</p> <p>6 aerobic respiration</p> <p>7 oxygen concentration decreases in context</p> <p>8 animals / fish, migrate / die, in context</p> <p><i>land</i></p> <p>9 reduction in organic content of soil</p> <p>10 soil / fertilizer, blown / washed / leached, away A erosion of soil</p> <p>11 increase in soil acidity</p> <p><i>atmosphere</i></p> <p>12 increases loss of nitrous oxide / NO_x to the atmosphere</p> <p>13 nitrous oxide / NO_x, is a greenhouse gas</p> <p>14 carbon dioxide from combustion of fossil fuels / in production of fertilisers</p> <p>15 greenhouse effect / global warming, in context</p> <p><i>humans</i></p> <p>16 qualified health effect on humans / livestock</p>	[max 5]	<p>Mpt 15 linked with mpt 13 or 14</p> <p>e.g. blue baby syndrome, accumulation in dioxins</p>
		[Total: 17]		

Question		E	Answers	Marks	Additional Guidance
4	(a)		<i>Gallirallus</i> ;	[1]	R <i>Gallirallus calayanensis</i>
	(b)		<p>(clearing land for) agriculture ; roads / transport ; housing ;</p> <p>fuel ; timber qualified ; e.g. for building material AVP ; e.g. mining / industrialisation</p>	[max 3]	A furniture manufacture / paper
	(c)		<p><i>decrease</i> habitat loss ; fewer nesting sites ; less reproduction ; ref to, camouflage / exposed to predation ; less food / food chain disrupted ; more competition ; higher temperature / more exposure to storms / AW ;</p> <p><i>increase</i> fewer predators ; more food ; fewer competitors ; simpler food web ;</p>	[max 3]	No credit for 'decrease' / 'extinction' / 'increase' without qualification

4	(d)	<p><i>Question asks for reasons why conserving species is important – answers must be in this context</i></p> <p><i>ecological</i> ref to food chain / food web ; interdependence / AW ;</p> <p><i>aesthetic</i> species are unique / AW ; (eco)tourism ; ref to biodiversity ;</p> <p>retain genes / maintain gene pool / AW ; qualified potential use for humans ; AVP ; e.g. ethical considerations for future generations to appreciate</p>	[max 2]	<p>R 'become extinct' without further qualification</p> <p>A maintain / balance ecosystem</p> <p>A 'knock-on' effects / possible example / AW</p>
[Total: 9]				