

Question	Answer	Marks	AO Element	Notes	Guidance
1	<p><i>any five from</i></p> <p>1 protein, broken down / digested / decomposed, to amino acids ;</p> <p>2 by decomposers / fungi / bacteria in terms (in context of breakdown of manure / protein) ;</p> <p>3 ref to use of proteases ;</p> <p>4 deamination (of amino acids / proteins) / described ;</p> <p>5 production of, ammonia / ammonium ions / <math>\text{NH}_3</math> / <math>\text{NH}_4^+</math> ;</p> <p>6 ammonium (ions), converted to, nitrite / nitrate (ions) / <math>\text{NO}_3^-</math> / <math>\text{NO}_2^-</math> ;</p> <p>7 ref. to, <u>nitrification</u> / <u>nitrifying</u> bacteria ;</p> <p>8 AVP ; e.g., nitrite to nitrate ions</p>	6		<i>points must be given in a correct context</i>	

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2	<p><i>any three from:</i></p> <p>if crops are used as food for humans fewer trophic levels in the food chain ;</p> <p>energy lost at each trophic level in the food chain ;</p> <p>90% energy lost / only 10% energy passed on ;</p> <p>energy is lost from the cattle ;</p> <p>any two examples of energy loss from cattle ;;</p> <p>therefore less energy available to humans ;</p> <p>AVP ;</p>	3			
3	<p><i>any two from:</i></p> <p>ciliates eat (many) bacteria ;</p> <p><i>Didinium</i> / predatory ciliates, eat other (named) ciliates ;</p> <p>ciliates may eat, dead / decomposing, material ;</p>	2			

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4	<p><i>any two from:</i></p> <p>1 reduces, extraction / conserves, (named) fossil / non-renewable, fuels ;</p> <p>2 (temporarily) removes, carbon dioxide / greenhouse gases (from atmosphere) / does not add more, carbon dioxide / greenhouse gas (to the atmosphere) / <i>idea that the process is carbon neutral</i> ;</p> <p>3 does not cause / prevents a further increase in, <u>enhanced</u> greenhouse effect ;</p> <p>4 does not cause / prevents further increase in global warming / prevents further climate change ;</p> <p>5 it is a sustainable process / uses renewable fuel source / described ;</p> <p>6</p>	2			

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	AVP ; e.g. described example of less environmental impact caused by use of non-renewable (fossil) fuels ;				
5	<p><i>any two from:</i>  ref. to genetic, diversity / variation ;</p> <p><i>importance of genetic diversity:</i>  plants (grown from seeds) may be adapted to changes in the environment ;  plants (grown from seeds) may be resistant to, diseases / pests ;  (seeds collected) may not, be viable / germinate ;  (seeds collected) may, be diseased / have parasites / AW ;  (seeds collected) may have harmful, alleles / mutations ;  AVP ; e.g., increase in fitness</p>	2			

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6	<p><i>any three from:</i>  concentration of both herbicides decreased (with time) / described ;  <b>A</b> higher concentration than <b>B</b> (throughout) ;  <b>B</b> reached zero concentration before <b>A</b> ;  comparative data quote with units stated ;  <b>A</b> steeper than <b>B</b> initially ;</p>	3			
7	<p><i>use of trees</i>  paper ;  (as building materials) for furniture / construction / poles / boats / AW ;  firewood / fuel ;  to sell ;  <i>clearance of trees for</i>  agriculture ;  urbanisation / roads / housing / factories / industry / developments ;  extraction of, minerals / natural resources ;</p>	3			

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8	<p><i>any three from:</i></p> <p>drought / lack of rain / lack of (irrigation) water ;</p> <p>flooding ;</p> <p>fire ;</p> <p>tsunamis / cyclones / hurricanes ;</p> <p>earthquakes / volcanic eruptions ;</p> <p>plagues of, animals / insect pests ;</p> <p>pests / diseases, of stored food / livestock ;</p> <p>conflict / war ; rising prices of food ; poverty ;</p> <p>unequal distribution of food ;</p> <p>growing, non-food crops / biomass for fuels / crops for export ;</p> <p>increase in population / migration of people ;</p> <p>soil degradation / soil erosion / desertification / salination of soils / loss of soil fertility / barren land / AW ;</p>	3			
9	<p>kills, bacteria / microorganisms / pathogens ;</p>	1			

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10	<p><i>any one from:</i>  reliable / constant, supply ;  produce, large(er) quantities / in a fermenter / bacteria reproduce quickly (to make more genetically engineered bacteria) ;  not dependent on blood donations ;  idea that no (named) health risk(s) ;  higher quality of product ;  AVP ;</p>	1			
11	<p><u>carbon dioxide</u> (produced by respiration) ;  (gas) pressure will increase / AW ;</p>	2			
12(a)(i)	<p>line drawn on graph <b>2</b>, increasing from day 3, more slowly / level ;  line drawn on graph <b>2</b> showing any decrease (in population) at end of candidate's line ;</p>	2			

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12(a)(ii)	<p><i>any five from:</i>  sugar concentration decreases faster between day 6 and 9 ; <b>ora</b></p> <p>no change in sugar concentration / stops decreasing, from day 9 ;</p> <p>the yeast population affects the sugar concentration ;</p> <p>(yeast use sugar) in respiration ;</p> <p>release energy ;</p> <p>rate of sugar decrease is slow, at first / in lag phase, because there are few yeast cells ; <b>ora</b></p> <p>ref. to dead yeast (after day 9) / death phase / AW ;</p> <p>AVP ; e.g. ethanol build up / change in pH, could kill the yeast / some sugar leftover so it is not a limiting factor</p>	<b>5</b>			
13	<p>penicillin ;</p> <p>AVP ;</p>	<b>1</b>			
[Total: 36]					