Question number	Answer	Notes	Marks
1(a) (i)	amino acids / protein / DNA / RNA / nucleic acid;		1
(ii)	nitrogen-fixing;	Allow *Rhizobium*	1
(b)	1. nitrifying (bacteria) / nitrification; 2. nitrite (to nitrate);		2
(c) (i)	1. re movement / more (kinetic) energy / eq; 2. re collisions / more enzyme substrate complexes / eq;		2
(ii)	1. denatured; 2. ctive site; 3. shape altered / bonds broken / eq; 4. substrate no longer fits / eq;	1. Ig re inactive / destroyed 1. Reject death	3

Total 9 marks

Question number	Answer	Notes	Marks
2 (a)	cell membrane; cytoplasm; plasmid; nucleoid / chromosome / DNA once;	reject nucleus / nucleolus ignore vacuole / ribosomes / mitochondria	3
(b) (i)	enzymes; optimum; denatured / destroyed / eq;	ignore references to low pH and high pH	2
(ii)	amino acids; protein / DNA;		2
(iii)	active transport / active uptake; low to high conc. / against conc. gradient / eq; respiration / energy / ATP; root hair (cells); large surface area / eq;		3
(c) (i)	X at 100;	allow any indication at 100	1
(ii)	11.1%;; allow one mark for 8000 or 7200 or 800 in working		2
(iii)	nitrate (already) in soil / nitrogen fixing bacteria / nitrification / organic material in soil / eq;		1
		Total	14

Question number	Answer	Notes	Marks
3 (a)	different diet / different species / eq;	Ignore nitrogen Eg. eat different food / eat more food / different amounts of protein / different amounts of nitrogenous food / different amounts of nitrogen compounds in food / one is carnivorous Eg. type of fish / breed of fish / strains of fish / genes in fish / metabolism of fish	1
(b)	28.9 / 28.92;	Allow one for 0.4 / 0.0723 / 2.5 in working Allow 28.9 / 28.92 in working for 2 marks if 29 on answer line	2

(c)	1. plant / algae growth / algal bloom / eq; 2. algae block light; 3. less photosynthesis; 4. ecomposers / decomposition / bacteria / microbes / <u>micro</u>organisms / fungi; 5. respiration; ONCE 6. oxygen depletion / anoxic; ONCE 7. death of plants / fish / organisms;		Max 5

(d)	1. ead / attenuated / harmless / inactive / weakened / modified / pathogen / bacteria / microbe / microorganism / virus / eq; 2. an gens; 3. memory cells; 4. secondary immune response / <u>faster immune</u> response / antibody produced <u>faster / sooner / quicker / more</u> ;	Dead form of the disease = 0 Dead strain = 0 Ignore dead virus Ignore antibody production in primary immune response	4

Question number	Answer	Notes	Marks
4 (a)	A evaporation; B transpiration; C precipitation / rain / snow / eq;		3
(b)(i)	1. ess transpiration / less water loss from plants / eq; 2. less loud formation / condensation; 3. less precipitation / rain / less water falls on the ground / eq;	1. Ig re water remains in soil 2. Ig re humidity	Max 2
(ii)	1. (less) photosynthesis; 2. re <u>carbon dioxide</u> in air / less <u>carbon dioxide</u> absorbed; 3. less onsumption of plants / eq; 4. less <u>decomposition</u> / <u>decay</u>; 5. bur ng of trees produces <u>carbon</u> <u>dioxide</u>;		Max 4

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>5 (a)</td><td>
<table>
<tr><th>Stage</th><th>Number</th></tr>
<tr><td>absorption</td><td>8</td></tr>
<tr><td>denitrification</td><td>6 / 7;</td></tr>
<tr><td>nitrogen fixation</td><td>1;</td></tr>
<tr><td>excretion</td><td>3;</td></tr>
<tr><td>decomposition</td><td>2;</td></tr>
</table>
</td><td></td><td>4</td></tr>
<tr><td>(b)</td><td>1 active transport / active uptake;
2 low concentration to high concentration / against concentration gradient / eq;

3 energy / ATP;
4 root <u>hair</u> (cell);</td><td>ignore diffusion
ignore along concentration gradient</td><td>3 max</td></tr>
<tr><td></td><td></td><td>Total</td><td>7</td></tr>
</table>

Question number	Answer	Notes	Marks
6 (a)	A nitrogen fixation / nitrogen fixing; B decomposition / decomposing / decay; C nitrification / nitrifying; D denitrification / denitrifying;	No mark if list given A. allow nitrogen fixing bacteria B. gnore decomposers / rotting / breakdown C. allow nitrifying bacteria D. allow denitrifying bacteria	4
(b)	1. bacteria; 2. fungi;	ignore nitrogen fixing / nitrifying bacteria / denitrifying bacteria / mushroom / toadstool / protoctists / detritivores / worms	2
(c)	1. absorption by roots / root hair cell; 2. active transport / active uptake; 3. (make) amino acids / (plant) protein; 4. assimilation / assimilate; ONCE 5. eaten / ingested by animal / herbivore; 6. digestion / digests / digested / eq; 7. protease / named protease;	1. ignore root nodules 7. ignore enzyme	4

Question number	Answer	Notes	Marks
6 (d)	1. cheaper / readily available / less transport needed / renewable / sustainable / recycles / eq; 2. ess eutrophication / leaching / run off / pollution / slow release of ions / less soluble / eq; 3. improves soil structure / holds water / stops erosion / eq;	allow converse ignore less harm to environment / damage to wildlife / more natural / idea that chemicals harm humans	2

(Total for Question = 12 marks)