

BY4 January 2014

Question	Marking details	Marks Available
1 (a)	There more {microorganisms/ bacteria/ fungi} in indoor air than outdoor air samples;	1
(b)	(Different) pH; (Different) C {source/ concentration}; (Different) N {source/ concentration}; (Different) growth factors: {Different/ different concentration} Vitamins/minerals; NOT nutrients Any 4 1 mark per pair	max 2
Question 1 total		[3]

Question	Marking details	Marks Available	
2	(a)	Legumes/ leguminous;	1
	(b)	Contain nitrogen fixing bacteria/ OWTTE; (must be correct context, not plant fixing nitrogen) Such as <i>Rhizobium</i> ; (Some) {nitrogenous compounds/ ammonium ions/ ammonia/ amino acids} pass to the <u>plant</u> ; NOT nitrate/ nitrogen Allows the plant to grow in poor soil/ used for {amino acid/ proteinsynthesis};	max 3
	(c)	<i>Nitrosomonas</i> converts <u>ammonia to nitrites</u> ; <i>Nitrobacter</i> converts <u>nitrites to nitrates</u> ; <i>Accept diagram/equation</i> Which the plant can {absorb/take up} (from the soil); And use for {nucleic acid/eq or protein synthesis};	max 3
Question 2 total		[7]	

Question	Marking details	Marks Available
3	(a) millivolts/mV; NOT microvolts milliseconds/msec/ ms;	2
	(b) A Resting potential; B Depolarisation C Repolarisation; D Hyperpolarisation/ refractory ;	4
	(c) (i) Threshold (potential);	1
	(ii) Failed to reach threshold potential; All or nothing response; -55; So (too few) sodium gates opened/not enough depolarisation;	max 2
	Question 3 Total	[9]

Question	Marking details	Marks Available
4	<p data-bbox="284 286 316 315">(a)</p> <ul style="list-style-type: none"> <li data-bbox="475 286 1150 315">• Low water levels in blood/high osmotic potential/low Ψ; <li data-bbox="475 331 847 360">• Detected by <u>osmoreceptors</u>; <li data-bbox="475 376 719 405">• In <u>hypothalamus</u>; <li data-bbox="475 421 1142 450">• (More) <u>ADH</u> secreted from (posterior lobe of) <u>pituitary</u>; <li data-bbox="475 465 799 495">• {Into/travels in} blood to; <li data-bbox="475 510 1166 629">• {collecting duct/distal convoluted tubule}{ becomes more permeable/more aquaporins/ more water channels in membranes}; <li data-bbox="475 645 715 674">• Water absorbed; <li data-bbox="475 689 858 719">• Because of low Ψ in medulla; 	max 6
(b)	<p data-bbox="379 831 1222 904">(i) As plasma solute concentration increases to 282 there is no increase in ADH/ the concentration of ADH remains constant; After 282 there is {a proportional/ rapid} increase in ADH; (increase must be qualified)</p>	2
	<p data-bbox="371 1099 1161 1173">(ii) (Up to 293 au) ADH can achieve sufficient water reabsorption/ OWTTE; After this point {water needs to be taken in/ by drinking} to <u>avoid dehydration</u>;</p>	2
(c)	Blood loss/vomiting; NOT dehydration/ anaemia	1
Question 4 Total		[11]

Question

Marking details

Marks Available

5 (a)

8

	<i>Name of stage</i>	<i>Precisely what is happening in the culture</i>
A	Lag;	Cells are rehydrating/ Yeast is synthesizing enzymes/ gene activation; NOT adapting/ acclimatizing/DNA replication
B	Log/Exponential;	Cells are {dividing/budding/ replicating/ fission} (at maximum rate) eq; NOT rapid growth
C	Stationary;	Cells are dying in equal numbers to those produced by division; NOT births=deaths
D	Decline/death;	There is a build up of <u>ethanol</u> which is killing the cells;

(b)

Pyruvate is converted to ethanal/acetaldehyde;
With the removal of CO₂/ by decarboxylation;
Ethanal/acetaldehyde is reduced to ethanol;
Using the NADH₂/ reduced NAD/ NADH. ;
Or correct diagram for 3max
Accept Pyruvate is converted to ethanol = 1 mark (alternative to MP 1 and 3)

4

Question 5 Total

[12]

Question	Marking details	Marks Available
6 (a)	<p><u>Similarities</u></p> <p>(Both contain) a 5 carbon sugar; Both have two phosphate groups; Both contain (two) nitrogenous bases/ adenine/ organic base; Dinucleotide; Accept adenosine for 1 mark if MP1 and 3 not awarded</p> <p><u>Differences</u></p> <p>FAD only contains one (ring form) sugar and NAD contains 2/ One 5C sugar is in its linear form in FAD <u>and</u> both 5C sugars are in ring form in NAD/ NAD contains nicotinamide and FAD contains flavin/ FAD has a three ring base and NAD has one ring base;</p>	max 2
(b) (i)	The bond between the {terminal/last two} phosphate groups on ATP;	1
(b) (ii)	Does not involve the ETC/complex series of carriers and pumps; Does not need stalked particles/ATP synthetase; Does not need an electrochemical gradient/eq; Does not require oxygen; Accept 'Does not require mitochondria' as alternative to MPs 1, 2,3	Max 2
(b) (iii)	Arrows showing In the conversion of triose phosphate to pyruvate; After the 5C compound in the Krebs's cycle;	2
(b) (iv)	4; 2;	2
(c) (i)	In the mitochondrial matrix;	1
(c) (ii)	Dehydrogenase AND decarboxylase;	1
Question 6 Total		[12]

Question	Marking details	Marks Available
7 (a)	It stops electrons from PS II being moved to PS I; So blocking the reduction of NADP^+ to NADPH; Cyclic Photo Phosphorylation only involves PSI; is not stopped as the electrons pass from PSI and return to PSI/ eq; And the carrier involved in this is not affected;	4
(b)	Plant cannot generate { NADPH_2 / NADPH/ reduced NADP} {so Calvin cycle cannot work/ description of part of process which is prevented}; {No glucose/ hexose sugar} will be formed; For respiration;	3
(c) (i)	1. Ribulose bisphosphate; 2. Glycerate(-3-)phosphate; 3. Glyceraldehyde(-3-)phosphate/triose phosphate;	3
(ii)	<u>Catalyses</u> {the reaction between RuBP and carbon dioxide/ to fix carbon dioxide} ;	1
(iii) X	ATP;	2
Y	NADPH_2 ;	
(iv) A	CO_2 Fixation/ 6C intermediate/ RuBP binds to CO_2 ;	3
B	Regeneration/resynthesis of RuBP;	
C	Reduction;	
Question 7 Total		[16]

Question	Marking details	Marks Available
8 (a)	Viable count mark scheme	
	<p>A Viable count is counting living cells;</p> <p>B As opposed to a direct count which counts both living and dead cells;</p> <p>C One cell gives rise to one colony/so N° of colonies = N° of viable cells;</p> <p>D Use of aseptic technique + example; (eg flaming neck of bottle etc)</p> <p>E Sterilisation of equipment and media + example; (eg autoclave/ oven/ radiation)</p> <p>F Serial dilution;</p> <p>G Culture needs diluting by ten-fold steps;</p> <p>H 1cm^3 of original sample added to;</p> <p>I 9cm^3 of (sterile) water;</p> <p>J (Mixed and) process repeated;</p> <p>K Known volume(or eg such as $1\text{cm}^3/0.5\text{cm}^3$) of microorganisms are added to agar plates;</p> <p>L Incubated at 25°C (up to 37°C) for 24-48 hours; Must state a temperature and time</p> <p>M Count N° of colonies in {appropriate plate/appropriate number of colonies};</p> <p>N Multiply by dilution factor to calculate No of cells per cm^3 in original sample;</p> <p>O Some comment on unreliability eg reference to clumping of cells;</p>	
	Question 8a Total	[10]

Question	Marking details	Marks Available
8 (b)	<p data-bbox="427 309 708 331">Synapse mark scheme</p> <p data-bbox="368 367 863 389">A A synapse occurs between neurones;</p> <p data-bbox="368 434 1177 456">B The impulse across a synapse is chemical (rather than electrical);</p> <p data-bbox="368 501 628 524">C Neurotransmitter;</p> <p data-bbox="368 568 756 591">D Acetylcholine/noradrenaline;</p> <p data-bbox="368 636 796 658">E Is enclosed in synaptic vesicles;</p> <p data-bbox="368 703 828 725">F Arrival of an action potential at the;</p> <p data-bbox="368 770 820 792">G Axon terminal/(pre) synaptic knob;</p> <p data-bbox="368 837 975 860">H Causes Ca^{2+} ions to flow into the axon terminal;</p> <p data-bbox="368 904 1214 927">I This causes synaptic vesicle to fuse with the <u>presynaptic membrane</u>;</p> <p data-bbox="368 972 975 994">J Neurotransmitter is released by <u>exocytosis</u> and;</p> <p data-bbox="368 1039 815 1061">K <u>Diffuses</u> across the <u>synaptic cleft</u>;</p> <p data-bbox="368 1106 1139 1128">L Where it binds with receptors on the <u>post synaptic membrane</u>;</p> <p data-bbox="368 1173 772 1196">M Which open sodium channels;</p> <p data-bbox="368 1240 684 1263">N allowing Na^+ to enter;</p> <p data-bbox="368 1308 780 1330">O The membrane is depolarised;</p>	
Question 8b Total	[10]	