



**General Certificate of Education
June 2010**

Biology

BIO6X

**Externally Marked Practical Assignment
(EMPA)**

Final

Mark Scheme

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TASK 1

Question	Part	Marking Guidance	Mark	Comments
1		e.g. Length of root as its <u>longest</u> / total length as not always easy to <u>distinguish</u> root and shoot/shoot length as it was less easily <u>damaged</u> /root because <u>straightest</u> /less tangled/strongest;	1	Award mark for reason
2	(a)	Biased method = 0 Some attempt at randomisation =1 e.g. "bran tub" method/seedlings lined up (unqualified) Unbiased random =2 e.g. Grid lines drawn on base of Petri dish/seedlings numbered /seedlings lined up (on bench); Use random numbers/systematic method (for choosing seedlings);	2 max	
2	(b)	Able to use statistics/removes bias/representative sample;	1	Neutral reliable/accurate Reject remove anomalies
3		Seedling curled/not straight/tangled/brittle; Use piece of cotton/stretch out/ straighten against ruler/measure broken pieces; Difficult to see start/end of radicle; Measure whole length; Seedlings difficult to see; Put it on black paper/ use a magnifying glass;	2 max	Must be marked as pairs
4	(a)	Running means calculated correctly;	1	At least one decimal place To score this mark data must be collected independently by the candidate.
4	(b)	Look for number of samples where mean does not change/changes little/mean shows less fluctuation;	1	

TASK 2

Question	Part	Marking Guidance	Mark	Comments
5	(a)	Clear statement of null hypothesis; e.g. there is no effect of different concentrations of sodium chloride on the root growth of lettuce seedlings	1	Accept any valid independent/dependent variable
5	(b)	Standard error and (95% confidence limits);	1	Accept Spearman rank correlation
5	(c)	This test determines if there is a difference between the means of two samples;	1	For Spearman rank correlation accept this test determines if there is an association between two variables
5	(d)	Test statistic correctly calculated;	1	Spearman rank has to be negative for mark
5	(e)	Spearman rank: If '1' or more than 1 <u>reject</u> null hypothesis; At critical value; If less than 1 <u>accept</u> null hypothesis; As lower than critical value; OR Standard error of the mean: Correct statement concerning <u>acceptance/rejection</u> of null hypothesis; Overlap of confidence limits used to determine if significant difference exists;	2	Use candidate's value of test statistic even if calculated incorrectly Reject 'prove' or 'disprove'

EMPA Test**Section A**

Question	Part	Marking Guidance	Mark	Comments
6		7.5 cm ³ sodium chloride and 2.5 cm ³ distilled water;	1	
7	(a)	Sufficient to get enough data for <u>statistical test</u> ; Not too many so they are crowded/become tangled/difficult to count;	1 max	
7	(b)	Award mark for reason; e.g. maintain distance so they do not <u>compete</u> with each other	1	No mark for arrangement
8	(a)	Evaporation would lead to loss <u>of water</u> ; This would increase concentration of salt solution / decrease water potential of salt solution;	2	Reject water loss from seeds
8	(b)	It would decrease oxygen availability; Would stop respiration/would inhibit respiration; Could encourage fungal growth/growth of mould;	2 max	

9	(a)	As NaCl concentration increases the percentage (of seeds growing roots) <u>and</u> (mean) root length decrease; Percentage (of seeds growing roots) decreases above 0.05 (mmol dm⁻³); Root length falls uniformly up to 0.10 (mmol dm⁻³) then falls less steeply after 0.10 (mmol dm⁻³); No overlap of SD / SD decreases as concentration (of NaCl) increases; At 0.05 (mmol dm⁻³) all seedlings are growing (roots) but have shorter (mean) root length;	3 max	
9	(b)	Increased sodium chloride concentration decreases water potential/makes water potential more negative outside seeds/in surrounding solution; Seeds take up less water; By osmosis; Reduces enzyme activity/named enzyme activity;	3 max	<i>Allow lose water</i> <i>Reject named reaction</i>
10		Lay tape/rope at right angle/perpendicular to road; Take samples at regular/stated intervals; Using a quadrat; Count numbers/percentage cover of dandelions; Use several transects;	4 max	

Section B

Question	Part	Marking Guidance	Mark	Comments
11	(a)	Increased <u>soaking</u> temperature decreases germination in seeds (germinated) at 35°C / soaking and germinating at 35°C results in failure (to germinate); Soaking at 20°C and 25°C has no effect on seeds germinated at 20°C; (Soaking above 30°C) may denature enzymes/proteins;	3 max	<i>In 3rd marking point: Accept description of denaturation Reject breakage of <u>peptide</u> bonds</i>
11	(b)	So that they could compare different numbers of seedlings;	1	
12		Affects germination of Y more than (germination of) X; After four days: No effect on (germination of) X up to 15 (mmol dm ⁻³) and then constant decrease / (causes) sharp decrease in (germination of) Y up to 15 (mmol dm ⁻³) and then more gradual decrease; After eight days: Decrease in (germination of) X up to 45 (mmol dm ⁻³) and then no further decrease / sharp decrease in (germination of) Y up to 15 (mmol dm ⁻³) and then more gradual decrease;	3	
13	(a)	Heat at 100°C / heat to temp to evaporate water; Weigh and heat until no further change in mass;	2	Value which would not burn material
13	(b)	Amount of water present will vary; This will affect fresh mass / will not affect dry mass;	2	

14		1. Evidence for red oak is reliable because 100% healthy and large sample size / evidence for paper birch unreliable because sample size too small; 2. Other species show injury so may not be tolerant; 3. Amount of injury is subjective so not reliable; 4. Paper birch is 100% healthy with high chloride in tissues so may be tolerant;	4	
15		(Resource B suggests that) sodium chloride decreases the percentage germination (of barley); (Resource C suggests that) sodium chloride decreases the yield of some grasses/named grasses/named crops; (Resource D suggests that) the damage in susceptible plants/trees is associated with chloride accumulating in the tissues; Some plants/ trees are able to prevent chloride from entering the tissues and are not damaged;	4	