

MARK SCHEME for the May/June 2010 question paper
for the guidance of teachers

9700 BIOLOGY

9700/32

Paper 32 (Advanced Practical Skills 2),
maximum raw mark 40

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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| Question | Expected Answers | Additional Guidance | Marks |
|--|---|---|-------|
| 1 (a) (i) Calculate the surface area of each bead and the mean surface area of beads. | | | |
| MMO decision 1 | 1. 5 or more (bead radii/diameters); | | [1] |
| MMO collection 1 | 2. measures diameter or records radius | AND units mm; Reject any measurements not whole number of mm Reject 6 mm or more for diameter or 3 mm or more for radius | [1] |
| ACE interpretation 1 | 3. one correct calculation for one bead surface area; | | [1] |
| PDO display 2 | 4. shows addition of bead measurements divided by number measured or each surface area added together and divided by number; | | [1] |
| | 5. answer no more than 3 sig. figs.; | | [1] |

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|---|--|--|---|-------|
| (ii) Prepare the space below to record your observations. | | | | |
| PDO recording 2 | 1. table with all cells drawn | (heading top/left) AND surface area (/)mm ² or no. of beads; | Reject if units in body of table | [1] |
| | (heading) 2. colour/observation; | | | [1] |
| MMO collection 2 | 3. only records at 2, 4 and 6 (minutes); | | | [1] |
| | (highest no. of beads) 4. yellow/green; | | | [1] |
| MMO decisions 3 | 5. surface area recorded; | | | [1] |
| | 6. use 20 beads in one tube and at least 3 different numbers of beads; | | | [1] |
| | 7. even range; | | | [1] |
| (iii) The student realised that there were two independent variables in this procedure. State the two independent variables. | | | | |
| ACE interpretation 1 | surface area or number of beads | AND enzyme or yeast concentration/quantity; | Reject more than two variables | [1] |

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| (iv) Suggest how you would make three improvements to the student's procedure. | | | |
| ACE improvements 3 | idea of cubes with equal volume of yeast; | Reject amount | [1] |
| | idea of equal shaking; | | |
| | repeat measurements AND mean or average; | | [max 2] |
| | colorimeter/white card or pH paper or meter; | | |
| | separate beads using Petri dish/larger container; | | |
| | use thermostatically-controlled water-bath; | | |
| | idea keep time the same e.g. stagger start or have separate experiments; | | |
| | use more beads or more surface areas; | | |

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| (b) Describe and explain the results shown in Table 1.2. | | | |
| ACE conclusions 3 | 1. (in context of data) stops increasing or levels off or stops or stays constant or no more carbon dioxide or reaction stops; | | [1] |
| | (in any correct context use of) 2. enzyme or catalase or active sites or ESCs; | | [max 2] |
| | 3. glucose or substrate fits into active sites or forms ESCs or (slowing or stops) lack of glucose or substrate or glucose not high enough or build up of product or ethanol lack of oxygen build up of carbon dioxide change in pH carbon dioxide dissolves into glucose or substrate or solution or water; | | |
| | Total | | [19] |

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|--|---|---|--|--|-----|
| 2 (a) (i) Draw a large plan diagram of a half of the specimen as shown in Fig. 2.1. Label xylem and the cortex. | | | | | |
| PDO layout 1 | clear, sharp, (not thicker than grid line for whole line) unbroken lines | AND no shading | AND large 5 cm or more from centre of stele to epidermis; | Reject if overlaps the text of question | [1] |
| MMO collection 2 | no cells | AND drawn only half with detail (shown by epidermis line); | | | [1] |
| | endodermis shown by two lines | AND length between epidermis and endodermis is at least twice the diameter of stele; | | | [1] |
| MMO decision 2 | draws region of xylem central; | | | | [1] |
| | Reject if any label is biologically incorrect. one correct label with label line from xylem or cortex; | | | Reject if any writing on drawing | [1] |

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| (ii) Make a high-power drawing of a group of three complete touching xylem vessels and a group of three complete touching cortex cells. Reject all marks if only two cells drawn except label mark? | | | | |
| PDO layout 1 | 1. clear, sharp, (not thicker than grid line for whole line) unbroken lines | AND no shading | AND smallest group of complete touching cells will not fit inside 6 × 6 cm grid; | [1] |
| MMO collection 2 | only 6 complete cells drawn | AND two groups of 3 touching cells; | | [1] |
| | cell wall in at least one cell drawn angular in one group of three | AND other group of cells rounded; | | [1] |
| MMO decision 2 | (xylem) thicker cell wall than (cortex) cell walls; Measure thickest on both. | | Allow only if cell walls drawn as double lines for both groups of cells | [1] |
| | correct labels with label lines to lumen in xylem AND any cell wall; | | Reject if any writing on drawing | [1] |

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|--|--|----------------------------------|--|-----|
| (b) (i) Calculate the magnification of the specimen shown in Fig. 2.2. Actual length of line X = 1900 μm. | | | | |
| MMO collection 1 | measures line X correctly with mm or cm; | | [1] | |
| ACE interpretation 2 | show in last calculation before answer 52 or 52.5 or 53 or 53.5 or 54 with 1.9 OR 5.2 or 5.25 or 5.3 or 5.35 or 5.4 with 0.19 OR 52000 or 52500 or 53000 or 53500 or 54000 with 1900; | | [1] | |
| | correct calculation of any figure divided by 1900 or 1.9 or 0.19; | | [1] | |
| (ii) Prepare the space below so that it is suitable for you to record the observable differences between the specimens on slide M1 and in Fig. 2.2. | | | | |
| PDO recording 2 | organise as a table/venn diagram/ruled connected boxes | AND headed M1 and Fig 2.2 | AND all comparative statements opposite each other; | [1] |
| | only differences recorded; | | | [1] |

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| ACE interpretation 2 | feature | M1 | Fig. 2.2 | Reject all ticks with crosses unless have key | [max 2] |
|----------------------|------------------------------------|--|---|--|---------|
| | 1. xylem shape | star-shape; | | | |
| | 2. xylem position | centre; | | | |
| | 3. phloem | clearer or can see or present | not clear or cannot see or absent; | | |
| | 4. pith | absent | present; | | |
| | 5. thickened cells under epidermis | absent | thick ring/present; | | |
| | 6. epidermis layers | one or thin(ner) | two or thick(er); | | |
| | 7. size cortex stele/xylem | larger/wider/thicker or more smaller/narrower/thinner or less | smaller/narrower/thinner or less larger/wider/thicker or more; | | |

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| (c) Plot a graph of the data shown in Table 2.1. | | | | |
| PDO layout 4 | O | x-axis time /hr(s) or hour(s) | y-axis AND vol(ume) /cm ³ hr ⁻¹ ; | Must have units [1] |
| | S | scale as 1hr to 2 cm (allow no 0) Allow 1 at origin as long as 1hr to 2 cm must label origin. | AND 0.5 cm ³ to 2 cm; Allow 0. 5 at origin must label origin if not 0 | Reject S if awkward scale [1] |
| | P | correct plotting with crosses or dot in circle; | Intersection of cross must be clear to show plot | Reject P plotting if awkward scale Reject if only blobs or dots or blobs in circles [1] |
| | L | straight line between all points or smooth curve through all points; | Quality – no thicker than on grid, not feathery for the complete line Joining plots <ul style="list-style-type: none"> • <u>Ruled lines plot to plot</u> • <u>Curve through all plots</u> Extrapolation <ul style="list-style-type: none"> • Not beyond x- or y-axis • If in context of data correct to go to 0,0 must be within 2 mm of 0 If not correct in context of data then no extrapolation at either end of data | Reject if not five plots [1] |
| | | Total | | [21] |