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MARK SCHEME for the March 2016 series

9700 BIOLOGY

9700/33 Paper 3 (Advanced Practical Skills), maximum raw mark 40

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question or by extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore
AVP	Alternative valid point (examples given as guidance)

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1 (a) (hazard and level of risk)
corrosive + medium or high ; **[1]**

(b) (i) 1 at least four percentage concentrations of protein ;

2 volumes of **P** for three percentage concentrations of protein ;

3 volumes of **P** and **W** for three percentage concentrations of protein make $5\,cm^3$; **[3]**

(ii) volume of, sample / protein solution, to test
or
volume of reagents (potassium hydroxide solution / **K** and copper sulfate solution / **C**) ; **[1]**

(iii) 1 table drawn + heading for percentage concentration of protein ;

2 headings for colour / observation + (scale) number ;

3 records results for at least four concentrations of protein ;

4 appropriate result for 1% protein solution ;

5 appropriate result for solution with lowest concentration of protein ; **[5]**

(iv) stated protein concentration of **U** matched to number and results in **(b)(iii)** ; **[1]**

(v) appropriate error identified ; e.g. difficulty of judging colour **[1]**

(c) (i) 1 two correct variables ; ; e.g. volume of urine sample
+ volume of reagents (**K** and **C**)
2 shaking or mixing of solutions

3 correct description of any one method ;
e.g. using syringe to standardise volume
stated method to standardise mixing **[3]**

(ii) 1 (*x*-axis label) protein concentration / $\mu g\,cm^{-3}$ +
(*y*-axis label) absorbance ;

2 (scale on *x*-axis) 200 to 2 cm, labelled at least each 2 cm +
(scale on *y*-axis) 0.2 to 2 cm, labelled at least each 2 cm ;

3 correct plotting of six points as small crosses or dots in circles ;

4 six plots + thin smooth line of best fit to zero or ruled lines exactly point to point ; (not including anomalous result) **[4]**

(iii) circle around plotted point on graph at 200, 0.36 ; **[1]**

(iv) 1 shows how to read off concentration of protein from graph at 0.49 ;

2 correctly estimates concentration of protein + $\mu g\,cm^{-3}$; **[2]**

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2 (a) (i) 1 sharp and continuous line for outer walls of cells ;

2 size at least 50 mm across largest cell + no shading ;

3 two touching cells drawn for each slide ;

4 both cells in **S1** drawn with cell surface membrane pulled away from cell wall ;

5 label line + label to cell wall of one of the cells ; **[5]**

(ii) 1 (solution) **S1** ;

2 correct explanation in terms of water potential ;

3 direction of water movement + cell (surface) membrane away from cell wall / plasmolysis ; **[3]**

(b) (i) 1 cell **D**: wavy outline ;

2 cell **D**: 9–11 folds ;

3 cell **Z**: smooth outline with sharp, continuous line ; **[3]**

(ii) cell **D** annotation: wavy / folded, cell (surface) membrane
or
cell **Z** annotation: cell (surface) membrane, smooth / not folded ; **[1]**

(iii) (cell **D** and cell **Z**) have different water potentials
or
cell **D** has higher water potential than (surrounding) solution
or
cell **Z** has same water potential as (surrounding) solution ; **[1]**

(c) (i) 1 correct measurements for all cells + recorded as whole numbers (or to 0.5) + units in mm ;

2 (for all five cells) shows division by 1430 ;

3 (for all five cells decides on correct conversion of mm to μm) multiplies by 1000 ; **[3]**

(ii) 1 shows addition of measurements from **(c)(i)** + division by 5 ;

2 answer shown to whole number or to appropriate accuracy + μm ; **[2]**

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