

STUDENT CODE:

Student Code: \_\_\_\_\_

## 22<sup>nd</sup> INTERNATIONAL BIOLOGY OLYMPIAD

July 10-17, 2011

Taipei, Taiwan



### PRACTICAL TEST 4

### PLANT ANATOMY, PHYSIOLOGY, AND GENETICS

Total Points: 100

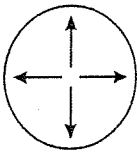
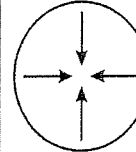
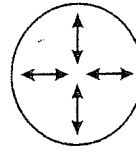
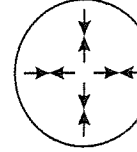
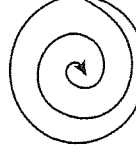
Duration: 90 minutes

## ANSWER KEY

**Q1.A.1. (2 point each, 6 points total) Check [X] the correct answers**

	Part A	Part B	Part C	Part D
Section X		X		
Section Y	X			
Section Z			X	

**Q.1.A.2. (Single answer, 4 points) Check [X] the correct answers**

				
	X			

**Q.1.B. (3 points for each plant, points are given when all correct answers are selected; 6 points total)**

Check [X] the correct answers

Distribution pattern of vascular bundles in the stem	Plant V	Plant W
arranged in a ring	X	
scattered in ground tissue		X
solid vascular cylinder with star-like xylem		
central core of parenchyma cells surrounded by rings of xylem and phloem		

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**Q.1.C.1 (8 points)**

Fill in the correct answers

(a)

i) 3  $\mu\text{m}$ . (1 point)

ii) 40  $\mu\text{m}$  ( $\pm 10$ )  $\mu\text{m}$ . (3 points)

(b)

i) 0.25 ( $\pm 0.05$ )  $\text{mm}^2$ . (1 point)

ii) 130 ( $\pm 50$ ) (stomatal number / $\text{mm}^2$ ). (3 points)

**Q.1.C.2 (6 points, points are given when all correct answers are selected)**

Check [X] the correct answers

	True	False
Few or no stomata on the upper epidermis	<b>X</b>	
Many stomata on the lower epidermis	<b>X</b>	
An aquatic plant		<b>X</b>

**Q.1.D (1 point each, 5 points total)**

Check [X] the correct answers

Plant	Monocot	Dicot
K		<b>X</b>
V		<b>X</b>
W	<b>X</b>	
M	<b>X</b>	
N		<b>X</b>

**Q.1.E ( 6 points for each plant with the presence of crystals, points are given when all correct answers are selected ; 2 points for the plant with the absence of crystals; 20 points total )**

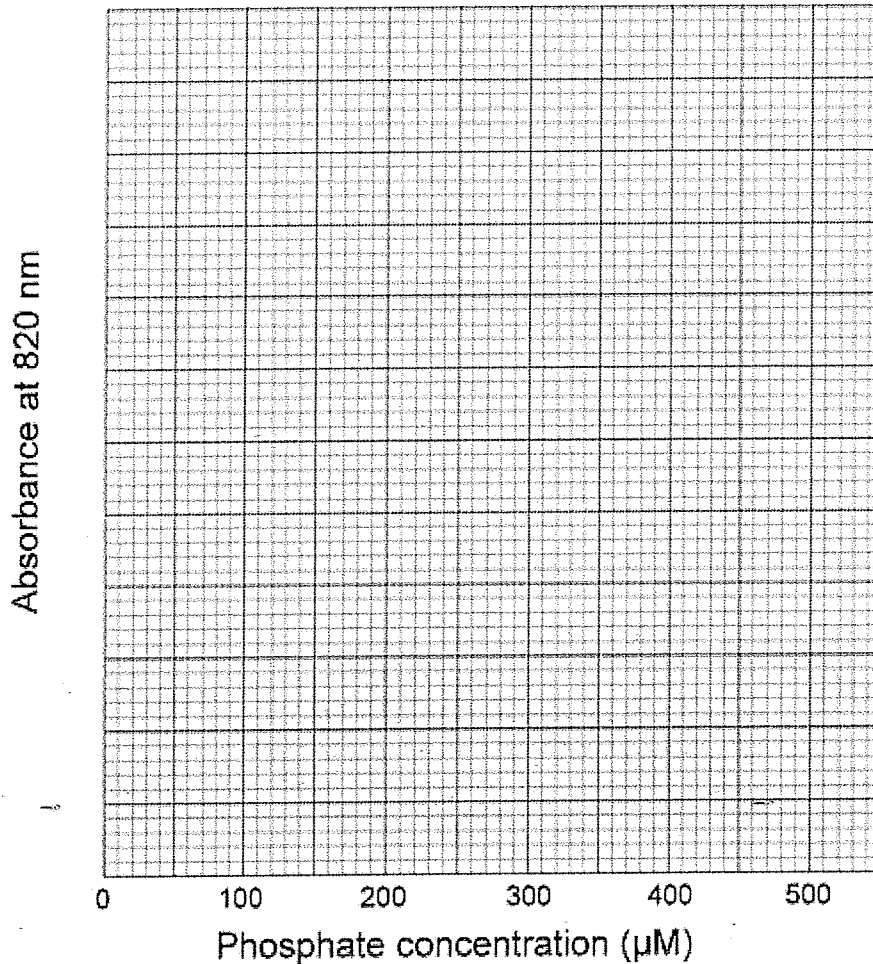
**Fill in the corresponding letters**

	Plant (P, Q, R, or S)	Location of crystals (A or B)	Crystal type (C or D)
Presence of crystals	P	B	D
	Q	B	D
	S	B	C
Absence of crystals	R		

**Documentation (0.5 point for each slide present, 5 points total).**

**Q.2.1. (18 points total)**

**(0.5 point for each standard point correctly plotted)**



**(2 points for each phosphate concentration measured, 0.5 point for each nmol/mg of phosphate calculated)**

Sample #	Plant	Fresh weight of seedlings (mg)	Average phosphate concentration of extract ( $\mu\text{M}$ )	nmol of phosphate per mg of seedling fresh weight (nmol/mg)
1	A	40.4	$160 \pm 10\%$	$39.6 \pm 10\%$
2	A	17.3	$33 \pm 10\%$	$19.0 \pm 10\%$
3	B	28.0	$75 \pm 10\%$	$26.8 \pm 10\%$
4	C	39.2	$150 \pm 10\%$	$38.3 \pm 10\%$
5	D	30.6	$380 \pm 10\%$	$124.2 \pm 10\%$
6	E	33.8	$300 \pm 10\%$	$88.8 \pm 10\%$

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**Q.2.2. (Multiple answers, 4 points. Points given when all correct answers are selected) Check [X] the correct answers**

	(A)	(B)	(C)	(D)	(E)	(F)
True			X	X		
False	X	X			X	X

**Q.2.3. (2.5 points each, 10 points total) Check [X] the correct answers**

	B	C	D	E
Knockout mutant plant of gene X		X		
Knock out mutant plant of gene Z			X	
Plant with defective protein T	X			
Transgenic plant with gene Y over-expression				X

**Q.2.4. (Single answer, 4 points) Check [X] the correct answers**

(A)	(B)	(C)	(D)	(E)	(F)
					X

**Q.2.5. (Single answer, 4 points) Check [X] the correct answers**

(A)	(B)	(C)	(D)	(E)
		X		