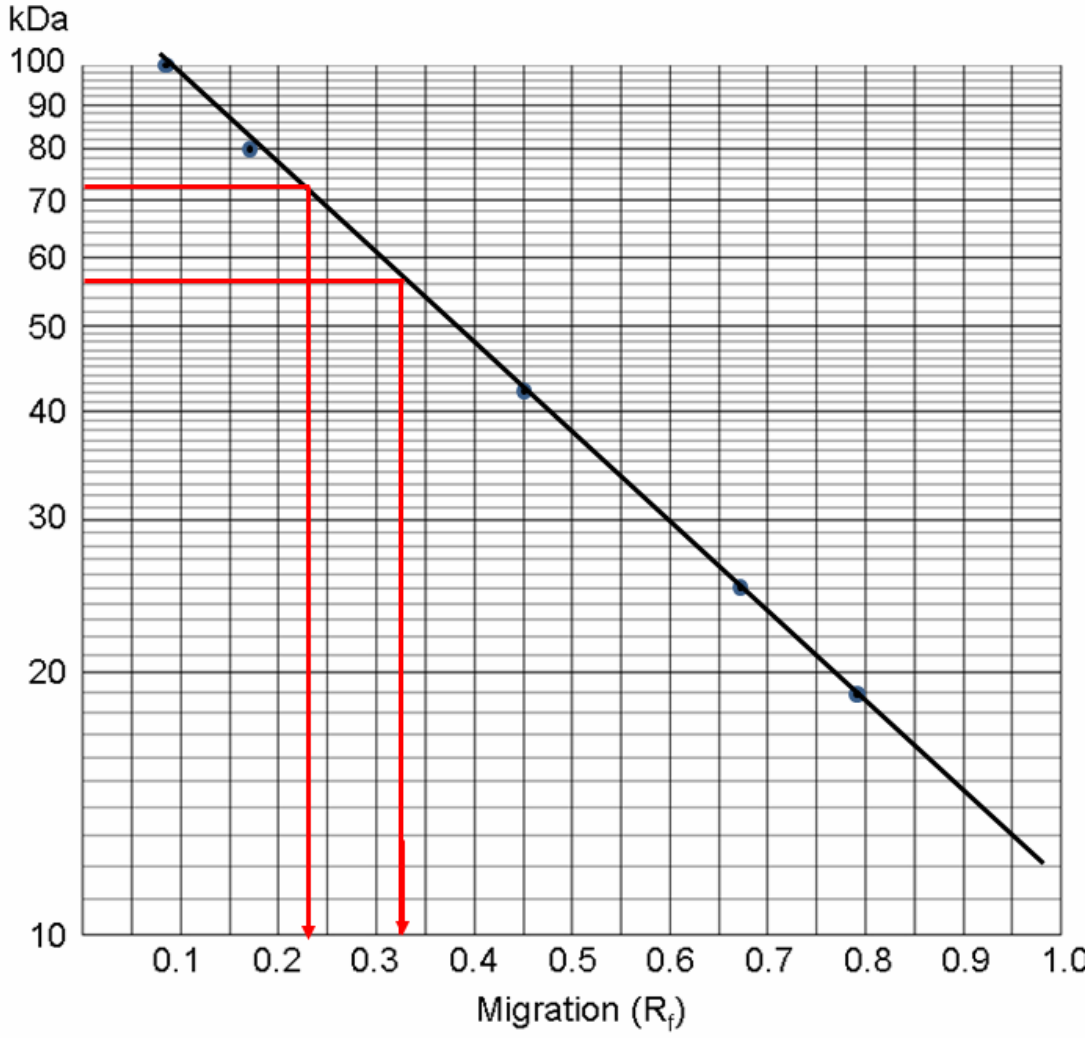
(4) Answer key

PRACTICAL TEST 1 : BIOCHEMISTRY AND CELL BIOLOGY

Q.1.1. (2 points)

Anode (+ charge)	Start point	Dye-front
		X

Q.1.2. (4+4 points)



Protein	Lane A	Lane B
Molecular weight (kDa)	**56 (53-59)**	**72 (68-76)**

Q.1.3. (5 points)

	57 kDa	33 kDa
Number	**2**	**4**

Q.1.4. (5 points)

	Amino acid	Nucleotide
Number	**300**	**900**

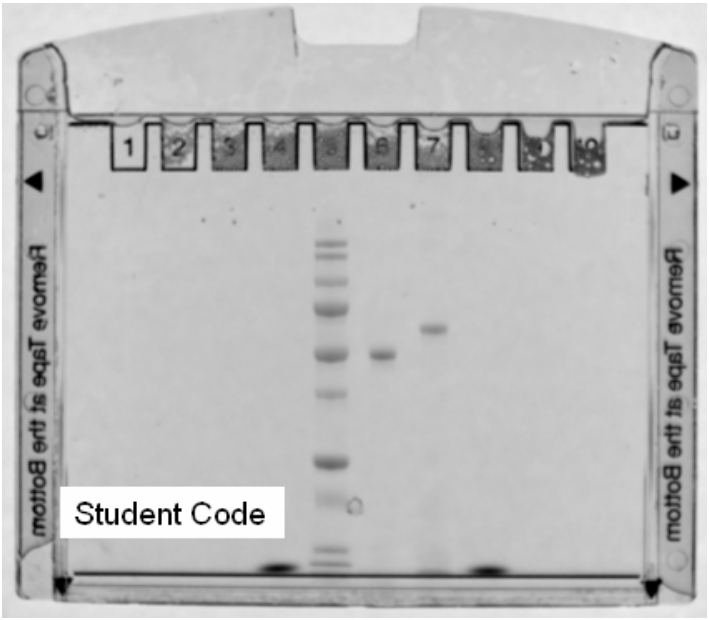
Q.1.5. (5 points)

DNA	:	Protein
18	**:**	**1**

Q.1.6. (5 points)

P	:	Q	=	**1**	**:**	**2**

Task I photo - protein electrophoresis (5 points)



Task II result sheet - Protein quantification

BSA

X

Y

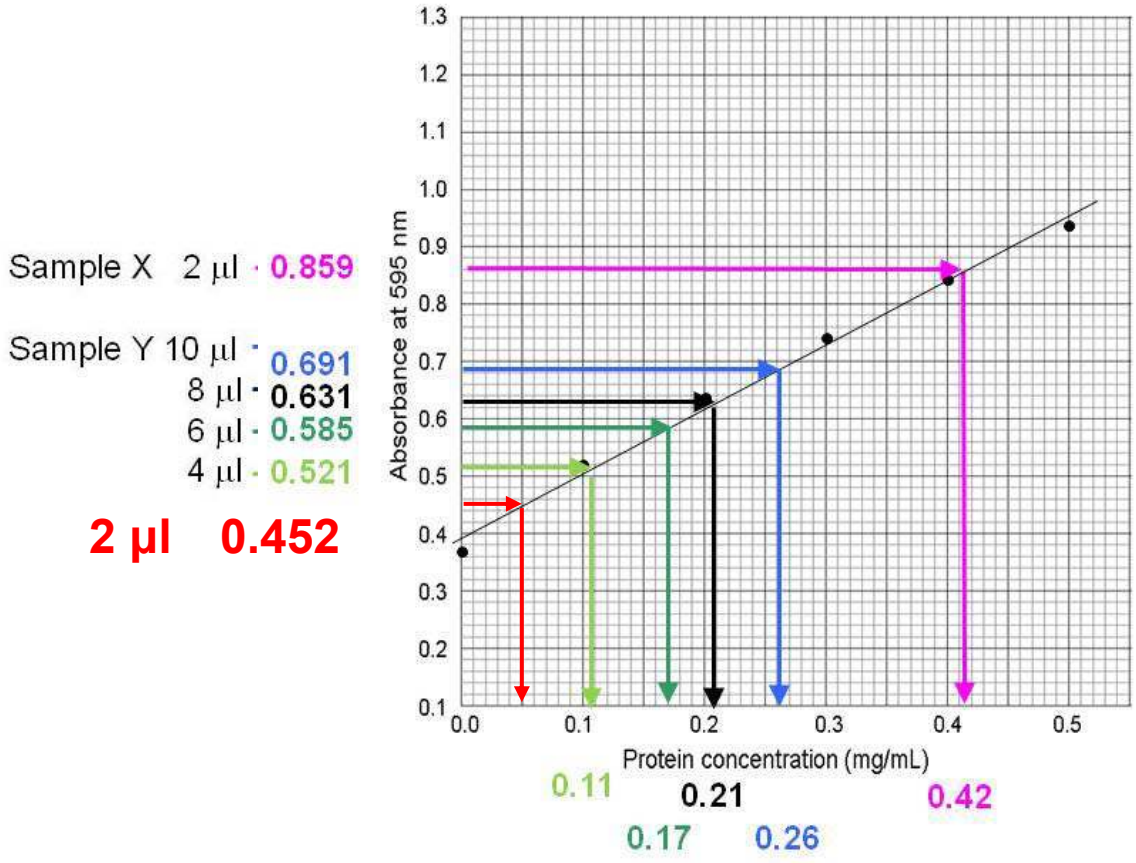
Absorbances Filter 1: 595nm

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.369	0.503	0.635	0.729	0.813	0.935	0.045	0.045	0.044	0.044	0.044	0.045
B	0.371	0.539	0.634	0.746	0.825	0.929	0.045	0.045	0.044	0.044	0.044	0.044
C	0.044	0.045	0.044	0.045	0.045	0.044	0.045	0.044	0.044	0.044	0.044	0.044
D	0.062	0.885	1.121	1.299	1.371	1.412	0.045	0.044	0.044	0.044	0.044	0.044
E	0.044	0.833	1.130	1.236	1.314	1.430	0.044	0.044	0.044	0.045	0.044	0.044
F	0.044	0.044	0.044	0.044	0.044	0.044	0.045	0.044	0.044	0.044	0.044	0.044
G	0.044	0.445	0.524	0.584	0.634	0.689	0.045	0.045	0.044	0.044	0.044	0.044
H	0.045	0.459	0.517	0.587	0.628	0.693	0.044	0.044	0.044	0.044	0.045	0.044

Q.2.1.1. (5 points)

Materials	Well of a microplate					
	A1 & B1	A2 & B2	A3 & B3	A4 & B4	A5 & B5	A6 & B6
0.5 mg/mL BSA (µL)	0	2	4	6	8	10
H_2O (µL)	10	8	6	4	2	0
Diluted BSA concentration (mg/mL)	0	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**

Q.2.1.2. (5 points) Standard curve for BSA



Q.2.2. (12 points)

	Solution X					Solution Y				
Sample volume (μL)	**2**	4	6	8	10	2	**4**	**6**	**8**	**10**
H_2O (μL)	**8**	6	4	2	0	8	**6**	**4**	**2**	**0**
Optical density - OD_{595} nm	**0.859**					**0.452**	**0.521**	**0.586**	**0.631**	**0.691**

out of range

Q.2.3. (8 points)

Concentration of X (mg/mL)	Concentration of Y (mg/mL)
2.0 (1.6-2.4)	**0.26 (0.21-0.31)**

Q.3.1.1. (5 points)

Tube	A1	A2	A3	B1	B2	B3
Color change				**X**		

Q.3.1.2. (2 points)

Buffer	A	B
		X

Q.3.2. (5 points)

A	B	C	D	E
X				

Q.3.3. (4 points)

A	B	C	D
	X		

Q.3.4. (5 points)

A	B	C	D	E
				X

Q.3.5. (4 points)

A	B	C	D
X			

Q.3.6. (5 points)

G-10	G-15	G-25	G-50	G-75	G-100	G-150	G-200
			X				

Q.3.7. (5 points)

20

PRACTICAL TEST 2 : ANIMAL PHYSIOLOGY AND ANATOMY

Q.1.1. (9 points) When you have finished the above five steps, **lift the sign** to notify the Lab assistant to videotape the contraction.

The 1st checkpoint	Points	Lab assistant signature
Leg limb muscle contraction	0 or 9	

Q.1.2. (8 points) When you have finished the steps 6 to 10, **lift the sign** to notify the Lab assistant to videotape the contraction.

The 2nd checkpoint	Points	Lab assistant signature
Indicate the sciatic nerve correctly (nerve must be intact)	0 or 4	
Gastrocnemius contraction	0 or 4	

Q.1.3. (40 points) When you have finished the steps 11-12, **lift the sign** to notify the Lab assistant for checking the results and videotape the contraction.

The 3rd checkpoint	Points	Lab assistant signature
Isolation of "sciatic nerve" (must be more than 2 cm)	0 or 15	
Isolation of "gastrocnemius" (must be intact; including A and B parts)	0 or 15	
Contraction of the isolated sciatic nerve-gastrocnemius tissue.	0 or 10	

Q.2.1. (30 points) Match each tissue section (A to J) with its correct name from 20 different tissue/organ names listed in above table. (Note: only one correct answer for each specimen). Fill in the correct number in the answer sheets.

Slide specimen	Answers（3 points each）
A.	**4**
B.	**9**
C.	**15**
D.	**10**
E.	**14**
F.	**11**
G.	**18**
H.	**5**
I.	**12**
J.	**17**

Q.2.2. (13 points) **Correctly write down the functional symbols, i.e. the alphabetic letters (A to K), on the answer sheets.** Match the organ with their functionalities. Note: some organs may have more than one function (1 point will be deducted for each incorrect answer, minimum score will not be less than zero).

Figure	Functional symbol
1.	**B,E**
2.	**A**
3.	**C**
4.	**D,E**
5.	**F**
6.	**I ,K**
7.	**J**
8.	**G,H**
9.	**I**

PRACTICAL TEST 3 : ECOLOGY AND SYSTEMATICS

Q.1.1.1. (4 points for each correct spider; 16 points total)

Note: each spider code can only be used once, or the grades of these cells will not be counted.

Taxon name	Spider code
A. aus	
C. gus	
L. ous	**Z**
M. bus	
N. pus	**Y**
O. lus	**W**
P. eus	

Taxon name	Spider code
P. mus	**X**
P. nus	
S. dus	
T. fus	
T. kus	
Z. cus	
Z. hus	

Q.1.1.2. (0.65 points for each right answer cell; 13 points total)

(Penalty of 0.2 point for each wrong answer, minimum 0 point)

Spider Code / **Character**	**W**	**X**	**Y**	**Z**
Eyes in two rows	−	−	+	+
Tarsi with three claws	+	+	+	+
Bases of both anterior spinnerets in contact	+	+	+	+
Calamistrum present on metatarsus IV	−	−	−	−
A cluster of double-rowed trichobothria present on femora IV	−	−	−	+

Please put all spider specimens back to the original vials.

Up to 4 points bonus will be granted to students who keep the intact specimens.

Q1.2. (1.2 points for each cell; 18 points total)

1	2	3	4	5
a-1 or b-1	**b-1 or a-1**	**s-2**	**h-1 or m-1 or n-1**	**h-1 or m-1 or n-1**

6	7	8	9	10
h-1 or m-1 or n-1	**d-1**	**e-4**	**s-1**	**t-3**

11	12	13	14	15
d-1	**e-6**	**e-3**	**o-1**	**g-1**

Q1.3.1. Q1.3.2. Q1.3.3.

19	**d-1**	**B**

(2 points for each cell)

Q1.3.4. (Each correct answer will get 0.4 points, 2 points total)

Character	True	False
s-1		**X**
s-2	**X**	
a-1	**X**	
g-1		**X**
d-1		**X**

Q1.3.5. (1 point for each cell; 5 points total)

Taxon	Kind of grouping
{H}	**III**
{B, C, G, H}	**II**
{C, D, E, F}	**II**
{B, G, H}	**III**
{B, E, G}	**I**

Q2.1.1. (1 point each; 9 points total)

Table 2-1-1

Plant-A(○)	Spider (＊)		Total
	Present	Absent	
Present	**2**	**10**	**12**
absent	**4**	**24**	**28**
Total	**6**	**34**	**40**

Q2.1.2a.	Q2.1.2b.	Q2.1.2c.	Q2.1.2d.	Q2.1.2e.
0.3	**0.15**	**0.045**	**1.8**	**P**

(0.6 points for each cell)

Q2.1.3.(2 points)

0.0373

Q2.1.4a. (2 points)

0.0306

Q2.1.4b. (2 points)

Association V value	Strong — -1=V≦-0.6	Moderate — -0.6＜V≦-0.2	None -0.2＜V＜0.2	Moderate + 0.2≦V＜0.6	Strong + 0.6≦V=1
			X		

Q2.2.1a. (2 points)

N

Q2.2.1b. (2 points)

Association V value	Strong — -1=V≦-0.6＜	Moderate — -0.6＜V≦-0.2	None -0.2＜V＜0.2	Moderate + 0.2≦V＜0.6	Strong + 0.6≦V=1
		X			

	Q2.2.2a. (2 points)	Q2.2.2b. (2 points)	Q2.2.2c. (2 points)
True			**X**
False	**X**	**X**	

Q2.3.1. (0.5 points for each cell; 3 points total)

Table 2-3-1

Species	Species of nearest neighbor		Total
	Plant-A (○)	Plant-B (●)	
Plant-A (○)	**24**	**16**	**40**
Plant-B (●)	**21**	**19**	**40**
Total	**45**	**35**	**80**

Q2.3.2a. (2 points)

0.4571

Q2.3.2b. (3 points)

randomly distributed	X
associated	
segregated	

	Q2.4.1 (2 points)	Q2.4.2 (2 points)
True	**X**	**X**
False		

Check list of the spider condition in their original vials

(**Filled out by the LAB ASSISTANTS after test**)

Taxon	W	X	Y	Z
Damaged				
Undamaged				

Signed by Inspector:_____Student Code:_____

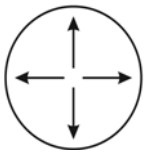
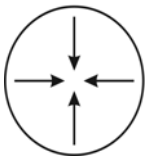
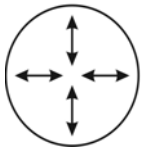
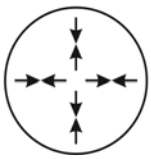
(Without Student Code written here, the 4 bonus points will not be awarded)

PRACTICAL TEST 4 : PLANT ANATOMY, PHYSIOLOGY, AND GENETICS

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		

Q.1.C.1（8 points）

Fill in the correct answers

(a)

i) 3 μm. (1 point)

ii) 40 μm (± 10) μm. (3 points)

(b)

i) 0.25 (± 0.05) mm^2. (1 point)

ii) 130 (± 50) (stomatal number /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	**X**	
Many stomata on the lower epidermis	**X**	
An aquatic plant		**X**

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

Check [X] the correct answers

Plant	Monocot	Dicot
K		**X**
V		**X**
W	**X**	
M	**X**	
N		**X**

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）

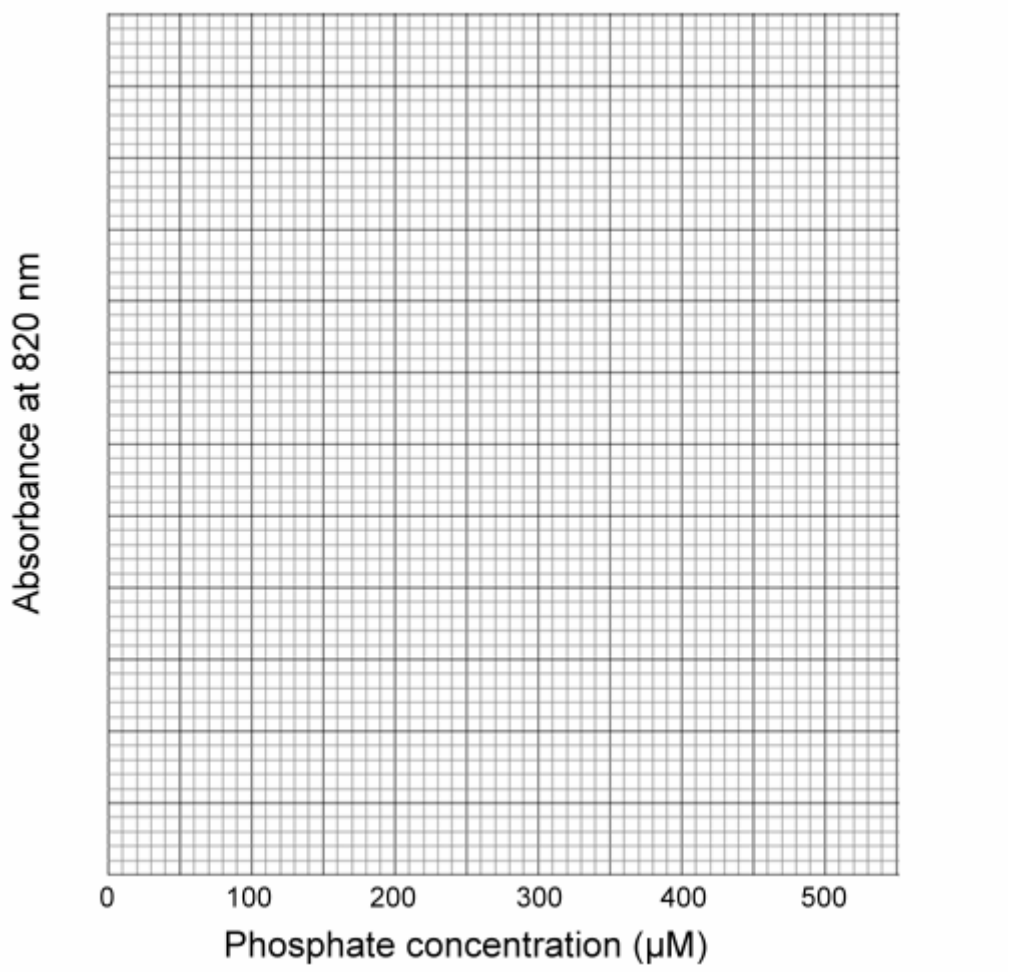
Fill in the corresponding letters

	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 (μM)	nmol of phosphate per mg of seedling fresh weight (nmol/mg)
1	A	40.4	**160 ± 10%**	**39.6 ± 10%**
2	A	17.3	**33 ± 10%**	**19.0 ± 10%**
3	B	28.0	**75 ± 10%**	**26.8 ± 10%**
4	C	39.2	**150 ± 10%**	**38.3 ± 10%**
5	D	30.6	**380 ± 10%**	**124.2 ± 10%**
6	E	33.8	**300 ± 10%**	**88.8 ± 10%**

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		