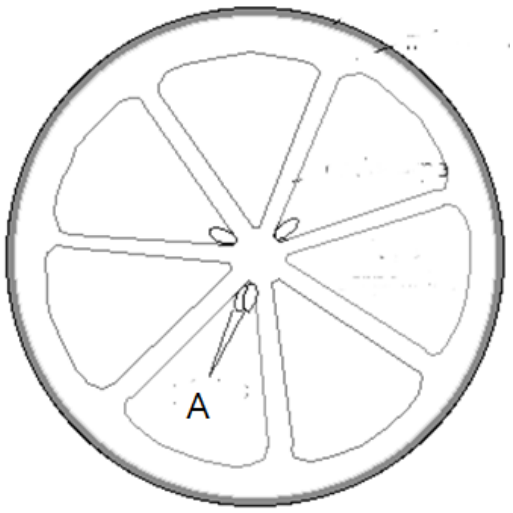
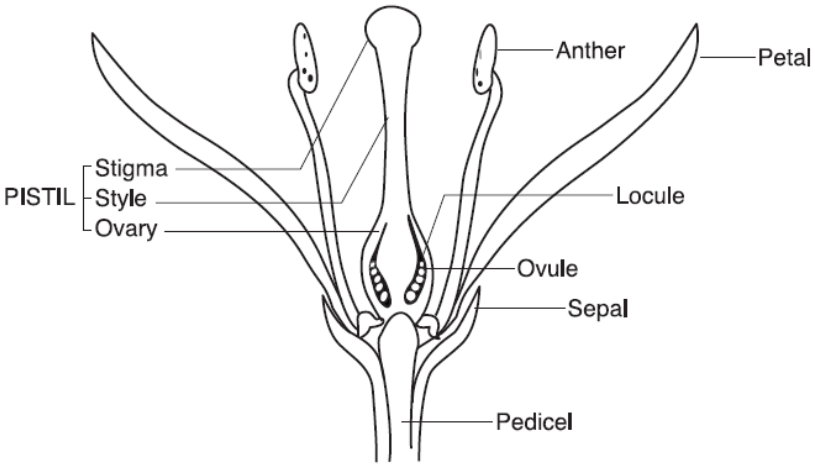
Experiment III. Anatomy and classification of fruits and seeds

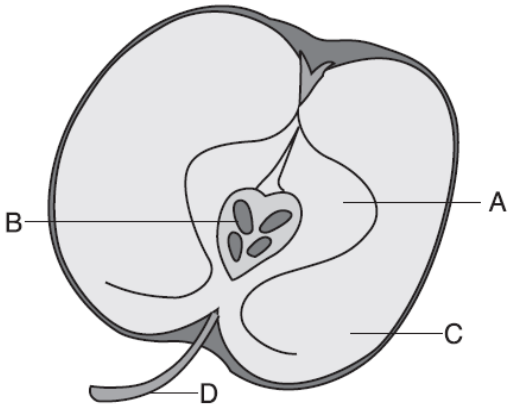
III-1. [1.0 point](Answer): 0.5 points for correct drawing (separate sections and seeds) and 0.5 points for correct labeling.

III-1	

(Explanation) A is ovules which become seeds.

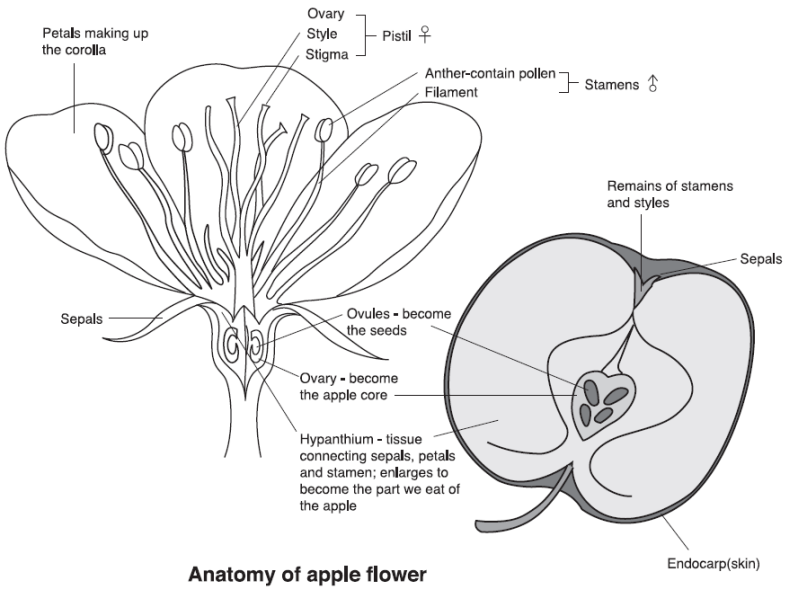


III-2. [2.5 point](Answer) = **4 x 0.5 points for correct labeling and 0.5 points for correct drawing (Seeds, stem and inner and outer fleshy tissue).**

III-2	

(Explanation)

A is originated from ovary, B from ovules, C from hypanthium, and D from pedicel.



Anatomy of apple flower

III-3-1. [2.0 points] (Answer) = **2 x 1 point**

①	②
C	A

III-3-2. [2.0 point] (Answer) = **2 x 1 point**

c	d
III-b	III-a

III-3-3. [4.0 points] (Answer)
0.5 points per correct fruit (column)
0.25 points for only one mistake per column.

Fruit / Classification	A Acorn	B Apple	C Bean pod	D Lychee	E Lemon	F Persimmon	G Rice	H Strawberry
Single seed fruit	√			√			√	
Many seeded fruit		√	√		√	√		√
Aggregate fruit								√
Multiple fruit								
True fruit	√		√	√	√	√	√	
Accessory fruit		√						√
Fleshy fruit		√		√	√	√		√
Dry fruit	√		√				√	

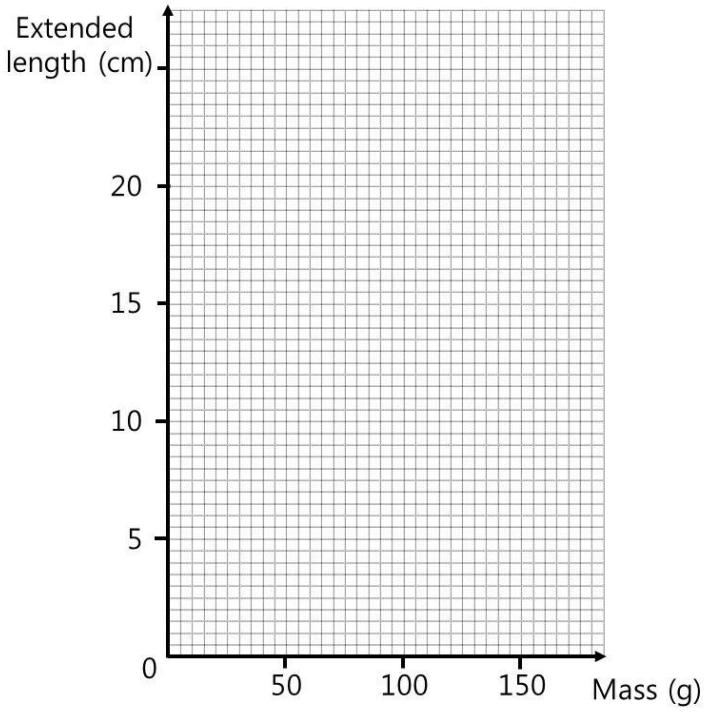
III-3-4. [1.5 points] Identify which fruits from box 1 most appropriately are represented by 3, 4, 5 and 6.

		Points
3	B, E, F in any order	0.25 per correct fruit
4		
5		
6	H	0.75

ANSWER SHEET

Country			
	Student 1	Student 2	Student 3
Name			
Code			
Signature			

Experiment I. Determination of the Densities of Fruit Juices

Questions (Points)		Data and Answers					
I-1 (1.0)		Length of spring (cm)					
I-2 (6.0)	I-2-1 (1.0)	Masses (g)	0				
		Lengths of spring (cm)					
	I-2-2 (1.0)	Extended lengths of spring (cm)	0				
	I-2-3 (2.0)						

ANSWER SHEET

	Student 1	Student 2	Student 3
Name			
Code			

Experiment I. Determination of the Densities of Fruit Juices (Cont'd)

I-2 (6.0)

I-2-3 (2.0)

(Show your working)

<x>		<y>	
$< x^2 >$		<xy >	
Slope, *A*	cm/g	Intercept, *B*	cm

I-2-4 (2.0)

Spring Constant	N/m

ANSWER SHEET

	Student 1	Student 2	Student 3
Name			
Code			

Experiment I. Determination of the Densities of Fruit Juices (Cont'd)

Questions (Points)		Data and Answers		
I-3 (4.0)	I-3-1 (1.0)	Juice	Mandarin	Apple
		Lengths of spring (cm)		
	I-3-2 (1.0)	Extended lengths of spring (cm)		
	I-3-3 (2.0)	(Show your working)		
		Juice	Mandarin	Apple
		Buoyant forces (N)		

ANSWER SHEET

	Student 1	Student 2	Student 3
Name			
Code			

Experiment I. Determination of the Densities of Fruit Juices (Cont'd)

Questions (Points)	Data and Answers		
I-4 (1.0)	Volume (cm^3)		
I-5 (2.0)	(Show your working)		
	Juice	Mandarin	Apple
	Densities (g/cm^3)		

---------- DO NOT WRITE BELOW ----------

Total points for experiment I	

ANSWER SHEET

	Student 1	Student 2	Student 3
Name			
Code			

Experiment II. Determination of the Citric Acid Contents in Fruit Juices

Questions (Points) | Data and Answers

II-1 (7.0)

(Show your working)

0.5 per juice for completing all readings to two decimal places and all appropriate units

0.5 per juice for correct calculation of average values (if necessary disregarding anomalous values); 0.25 if anomalous values are included

0.5 per juice if at least two titers are no more than 0.1 mL apart

---

Marks for accuracy compared to **ideal titer**

≤ ±0.25 mL [2.0] per juice
± 0.26 – 0.45 mL [1.5]
± 0.46 – 0.65mL [1.0]
± 0.66 – 0.85 mL [0.5]
±0.85 – 0.99 mL [0.2]
≥ 1 mL [0.0]

	Juices							
	Mandarin				Apple			
Trials	1	2	3	4	5	6	7	8
Initial Readings (in)								
Final Readings (in)								
Volumes of NaOH solution consumed for titration								
	Average volume				Average volume			

ANSWER SHEET

	Student 1	Student 2	Student 3
Name			
Code			

Experiment II. Determination of the Citric Acid Contents in Fruit Juices (Cont'd)

Questions (Points)	Data and Answers

II-2 (2.0)

(Show your working)

$n(NaOH) = V(NaOH) * c(NaOH)$ [1]

Correct values for each juice [0.5]

Moles of NaOH	Mandarin	mol	Apple	mol

II-3 (2.0)

(Show your working)

Mole ratio: 3:1
Calculation n(acid) = n(NaOH) / 3 [0.5 per juice]
Calculation m(acid) = n(acid) * M_r(acid) [0.5 per juice]

0.25 if error in M_r or missing units

Moles of citric acid	Mandarin		Apple	

ANSWER SHEET

	Masses of citric acid	Mandarin		Apple	

	Student 1	Student 2	Student 3
Name			
Code			

Experiment II. Determination of the Citric Acid Contents in Fruit Juices (Cont'd)

Questions (Points)	Data and Answers
II-4 (2.0)	(Show your working) Calculation m(juice) = density * volume = 1.00 g/cm^3 * 10.0 cm^3 = 10.0 g [0.5] Calculation Percent Concentration m(acid) / m(juice) * 100 [0.75 per juice] Or value based on students' answer of II-3

Percent concentration of citric acid	Mandarin	%	Apple	%

---------- DO NOT WRITE BELOW ----------

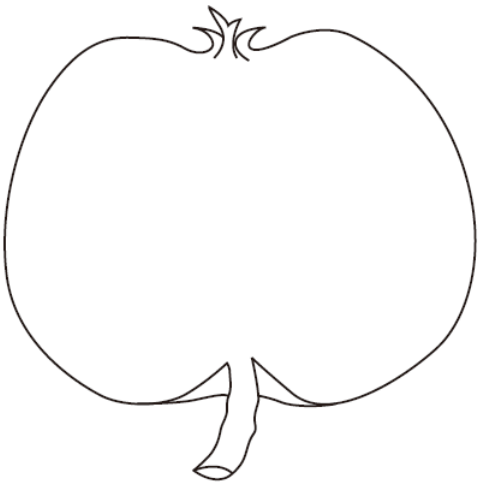
Total points for experiment II	

ANSWER SHEET

ANSWER SHEET

	Student 1	Student 2	Student 3
Name			
Code			

Experiment III. Anatomy and classification of fruits and seeds

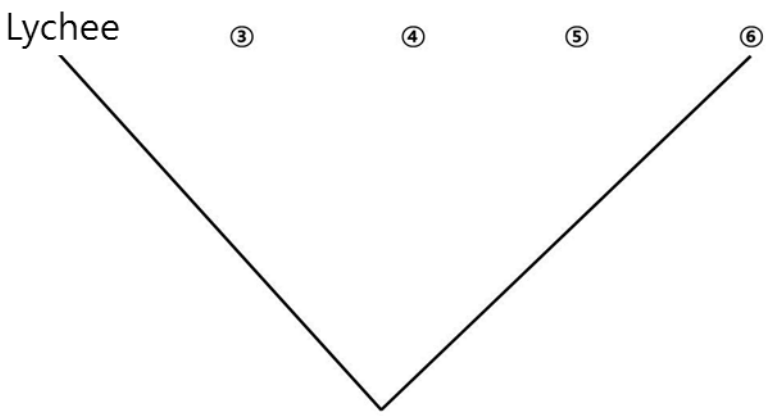
Question (Points)	Data and Answers	
III-1 (1.0)	Location of tissues originated from A	
III-2 (2.0)	Location of tissues originated from A, B, C and D	

ANSWER SHEET

	Student 1	Student 2	Student 3
Name			
Code			

Experiment III. Anatomy and classification of fruits and seeds (Cont'd)

<table>
<tr><td>Question (Points)</td><td colspan="3">Data and Answers</td></tr>
<tr><td rowspan="3">III-3-1
(2.0)</td><td rowspan="2"></td><td colspan="2">fruits</td></tr>
<tr><td>①</td><td>②</td></tr>
<tr><td>Fruits for ① and ②</td><td></td><td></td></tr>
<tr><td rowspan="3">III-3-2
(2.0)</td><td rowspan="3">Classification schemes for 'c' and 'd'</td><td colspan="2">characters</td></tr>
<tr><td>c</td><td>d</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="6">III-3-3
(6.0)</td><td>III-3-3-1

Draw branch lines to complete the diagram.
(4.0 points)</td><td colspan="2"> 
</td></tr>
<tr><td>III-3-3-2
(0.5 points)</td><td colspan="2">A fruit for ③</td></tr>
<tr><td>III-3-3-3
(0.5 points)</td><td colspan="2">A fruit for ④</td></tr>
<tr><td>III-3-3-4
(0.5 points)</td><td colspan="2">A fruit for ⑤</td></tr>
<tr><td>III-3-3-5
(0.5 points)</td><td colspan="2">A fruit for ⑥</td></tr>
</table>

---------- DO NOT WRITE BELOW ----------

Total points for experiment III	

ANSWER SHEET

Partially marking scheme

I-1. [6.0 points]

I-1-1 [1.25 points] 0.25 points for each of the lengths measure.

I-1-2.[2.5 points]

- 0.25 each for drawing axes, writing down quantity and unit → 0.5
- 1.5 if all 5 measurement points are presented in the graph
- 0.5 for drawing the best fitted line

I-1-3. [1.25 points]

- 1.0 for calculating the slope A (within $\pm$10% error)
- 0.5 for calculating the slope A (within $\pm$20% error)
- 0.25 for reading the intercept B

I-1-4. [1.0 point] Calculate the spring constant in N/m. (Assume that the gravitational acceleration is 9.81 m/s^2)

- 0.5 for the formula to get the spring constant
- 0.5 for calculating the value in N/m

I-2. [6.0 points]

I-2-1. [2.0 points]

- 0.25 each for measuring the volume without weights immersed → 0.5
- 0.5 each for measuring the volume with weights immersed → 1.0
- 0.25 each for calculating the differences → 0.5

I-2-2. [2.0 points].

- 0.25 each for measuring the length before emersion → 0.5
- 0.25 each for measuring the length for 2 and 3 weights immersed for apple juice → 0.5
- 0.25 each for measuring the length for 2 and 3 weights immersed for mandarin juice → 0.5
- 0.125 each for calculating the length differences → 0.5

I-2-3. [2.0 point]

- 0.5 each for calculating the buoyant force value in N → 2.0

I-3. [2.0 points] Calculate the average densities of the apple juice and mandarin juice respectively.

- 0.25 each for calculating the density using volumes and buoyant forces → 1.0
- 0.5 each for calculating the average density (if between 0.70 g/cm^3 and 1.30 g/cm^3)