

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)

**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**

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Code			

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

I-2 (6.0)	I-2-3 (2.0)	(Show your working)			
		$\langle x \rangle$		$\langle y \rangle$	
		$\langle x^2 \rangle$		$\langle xy \rangle$	
		Slope, A	cm/g	Intercept, B	cm
	I-2-4 (2.0)	Spring Constant		N/m	

**ANSWER SHEET**

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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)		
		(Show your working)		
	I-3-3 (2.0)			
		Juice	Mandarin	Apple
		Buoyant forces (N)		

**ANSWER SHEET**

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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)		

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Total points for experiment I	
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ANSWER SHEET

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Name			
Code			

Experiment II. Determination of the Citric Acid Contents in Fruit Juices								
Questions (Points)	Data and Answers							
<p style="margin: 0;">II-1 (7.0)</p>	<p style="margin: 0;">(Show your working)</p> <p style="margin: 0; color: red;">0.5 per juice for completing all readings to two decimal places and all appropriate units</p> <p style="margin: 0; color: red;">0.5 per juice for correct calculation of average values (if necessary disregarding anomalous values); 0.25 if anomalous values are included</p> <p style="margin: 0; color: red;">0.5 per juice if at least two titers are no more than 0.1 mL apart</p> <p style="margin: 0; color: red;">-----</p> <p style="margin: 0; color: red;">Marks for accuracy compared to ideal titer</p> <p style="margin: 0; color: red;"> $\leq \pm 0.25$ mL [2.0] per juice $\pm 0.26 - 0.45$ mL [1.5] $\pm 0.46 - 0.65$ mL [1.0] $\pm 0.66 - 0.85$ mL [0.5] $\pm 0.85 - 0.99$ mL [0.2] ≥ 1 mL [0.0] </p>							
	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)				
	$n(\text{NaOH}) = V(\text{NaOH}) * c(\text{NaOH}) \quad [1]$				
	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				
	$\text{Calculation } n(\text{acid}) = n(\text{NaOH}) / 3 \quad [0.5 \text{ per juice}]$ $\text{Calculation } m(\text{acid}) = n(\text{acid}) * M_r(\text{acid}) \quad [0.5 \text{ per juice}]$				
	Moles of citric acid	Mandarin		Apple	



ANSWER SHEET

	Masses of citric acid	Mandarin	Apple	
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	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)	<p>(Show your working)</p> <p>Calculation $m(\text{juice}) = \text{density} * \text{volume} = 1.00 \text{ g/cm}^3 * 10.0 \text{ cm}^3 = 10.0 \text{ g}$ [0.5]</p> <p>Calculation Percent Concentration $m(\text{acid}) / m(\text{juice}) * 100$ [0.75 per juice]</p> <p>Or value based on students' answer of II-3</p>				
	Percent concentration of citric acid	Mandarin	%	Apple	%

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Total points for experiment II	
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IJSO-2015



12th International Junior Science Olympiad

Daegu, Republic of Korea

December 8, 2015

Experiment Competition

Time : 3 hr 30 min

Points : 40

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ANSWER SHEET



ANSWER SHEET

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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	

IJSO-2015



12th International Junior Science Olympiad

Daegu, Republic of Korea

December 8, 2015

Experiment Competition

Time : 3 hr 30 min

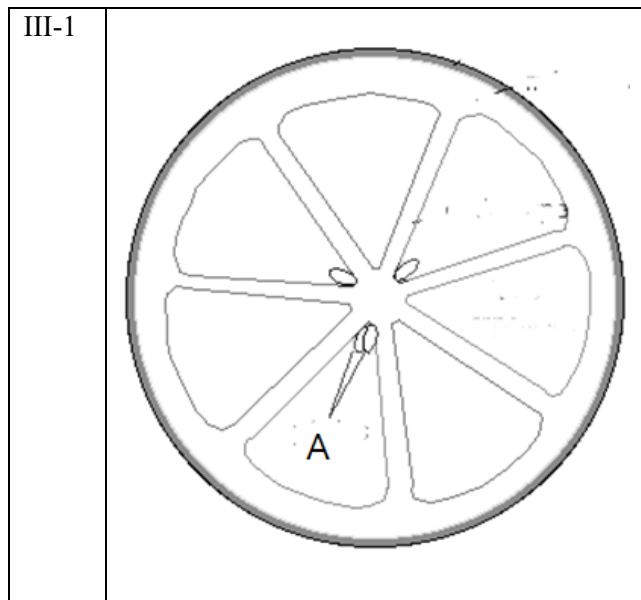
Points : 40

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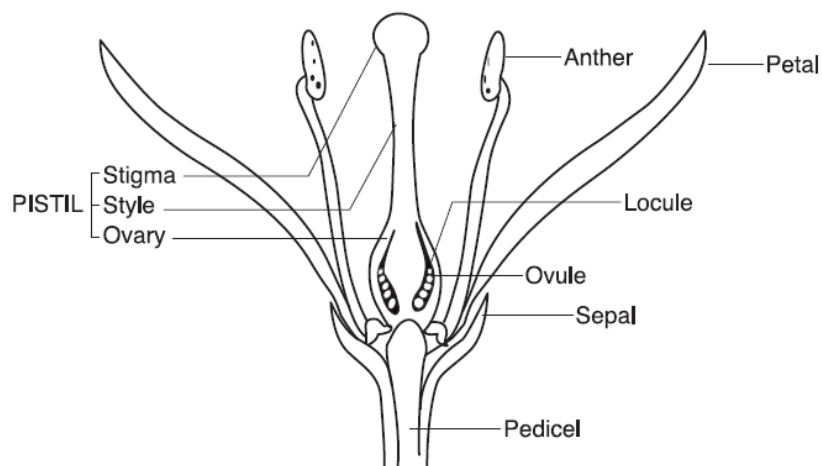
ANSWER SHEET

Experiment III. Anatomy and classification of fruits and seeds

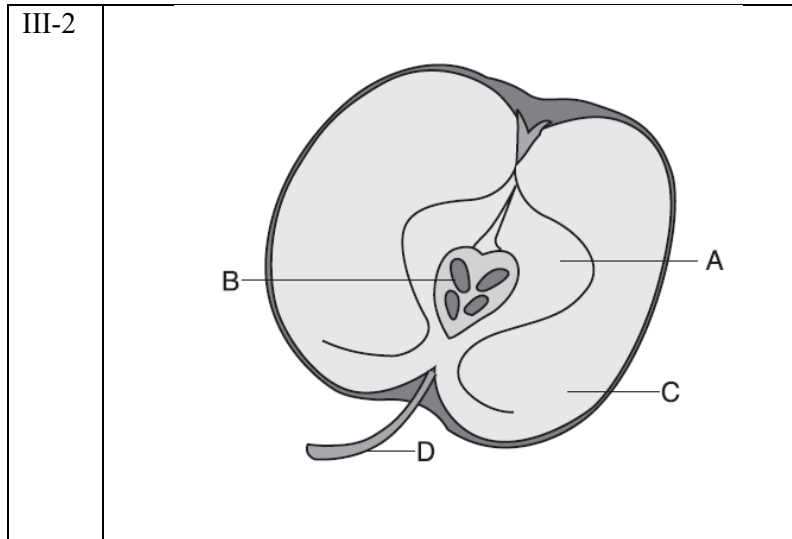
III-1. [1.0 point](Answer): 0.5 points for correct drawing (separate sections and seeds) and 0.5 points for correct labeling.



(Explanation) A is ovules which become seeds.

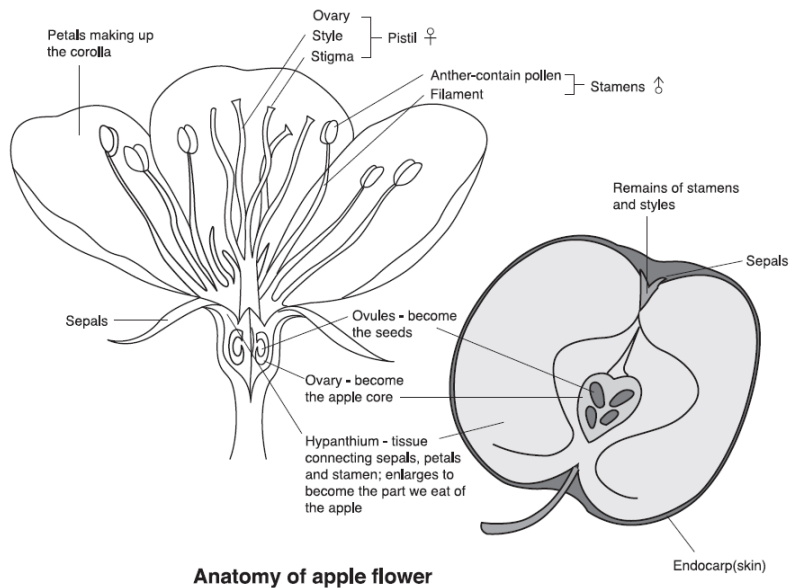


III-2. [2.5 point](Answer) = 4 x 0.5 points for correct labeling and 0.5 points for correct drawing (Seeds, stem and inner and outer fleshy tissue).



(Explanation)

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



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