

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)

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 $\leq \pm 0.25$ 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]																																																					
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="background-color: #cccccc;"></th> <th colspan="8" style="text-align: center;">Juices</th> </tr> <tr> <th colspan="4" style="text-align: center;">Mandarin</th> <th colspan="4" style="text-align: center;">Apple</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Trials</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: center;">Initial Readings (in)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Final Readings (in)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Volumes of NaOH solution consumed for titration</td> <td colspan="4" style="text-align: center;">Average volume</td> <td colspan="4" style="text-align: center;">Average volume</td> </tr> </tbody> </table>		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			
			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																																																	

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

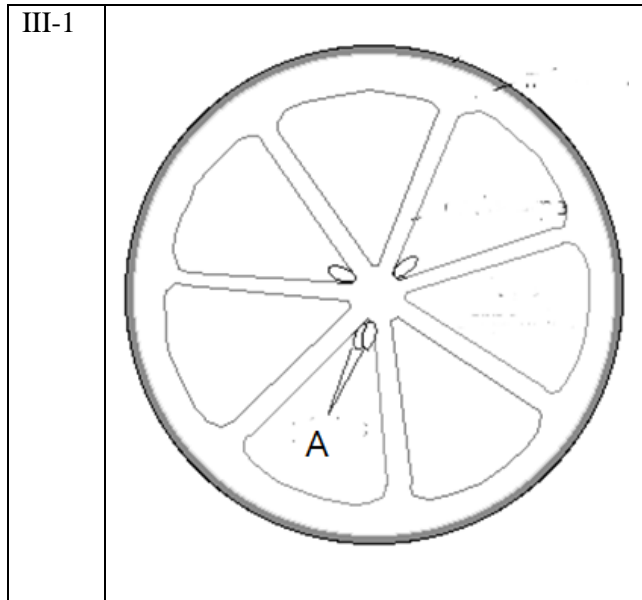
Questions (Points)	Data and Answers				
II-2 (2.0)	(Show your working)				
	$n(\text{NaOH}) = V(\text{NaOH}) * c(\text{NaOH}) \quad [1]$ $\text{Correct values for each juice} \quad [0.5]$				
	Moles of NaOH	Mandarin	mol	Apple	mol
II-3 (2.0)	(Show your working)				
	$\text{Mole ratio: } 3:1$ $\text{Calculation } n(\text{acid}) = n(\text{NaOH}) / 3 \quad [0.5 \text{ per juice}]$ $\text{Calculation } m(\text{acid}) = n(\text{acid}) * M_r(\text{acid}) \quad [0.5 \text{ per juice}]$ $0.25 \text{ if error in } M_r \text{ or missing units}$				
	Moles of citric acid	Mandarin		Apple	
	Masses of citric acid	Mandarin		Apple	

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

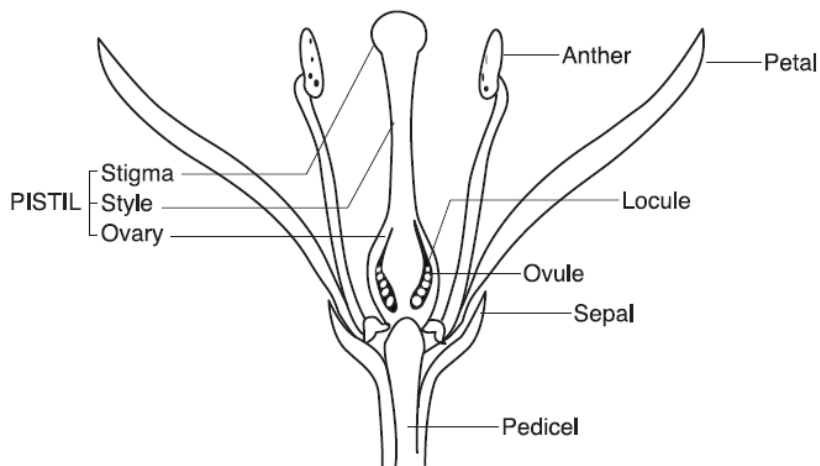
Questions (Points)	Data and Answers				
II-4 (2.0)	(Show your working) Calculation $m(\text{juice}) = \text{density} * \text{volume} = 1.00 \text{ g/cm}^3 * 10.0 \text{ cm}^3 = 10.0 \text{ g}$ [0.5] Calculation Percent Concentration $m(\text{acid}) / m(\text{juice}) * 100$ [0.75 per juice] Or value based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

Experiment III. Anatomy and classification of fruits and seeds

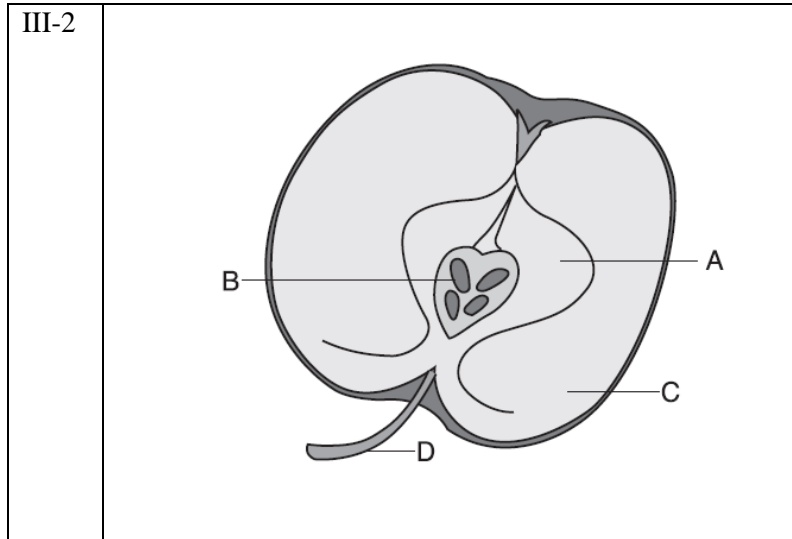
III-1. [1.0 point](Answer): 0.5 points for correct drawing (separate sections and seeds) and 0.5 points for correct labeling.



(Explanation) A is ovules which become seeds.

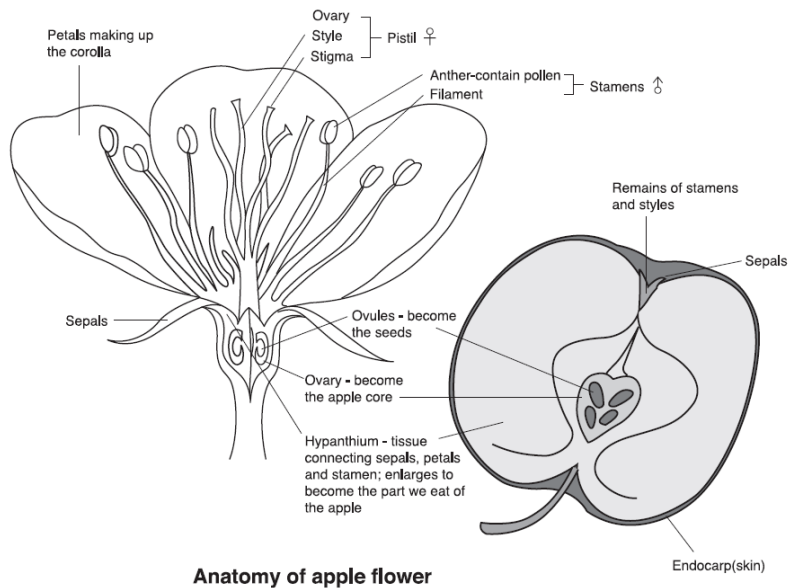


III-2. [2.5 point](Answer) = 4 x 0.5 points for correct labeling and 0.5 points for correct drawing (Seeds, stem and inner and outer fleshy tissue).



(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