Team Code		**ID Code & Name**		
Country		**Signature**		

Supervisor Signature		**Score**	

Experiment I. Peroxidase determination

I-1. Fill in the table with number of colors (given in instruction sheet) you observed after 2 min. (2.5 points)

Colour numbering:

1- Brown, 2- Pink, 3-Orange, 4-red, 5 - green, 6 - Blue, 7-No colour change

Sample	No heating (1)	Heated (2)
	Number	Number
Feykhoa (F)	**7**	**7**
Potato (P)	**1,2,3,4**	**7**
Cabbage(C)	**1,2,3,4**	**7**
Control (W)	**7**	**7**

I-2. Which of the investigated vegetables/fruit contain peroxidase? Choose the correct answer. (1.5points)

☐ Feykhoa	X Potato	X Cabbage

I-3. Do you observe any color change in control tubes? Tick the box. If yes, choose one of the following reasons?(You don't have to choose anything if the answer is no) (0.5 points)

X Yes	☐ No

A	Peroxidase is reacted with peroxide and formed colored product
X	Peroxide reacts with hydroquinone very slowly in the absence of enzyme.
C	Peroxidase is reacted with hydroquinone and formed colored product
D	Peroxide started to react with water and changes the color of the solution

I-4. How does boiling affect peroxidase? Circle the correct answer. (1points)

A	No effect
B	Boiling accelerates reaction rate by activating peroxidase.
X	Boiling reduces reaction rate by denaturizing peroxidase
D	Boiling reduces reaction rate by inhibiting peroxide

I-5. How will the color immediately change if only hydroquinone without peroxide is added to diluted juice of cabbage? Circle the correct answer. (1points)

X	No change, because peroxide is absent
B	Change will be observed immediately, because peroxidase affects hydroquinone
C	Change will be observed steadily because peroxidase affects hydroquinone slowly

Experiment II. Determination of optimum pH of enzymatic reaction

II-1. Record the pH reading for buffer solution	
Recorded pH for buffer solution	**6,8-7,2**

II-1. Fill in the chart with recorded pH of the tubes (from 1 to 10) (3points)

Added solution	0.05 mol·L^{-1} solution of HCl					0.1 mol·L^{-1} solution of NaOH				
Number of tube	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
mL of solution added	**3**	**1.5**	**0.75**	**0.3**	**0**	**0,2**	**0.4**	**1**	**2**	**3**
Recorded pH	**1,8-2,6**	**2,6-3,5**	**3,8-4,8**	**5,2-6,3**	**6,7-7,3**	**8,0-9,2**	**9,2-10,0**	**10,2-11,00**	**11,1 - 11,9**	**11,5 - 12,3**

II-2. Identify the range of optimal pH for peroxidase enzyme.(2points)

pH range: 6,7-10

II-3. Identify the tube in which the peroxidase enzyme is the most active.(1.5points)

Number of tube: 5 vəya 6 vəya 7

II-4. According to experimental results, predict which of the substances following would inhibit peroxidase activity. Tick the boxes. (0.25 x 2 points)

0.1M Oxalic acid $(COOH)_2$	0.1 M NH_4OH	0.1 M Na_2CO_3	0.1 M Acetic acid (CH_3COOH)
X	☐	☐	X

Experiment III. Determination of Vitamin C in Cabbage Juice

III-1. Write down the reduction half equation in acidic medium for iodate ions and the oxidation half equation for the iodide ions.(1points, 0.5points for each half equations)	
Reduction half equation:(0.5points) none	Oxidation half equation:(0.5points) none

III-2. Combine the half equations and write the overall equation between iodate and iodide ions.(0.5p)
none

III-3. Complete the table given for the titration steps.(3.5points)

	Trial-1	Trial-2	Trial-3 (if necessary)
Initial reading of burette (mL)			
Final reading of burette (mL)			
Volume of KIO_3 used (mL)			
Average volume of KIO_3 solution (mL)	12- 16 mL (3.5 points)	10-12 mL (2 points)	16-18 mL (2 points)

III-4. Calculate the amount in moles of iodate that reacted forming iodine. (1.5points)
Show your calculations here: n(iodate) = Average volume x 0.002 = …………….. mol Average volume 10- 18 mL olmasa hesablamalar nəzərə alınmır

	Moles of IO_3^-:cavab

III-5. Using the equation for the reaction between the iodate ions and iodide ions, calculate the amount of moles of iodine formed.(2points)	
Show your calculations here: n(iod) = n(iodate) x 3 = ……………mol	
	Moles of I_2:

III-6. From the titration equation determine the amount of moles of ascorbic acid in the **cabbage juice** (1.5points)	
Show your calculations here: n (ascorbic acid) = n (iod)	
	Moles of Ascorbic acid:

III-7. Calculate the concentration in $mol \cdot L^{-1}$, of ascorbic acid in the **cabbage juice** (1points)	
Show your calculations here: n (ascorbic acid) / 0.03=…….. $mol \cdot L^{-1}$	Molarity of Ascorbic acid:
III-8. Determine the mass of ascorbic acid in the 30 ml of cabbage juice sample (0.5points) Show your calculations here: n (ascorbic acid) x 176.2= mass of ascorbic acid	Mass of Ascorbic acid:

Experiment IV. Density measurements

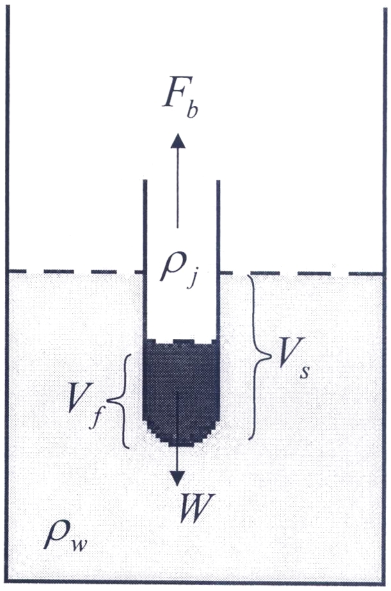
IV-1.

Amount of water (ml)	Sunk depth (ml)	Amount of pomegranate juice (ml)	Amount of feykhoa juice (ml)
4.0	12.2	3.8	4.2
4.6	12.6	4.2	5.1
5.2	13.0	4.6	5.4

0.5 point per data

IV-2. Write the equation that will be used to find the density of the juices at the provided space below

0.5 points for the figure



Since the test tube is floating, buoyancy force is equal to the weight of the test tube with fluid.

$$F_b = W$$

$$\rho_w V_s g = m_t g + \rho_f V_f g$$

Canceling g

$$\rho_w V_s = m_t + \rho_f V_f$$

(0.5 points)

Since the sunken volume of the test tube cannot be obtained in the experiment (volume of the wall is significant) a different method has to be used.

We can try to add as much juice as possible to the test tube such that its sunken depth is equal to the sunken depth of the test tube with known volume of water. That is

$$\rho_w V_s = m_t + \rho_f V_f$$

$$\rho_w V_s = m_t + \rho_w V_w \Rightarrow \rho_w V_w = \rho_f V_f$$

(0.5 points)

IV-3. Density of the pomegranate juice ρ_{pj} = | 1081.7 kg/m^3 |

Density of the feykhoa juice ρ_{fj} = | 965.7 kg/m^3 |

Marking scheme for pomegranate juice:

Range 980 kg/m^3- 1180 kg/m^3 – **1.0 point**
Range 880 kg/m^3- 1280 kg/m^3 – **0.5 points**
Outside the described range – **0.0 points**

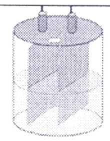
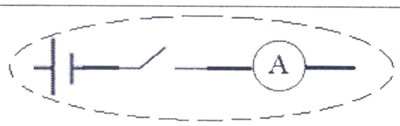
Marking scheme for feykhoa juice:

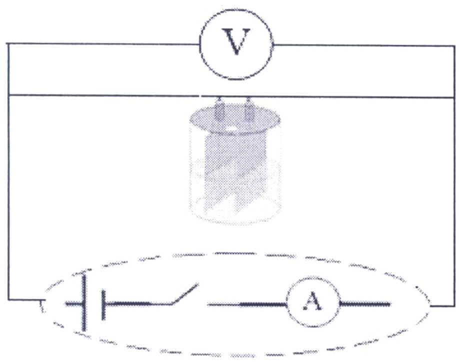
Range 860 kg/m^3- 1060 kg/m^3 – **1.0 point**
Range 760 kg/m^3- 1160 kg/m^3 – **0.5 points**
Outside the described range – **0.0 points**

Experiment V. Resistivity measurements

V-1. The circuit to measure the current vs. voltage characteristics

Use the common symbols as in the table below.

	Voltmeter
	Voltameter
	Power source with ammeter and switch



Correct circuit – **0.5 points**
Wrong circuit – **0.0points**

V-2. The distance between the plates $L=$ 15mm **0.15 points**

The width of the plates $a=$ 30mm **0.15 points**

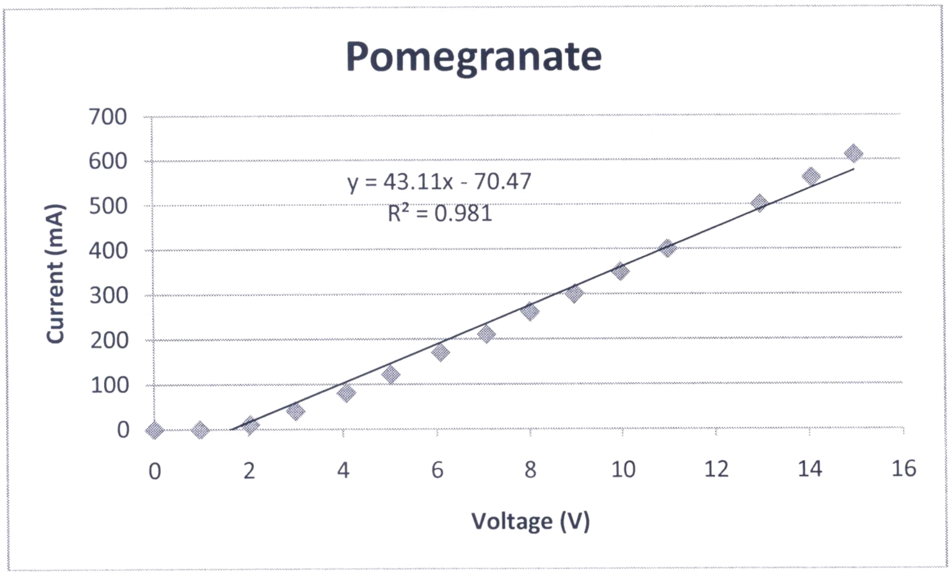
The height of the plates $b=$ 40mm **0.15 points**

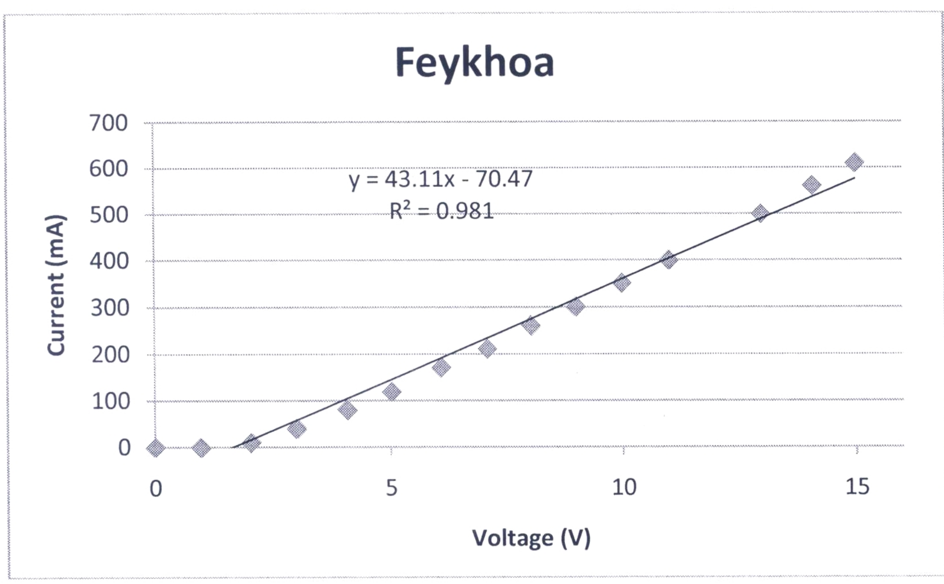
The effective area of the plates $A=$ $1.2\times10^{-3}m^2$ **0.05 points**

V-3.

Pomegranate juice	
Voltage (V)	Current (mA)
0	0
1,03	0
2,17	10
3,04	40
4,03	80
5,07	120
6,15	170
7,14	210
8,18	250
9,03	290
10,01	330
10,99	370
12,05	420
12,99	460
13,93	510
14,95	560

Feykhoa juice	
Voltage (V)	Current (mA)
0	0
0,97	0
2,03	10
3,00	40
4,07	80
5,02	120
6,08	170
7,07	210
8,01	260
8,98	300
9,98	350
11,00	400
12,98	500
14,08	560
14,99	610





Marking scheme:
8 or more data points – **1.2 points**
Less than 8 data points – **0.15 points per data**

0.3 point per graph

V-4. Resistance of the pomegranate juice R_{pj} = 24.81±0.61Ω

Resistance of the feykhoa juice R_{fj} = 22.95±1.81Ω

Marking scheme for pomegranate juice:
20 Ω to 30 Ω – **1.0 points**
15 Ω to 35 Ω – **0.5 points**
Outside the range – **0.0 points**

Marking scheme for feykhoa juice:
18 Ω to 28 Ω – **1.0 points**
13 Ω to 33 Ω – **0.5 points**
Outside the range – **0.0 points**

V-5. Resistivity of the pomegranate juice ρ_{pj} = 1.985Ωm

Resistivity of the feykhoa juice ρ_{fj} = 1.836Ωm

Marking scheme for pomegranate juice:
1.7 Ωm to 2.3 Ωm – **0.5 points**
1.4 Ωm to 2.6 Ωm – **0.25 points**
Outside the range – **0.0 points**

Marking scheme for feykhoa juice:
1.5 Ωm to 2.1 Ωm – **0.5 points**
1.2 Ωm to 2.4 Ωm – **0.25 points**
Outside the range – **0.0 points**