Experimental Tasks A + B + C

Time : 3 hrs
Marks :40

Task: C Tomato (6 marks for this task)

Examination Rules:

1. You are not allowed to bring any tools **except** any personal medicine or any personal medical equipment.
2. You must sit at your designated table.
3. Before the examination starts, you must check the stationery and any tools (pen, ruler, calculator) provided by the organizers.
4. You must check the question paper and answer sheet. Raise your hand, if you find any missing sheets. You may start only when given the signal by the organizers.
5. During the examination, you are not allowed to leave the examination room except in an emergency and for that the examination supervisor/volunteer/invigilator will accompany you.
6. You are not to disturb any other competitor or disrupt the examination. In case any assistance is needed, you may raise your hand and the nearest supervisor will come to help.
7. You may not question or discuss the examination problems with anyone other than your team members. You must stay at your table until the time allocated for the examination is over, even if you have finished the examination or you do not want to continue working.
8. A signal will indicate the end of the allotted time for the examination. You are not allowed to write anything on the answer sheet after the allocated time is over. You must leave the room quietly after all the answer sheets have been collected.

Read the following instructions carefully:

1. While you are in the examination hall, you should wear safety spectacles at all times. While doing your experimental task, always wear your lab coat, safety goggles, and hand gloves.
2. Handle each and every apparatus and chemicals with care.
3. Do not try to taste or smell any chemical substance.
4. Chemicals are very safe if handled and disposed of properly.
5. Ensure that you keep the answer sheet and question paper away from liquids.
6. Place all waste papers and used material in the waste basket provided.
7. Immediately report all accidents, injuries, however minor they may be, to the invigilator/supervisor/volunteer present.
8. Eating of any kind of food is strictly prohibited during the experimental task.
9. You are expected to work safely, to behave socially, and to keep the equipment and work environment clean. When carrying out discussions with your teammates, keep your voice low.
10. Do not leave the examination hall until you have permission to do so. Ask an invigilator/supervisor/volunteer if you need to use the bathroom.
11. You may start working only when the start signal is given.
12. You have 3 hours to complete the experimental tasks and to record your results on the answer sheets. You must stop your work immediately after the stop command is given.
13. Be sure that your team has a complete set of the question paper (3 copies) and 2 types of answer sheets (1 white copy for rough work and 1 yellow copy for final answers). **ONLY YELLOW ANSWER SHEETS WILL BE EVALUATED.**
14. Use only the pen and calculator provided.
15. ID code must be written on every page of the final (yellow) answer sheets. Each team member must sign on the front page of the final (yellow) answer sheets.

16. All results must be written in the designated boxes on the **yellow answer sheets**. **Data written elsewhere will not be graded.**

17. After completing the task, put all the equipment back to its original place. Make sure you clean your work place.

18. After the stop command is given, put all papers inside the envelope kept on the desk. Wait for the volunteer to check and collect it.

Experimental Tasks

A + B + C

Time : 3 hrs
Marks :40

Task C: In this experiment we will extract lycopene from tomato and study its absorbance

Tomatoes are one of the main ingredients of pizzas. Tomatoes have two ingredients, lycopene and β-carotene, which are antioxidants and very good for health. They are soluble in oil but not water and, hence, in many parts of the world tomatoes are cooked in oil. Red tomatoes can contain as much as 50 mg of lycopene per kilogram of tomato.

In order to test the presence of lycopene in tomatoes, we shall dissolve tomato concentrate in an extracting solvent made up of petroleum ether and ethanol; we shall allow the solution to settle. The lycopene-rich solution separates out, resulting in two immiscible liquids. The top solution will be carefully separated out; its moisture content will be removed by using magnesium salts (which are hygroscopic in nature).

Experimental Tasks

A + B + C

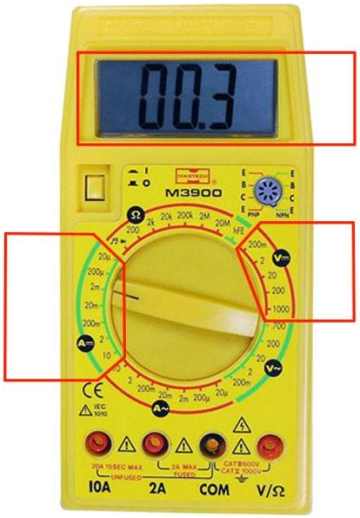
Time : 3 hrs
Marks :40

You are supplied with the following:

	Labelled as…	Quantity Supplied
Tomato Concentrate	**TP**	In 50 ml beaker
Extracting Solvent	**ES**	(20ml) in 50 ml tube
Anhydrous Magnesium sulphate	**$MgSO_4$**	(1.5g) in a plastic container
Sodium chloride	**NaCl**	In plastic container
Test tube with stopper	**FL**	1
Test tubes	**Ab, UL**	2
Funnel		1
Glass rod		1
Filter paper		3
12 ml syringe	**SS**	1
Wash Bottle		1
White LED and Photodiode acrylic set-up		1
50 ml beaker	**SS**	1
Test tube stand		1
Blue LED		1
Bag containing acrylic collar for test tubes	**Collar**	
Dropper		
Multimeter		as in task B

The photo below is that of a multimeter. Your multimeter may be either yellow or black.

Multimeter knob is to be positioned in this region for current measurement
2μA is the minimum range of current measurement
10A is the maximum range



If display read *-1*, it implies range is insufficient. Shift the knob to higher range. Working in higher range than required will result in loss of accuracy

For this experiment DO NOT keep the knob in A ~V ~Ω

Multimeter knob is to be in this region for voltage measurement



To measure current



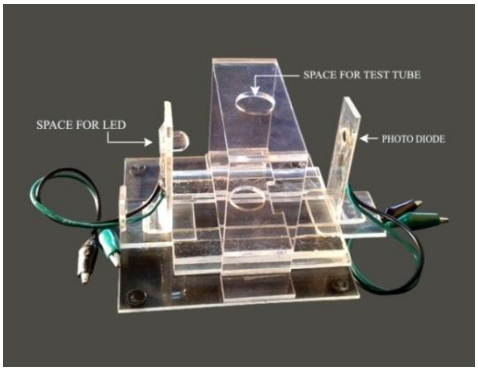
To Measure Voltage





1. Press MODE button, if the Stopwatch is on Time Mode, to bring it to Stop Watch Mode. 0:00 00
2. Press SPLIT/RESET button to reset the Stopwatch to Zero.
3. Press START/STOP button to start the Stopwatch.
4. Press START/STOP button to stop the Stopwatch.
5. In Stopwatch mode START/STOP button should be used to start and stop as many times as required.

Stopwatch



Procedure

Acrylic set-up with photodiode

1. **<u>Use the same acrylic apparatus that you used in Task:B2</u>**. Insert a white LED and photo-diode in their respective slots.
2. Half-fill test tube **Ab** with solvent from tube **ES**, using a dropper.
3. Using the acrylic collar provided, place test tube **Ab** in the acrylic apparatus, such that it is located between the LED and the photodiode (*as shown in the photograph).*
4. Adjust the position of the photodiode and the test tube so as to maximize the current in the photodiode which is connected to the multimeter, as described in **TASK: B2.** Please ensure that the label on the test tube does not obstruct the light.
5. Measure the maximum current, I_s, and record your observation in **Table C.1 in the yellow answer sheet.**
6. Replace the WHITE LED with the BLUE LED **without changing the position of either the test tube holder or the photodiode.** Measure the maximum current and record the value in **Table C.1 in the yellow answer sheet.**
7. Pour all the solvent back in test tube **ES**.

Note: Do not disturb the position of the photodiode and the acrylic test tube holder, it is crucial for subsequent readings.

We shall now extract lycopene from tomato concentrate, as follows.

8. Transfer all the solvent from test tube **ES** into the tomato concentrate in beaker **TP**. Stir the mixture well with the glass rod and allow it to settle for 2-3 minutes. Wash the glass rod for further use.
9. Now, filter the solution carefully by using funnel, and filter paper, in test tube **FL**. The red clear solution in test tube **FL** is your lycopene-containing extract (impure).
10. Preparation of saturated solution of NaCl: Take approximately 20 ml water in beaker **SS** using syringe SS; then add all the solid NaCl from container **NaCl,** stir well using the glass rod. Some part of the salt may remain undissolved.
11. Use syringe **SS** to add 10 ml of saturated NaCl solution in test tube **FL** containing lycopene extract. Put the stopper on the test tube and shake gently.
12. Keep the test tube on the test tube stand. Let the liquid in the test tube separate into two distinct layers. This should take about a minute.
13. Using the plastic dropper provided**,** carefully remove most of the upper layer (coloured) into test tube **UL**.

14. Add all the anhydrous $MgSO_4$ from the container labeled **$MgSO_4$** into test tube **UL** and swirl gently to allow water to be absorbed by the salt.
15. The yellow-red coloured solution in test tube **UL** is your lycopene extract (pure).

    We shall now carry out a comparative study of absorbance between solvent and the lycopene extract.

16. Place test tube **UL** in the acrylic apparatus.
17. Using the blue LED, measure the current I_l on the multimeter and record the value in **Table C.1 in the yellow answer sheet.**
18. Replace the blue LED with a white LED.
19. Measure the maximum current and record your respective observations in **Table C.1 in the yellow answer sheet.**
20. Deduce the percentage of light transmitted in each case.

[C.Q1: 3.5 Marks]

Questions

If the test tube **Ab** (containing the solvent) was removed from between the photodiode and the white LED,

a) The current measured would be less than I_s
b) The current measured would be more than I_s
c) The current measured would be equal to I_s

Write the correct option in the appropriate box in the yellow answer sheet.

[C.Q2: 1.0 Mark]

Which of the following can you *deduce from your observations in the experiments* on transmitted light. Indicate your answers as YES (Y) or NO (N) on **the yellow answer sheet**.

a) Lycopene absorbs more blue light relative to other parts of the visible spectrum.
b) Lycopene preferentially absorbs light in the red and yellow parts of the spectrum.
c) Lycopene is an antioxidant.
d) Red and yellow parts of the spectrum are absorbed relatively less compared to blue parts of the spectrum.
e) Blue light passes through the solution better compared to red light.
f) Lycopene absorbs light equally across the spectrum.

[C.Q3: 1.5 Marks]

Space for rough work