

## Permeability of a Membrane

### Report

#### Apparatus and Method

Everything was one as set out in the plan.

#### Table of Results

Temperature °C	Light Transmission %			Average
30	95	92	91	93
40	88	83	81	84
50	75	73	78	75
60	66	88*	68	67
65	57	59	54	57
70	6	8	6	7
80	2	4	5	4

$$\text{Average} = \frac{95+92+91}{3}$$

#### Comments

The starred result has been classed as an anomaly due to its lack of concordance with the other two. For this reason it was ignored when calculating the average.

#### Visual Observations

At higher temperatures some water vapour was seen this may have made the pigment less dilute than it would have been had no water escaped. Also at higher temperatures the cubes were seen to float this would increase the surface area because at lower temperatures some faces of the cube were pressed against the sides of the test tube.

#### Errors

##### **The random errors were:**

- Maintaining the temperature of the water bath +/- 10% (this was the most significant)
- Human error in reading the thermometer +/- 2%
- Human error in reading the colorimeter +/- 2%

##### **The systematic errors were:**

- Inaccuracies in the thermometer +/- 1%
- Inaccuracies in the colorimeter +/- 5%

#### Conclusions

The graph shows clear negative correlation (i.e. As the temperature goes up the light transmission falls). This indicates that the membrane becomes more permeable at higher temperatures. The sharp fall between 65°C and 70°C is indicative of a breakdown of the membrane which is in holding with the fluid mosaic model of the membrane whereby at lower temperatures the membrane is tightly packed and gel

like but at higher temperatures it becomes less tightly packed and more fluid until eventually it loses its structure and breaks down completely.

### Evaluation

The method selected would appear to be sound with most of the errors being quite low with only the temperature of the water bath being really significant. This could have been overcome if an automated water bath could have been used; unfortunately this was not possible due to lack of apparatus. Another related problem was reading off the thermometer as one had to make sure it was not at an angle and that the line of sight was directly at the top of mercury to make sure that it was at the right temperature. The results are all stated to two significant figures, as it is reasonable to assume that the equipment was accurate to this degree of precision. It is therefore reasonable to assume that the conclusions drawn are both reliable and accurate.