NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2015

LIFE SCIENCES: PAPER III

MARKING GUIDELINES

Time: 1½ hours 50 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

Invigilators are asked to please complete this after the examination.

CRITERIA		
Following instructions	0	1
Test tube contents	0	1
Manipulation	0	1
TOTAL		**3**

(3)

15. Complete the table below. Give the table an appropriate heading. **When the investigation is complete**, record your observations in this table. In the table, also record the concentration of ethanol in the test tubes C, D and E.

Heading: **Table to show the final colour of a solution of ethanol of varying concentrations (in which a cylinder of beetroot has been placed for 20 minutes)** (2)

Test tube	Concentration of ethanol (%)	Colour of the ethanol solution in the test tube
A	0	**Clear or light 'pink' colour/tinge of colour/no colour**
B	100	**Dark colour pink/red**
C	**50**	**Fairly red/pink**
D	**25**	**Light pink in colour**
E	**12,5**	**Very light pink/clear with a tinge of colour**

(3)

mention of colour not just dark, light, etc. DIFFERENT results recorded for tubes (A, B and D) varying trend of colouration evident (less colouration as ethanol concentration becomes less)
If units appear in the table, deduct a mark (–1) (6)

16. What is the **dependent** variable in this investigation?

Colour of the solution in the test tube/permeability of membrane/ Amount of pigment escaping cells (2)

17. What is the **independent** variable in this investigation?

Ethanol concentration (2)

18. Give ONE controlled variable that was important for the fairness of this investigation.
State clearly how this variable was controlled.

Type of beetroot all cut off same beetroot
Length of cylinder/size of cylinder cut each cylinder to 10 mm
Time in test tube all left for 20 minutes then recorded (2)

19. What conclusion can you reach from this investigation?

The more concentrated the ethanol solution, the more permeable the membrane is.
The more concentrated the ethanol solution, the more pigment passes into the solution in test tube.
(Others to be considered on merit) (2)

20. Why were the cylinders of beetroot cut and rinsed in water before you started your investigation?

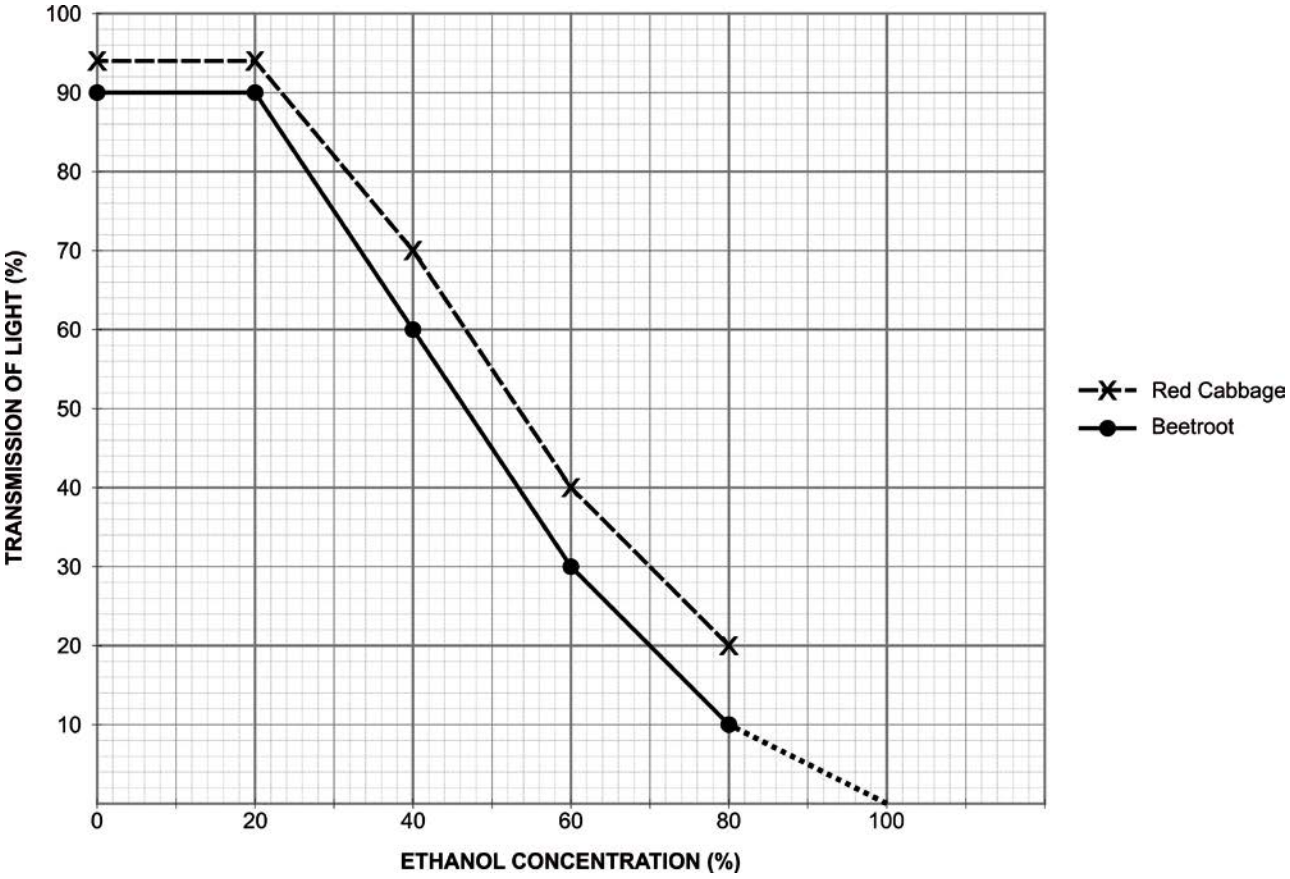
To remove/wash off any pigment that could escape onto the surface of the cylinder as cells are cut open and membranes are broken. (2)

21. Why are the results of this investigation regarded as being **qualitative** in nature?

Observation of results/a measurement that is not a real value/quantity/a description. Colour cannot be measured in this investigation. (2)

22. Plot a line graph for both sets of data on the graph paper provided. Your graph needs a suitable heading.

Heading: **Graph comparing the transmission of light (measured using a spectrophotometer) for beetroot and red cabbage placed in different concentrations of ethanol** (2)



Y-axis – transmission of light (%) **Key**
X-axis – concentration of ethanol **Points correct on both curves**
Correct scales given (6)

23. Comment on the results from the data you have plotted.

Transmission of light decreases as the concentration of ethanol increases.
Reason: (In both plants the permeability of the membranes rapidly/steadily increases in concentrations above 20% ethanol solution.) (2)

24. Extrapolate (extend) the data plotted on the graph to determine the % transmission of light in beetroot for a solution of pure (100%) alcohol. Record your result.

Shows correctly extrapolated curve on graph result is ... (0%) (2)

25. Assuming the components of the cell membranes and the cell walls are the same in both types of plant, suggest a reason for the possible variation in the results as shown in Question 22.

More pigment in beetroot than in red cabbage, so more 'leaks' out. OR Pigment particles are smaller in the one plant type so moves through the membrane more rapidly. OR colours the solution more.
(may be others) (2)

PART 2

EXPERIMENTAL DESIGN

You are to design a completely new experiment.

Design a simple experiment where you now investigate ONE other variable (mentioned in the Information Sheet) and its effect on the permeability of the membranes of beetroot cells. (Do not use a solvent.)

1.1 Formulate a hypothesis for this experiment that you are designing.

Statement
Variable: Temperature/pH and its effect on increasing or decreasing the permeability of the membrane. (3)

1.2 State the aim of the experiment.

To investigate if changing the temperature/pH of a solution in which you place beetroot effects the permeability of the cell membrane (2)

1.3 Outline your own method using numbered points.

One suggestion:

1. **Place four test tubes in a test tube rack.**
2. **Mark each test tube A, B, C and D with a marking pen.**
3. **Into each test tube place 30 ml of distilled water.**
4. **Place a cylinder of beetroot in each test tube.**
5. **Place test tube A in a waterbath of water at 90 °C, test tube B in a waterbath of water at 70 °C, and test tube C in a waterbath of 50 °C; leave test tube D at room temperature.**
6. **After 50 minutes, remove the beetroot gently with a kebab stick.**
7. **Using a piece of white paper as a background, observe the colours of the solution in each test tube.**
8. **Record the colour of the solutions on an appropriate table.**

Use the attached rubric for assessment for Question 1.3.

Method Rubric Criteria	**5**	**4**	**3**	**2**	**1**	**0**
L Layout – appearance of method.					Layout meets criteria below: Neat and tidy and bulleted/numbered.	Layout is untidy and hard to read. **OR** Method is not formatted correctly with bullet points or numbers.
A Aim – Method relates to prescribed experiment.				Method clearly tests an aim that relates to the prescribed experiment and achieves the required result.	Method relates to the prescribed aim given, but is a little confusing and does not achieve the required result.	Method does not relate to the prescribed aim or achieve the desired result. Method given is the same as the given experiment.
M Method – This needs to be appropriate and relevant to the aim, clearly logical and sequential. If apparatus is given in the examination paper, the method should resemble the one given in the marking guidelines.	All 5 criteria given below are met: 1. An original experiment provided. 2. Equipment is appropriate and used correctly. 3. Measuring of solutions, reagents and marking of equipment is explained and this assists in the control of variables. 4. Instructions are scientifically valid and ordered. 5. Instructions are complete to produce measurable results that are recorded.	An original experiment provided. Plus 3 of 5 criteria are met.	An original experiment provided. Plus 2 of 5 criteria are met.	An original experiment provided. Plus 1 of 5 criteria is met.	An original experiment provided.	None of the 5 criteria are met. **OR** Method a copy of the original given experiment.

[8]

Total: 50 marks