BIOLOGY **9744/04**

Paper 4 Practical **2 September 2021**

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure that any confidential information given does not reach the candidates either directly or indirectly.

Each candidate must be provided with the following apparatus and materials.

Question 1
Each candidate will require, for a period of at least 90 minutes:

1. At least 20 cm^3 of each of a 10% and a 1% betalain solution.

   A stock betalain solution should be prepared as follows:

   Peel and cut up 200 g of raw (uncooked) beetroot and liquidise with 100 cm^3 of distilled water. Pour the homogenate through several layers of muslin.

   The following procedures can be scaled up according to the number of candidates.

   Preparing 40 cm^3 of 10% betalain solution:

   4 cm^3 of the stock betalain solution should be used to make a 10% betalain solution, as follows:

   Add 4 cm^3 of stock betalain solution to 36 cm^3 distilled water and mix.

   This should be provided to the candidates in a 50 cm^3 beaker, or other suitable container, labelled **10.0% betalain solution**.

   Preparing 40 cm^3 of 1% betalain solution:

   4 cm^3 of the 10% betalain solution should be used to make a 1% betalain solution, as follows:

   Add 4 cm^3 of 10% betalain solution to 36 cm^3 distilled water and mix.

   This should be provided to the candidates in a 50 cm^3 beaker, or other suitable container, labelled **1.0% betalain solution**.

2. Three cores of raw (uncooked) beetroot tissue with a minimum length of 3 cm.

   These should be prepared as follows:

   Peel the beetroot. Use a size 6 cork borer to make several cores of beetroot tissue. The direction of the cores is not important and depends on the size of the individual beetroot. There is no need to trim the ends of the cores so that they are at right angles.

   Provide the cores to the candidates in a beaker and cover with distilled water.

3. **[F][MH][HH]** 50 cm^3 of 100% alcohol (IMS / IDA) in a capped bottle labelled **100% alcohol, flammable**.

4. Six plastic vials with caps (at least 10 cm^3 capacity)
5. 200 cm^3 distilled water in a capped plastic vial labelled **distilled water**
6. 250 cm^3 beaker labelled **tap water** (also used in Q2)
7. 12 test-tubes (15 mm × 150 mm) (also used in Q2)
8. Rack or racks to contain at least 12 test-tubes (also used in Q2)

9. Three 10 cm^3 syringes
10. Two 1 cm^3 syringes.
11. Scalpel (e.g. Swann-Morton No. 11) or single-edged razor blade
12. White tile
13. Blunt forceps
14. Stirring rod
15. Plastic ruler (also used in Q2)
16. Marker pen
17. A piece of plain white card (to help determine colour intensity), approximately 10 cm × 10 cm
18. Stopwatch
19. Beaker for waste, labelled **waste**
20. Eight paper towels
21. Protective gloves
22. Eye protection

Extra supplies of beetroot cores, plastic vials with caps, test-tubes, beakers, distilled water and 100% alcohol should be available if candidates request them.

Question 2

1) 25 cm^3 of 0.1% 2,6-dichlorophenol indophenol (DCPIP) solution in a covered, labelled plastic vial. Label as **DCPIP**.

2) 15 cm^3 of each of four standard solutions of ascorbic acid prepared as follows:

   Dissolve 400 mg of ascorbic acid powder in 100 cm^3 distilled water. Add 15 drops of BDH Universal Indicator solution and adjust the pH to between 7 and 8 by adding 5% sodium hydroxide solution drop by drop. This is **4.0mgcm^{-3}** ascorbic acid solution. Take 50 cm^3 of this solution and to it, add 50cm^3 of distilled water (the **2.0mgcm^{-3}** ascorbic acid solution). Repeat this procedure to obtain **1.0mgcm^{-3}** and **0.5mgcm^{-3}** ascorbic acid. Any variations in the colours of the solution can be ignored, but the pH of the most dilute solution should be checked with indicator paper. If it is found to be below 7 it should be adjusted to pH 7-8 by adding further drops of 5% sodium hydroxide solution.

   The solution should be dispensed to students in a covered, **labelled** plastic vials. Labels as such: **4.0, 2.0, 1.0, 0.5 respectively**

3) 15 cm^3 of fresh carrot juice. Dispense to students in covered plastic vial labelled **C**.

Each candidate will have sole, uninterrupted use of a microscope for 1 hour 15 minutes only.

Each candidate is provided with:

1. Microscope
2. **TSF** slide
3. Plastic ruler (also used in Q1)
4. test-tube rack(s) (also used in Q1)
5. 250 cm^3 beaker labelled **tap water** (also used in Q1)
6. Five test tubes (also used in Q1)
7. Six 5 cm^3 syringes (in plastic bag)
8. Sticky labels (in plastic bag)
9. Paper towel (in plastic bag)
10. 15 cm^3 of carrot juice extract labelled **C** (in plastic vial)
11. 15 cm^3 each of **4.0, 2.0, 1.0, 0.5** $mgcm^3$ ascorbic acid solutions (in plastic vials)
12. 25 cm^3 of DCPIP (in plastic vial)