Oxford Cambridge and RSA

GCSE Biology A (Gateway)

J247/03 B1-B3 and B7 Higher (Higher Tier)

Question Set 18

1 A scientist clones a cauliflower plant.

He uses small pieces of the cauliflower plant called explants.

This is the method the scientist uses to get the explants:

- Place the equipment in a beaker of bleach and swab the bench with 70% alcohol.
- Collect a small piece of cauliflower and place on a white tile.
- Using a scalpel cut the piece of cauliflower lengthways into small 3–5 mm pieces called explants.
- Measure the mass of the explants.

(a) What equipment should be used to measure the mass of the explants to 1 hundredth of agram?

Digital balance

[1]

(b) The scientist prepares the explants for cloning on an agar jelly plate.

He does this by placing the explants on the agar.

To grow the explants into cauliflower plants, the scientist places the agar jelly plate in a warmroom near to a window.

(i) Before they form new plant structures, the explants must take in sugars from the agar jelly.

Explain why explants cannot make their own sugars.

The explants do not possess chloroplasts so they cannot photosynthesise to produce glucose. **[2]**

(ii) The experiment could be improved by placing the agar jelly plate with explants into a heated cabinet containing light bulbs.

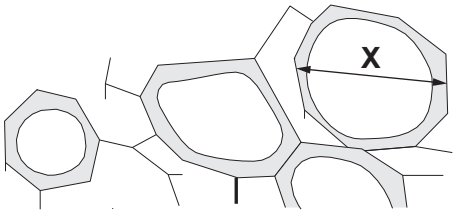
Describe how this cabinet could be further improved to maximise the growth and development of the explants.

Place a kerosene lamp in the cabinet to provide a constant supply of CO_2 for photosynthesis which occurs following the development of shoots and leaves

[2]

(c) The scientist observes some of the tissues of the growing explants using a light microscope.

The diagram shows some of the plant cells.



The diameter of **X** has been magnified 500×.

What is the actual diameter of **X**?

Give your answer in **standard form**.

I / A M

Image size = 20mm

Actual diameter = $\frac{20}{500}$ = 0·04 mm

Diameter = 4×10^{-2} Mm

[2]

(d) Transmission **electron** microscopes (TEM) work by passing a beam of electrons through avery thin slice of an object.

Suggest **one** advantage and **one** disadvantage of using TEM rather than a light microscope to look at cells.

Higher resolution provides ability to distinguish different structures and see detail. However TEM can't be used to visualise living cells as specimen must be placed in vacuum.

[2]

Total Marks for Question Set 18: 9