

Answers to exam-style questions

Option B

- 1 a batch fermentation is carried out in a closed fermenter;
Penicillium fungi are put in with nutrients and the fermenter left for the process to take place [2]
- b in continuous culture, nutrients are added as the process proceeds; whereas in batch fermentation nutrients are only added at the start of the process. [1]
- c a stirrer to ensure that the process is aerobic [1]
- d a water jacket to cool the fermenter / maintain a constant temperature [1]
- e a substance produced at a certain stage of a microorganism's life after the main growth phase / when spores are being produced or the organism is aging / e.g. penicillin from *Penicillium* [1]
- f approximately 20 hours (± 5 hours) [1]
- g *Penicillium* would use the nutrients to grow, not to produce penicillin [1]
- [total 8 marks]**
- 2 a RNA [1]
- b protein [1]
- c TMV modified to carry multiple copies of genes for vaccine proteins;
 viruses are then introduced into tobacco plants / using TMV as a vector / virus infects a tobacco plant;
 TMV genetic material is incorporated;
 plant expresses the protein for vaccine;
 proteins harvested from the plants to make vaccines [5]
- 3 contains only amylopectin;
 used in paper production;
 used in glue manufacture;
 used in cement manufacture;
 does not cause gelling during extraction of starch from potatoes [3 max]
- 4 D [1]
- 5 C [1]
- 6 C [1]
- 7 a sequence of nucleotides in a DNA molecule;
 that has no stop codons within it [2]

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Microorganism	Nucleus	Mitochondria	Ribosomes
fungi	✓	✓	✓
bacteria	✗	✗	✓
viruses	✗	✗	✗

[3]

- 9 a an aggregate of bacteria that live together within a matrix [1]
- b resistant to antibiotics
 resistant to removal from their substrate [1 max]
- c quorum sensing can enable bacteria to exploit a food source;
 be aware of environmental changes;
 be aware of competitors for food sources [2 max]
- [total 4 marks]**

10 B [1]

11 A [1]

12 B [1]