Nucleotides and Nucleic Acids

Total mark – 19

Question: 1

20. DNA can be extracted from a culture of white blood cells and precipitated using the following procedure:

1. Mix a culture of white blood cells with a detergent.
2. Add salt.
3. Add an enzyme.
4. Place in a water bath at 40 °C.
5. Filter the culture.
6. Gently pour ice-cold ethanol onto the filtrate.

i. Suggest why the cells do not need to be crushed before adding detergent.

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[1]

ii. Explain why the detergent is used in step 1.

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[1]

iii. Suggest the type of enzyme that should be used in step 3 and explain why.

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[2]

Question: 2

21. A group of students tried to purify some DNA from leek cells using the following method. They decided that exact volumes were not necessary.

1. Grind a leek leaf to a fine pulp using a pestle and mortar.

2. Add salt and cold water and mix again for at least 10 s.

3. Add protease enzyme and mix again for at least 10 s.

4. Filter the liquid into a test tube and stand for at least 10 min.

5. Tilt the test tube and gently pour in ice-cold ethanol.

6. A white layer of DNA forms between the sample and the ethanol.

7. Extract the white layer carefully using a glass rod.

i. State the purpose of step **1**.

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[1]

ii. Suggest why a protease enzyme added in step **3** is needed to purify DNA.

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[1]

iii. The students considered using pineapple juice as a source of protease enzyme.

Suggest why this would **not** be an appropriate source of protease when attempting to produce a pure sample of leek DNA.

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[1]

iv. State one important step that the students had left out of their method.

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[1]

v. Name the process described in step **6**.

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[1]

Question: 3

22. A group of students attempted to extract and purify DNA from a plant in Upper End Meadow.

The students used the following steps:

1. Mix the plant sample with detergent.
2. Add salt.
3. Add protease enzyme.
4. Spool the DNA precipitate onto a glass rod.

Suggest whether this method would successfully extract and purify DNA. Justify your conclusion.

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[3]

Question: 4

23. A student tried to extract some DNA from a crushed banana at home. DNA dissolves in water but the student realised that they needed to add something to break open the nuclear envelope to release the DNA.

Suggest a suitable substance the student could use to release the DNA, **and** explain why it should work.

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[2]

Question: 5

24. A DNA molecule contains polynucleotide strands.

i. Individual nucleotides are joined together to make a polynucleotide strand.

What type of chemical reaction takes place when two nucleotides in a single polynucleotide strand are joined together?

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[1]

ii. Name the chemical released when the bond is formed between the two nucleotides.

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[1]

iii. A DNA molecule contains two polynucleotide chains.

Describe how these two chains are held together.

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[3]