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BIOLOGY

FOUNDATIONS IN BIOLOGY

Level & Board	OCR (A-LEVEL)
TOPIC:	NUCLEOTIDES AND NUCLEIC ACIDS
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	06
TOTAL MARKS	/31

Nucleotides and Nucleic Acids - 1

1.

The following process can be used to extract DNA and precipitate it from a culture of white blood cells:

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.

(a) Explain why applying detergent does not require crushing the cells first.

(2)

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(b) Justify the usage of the detergent in step one. **(2)**

(c) Explain why you believe a certain type of enzyme should be utilized in step 3. **(2)**

2.

Using the following technique, a group of students attempted to extract some DNA from leek cells. They concluded that precise numbers were not required.

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.

(a) Describe the goal of the first step. **(2)**

(b) Explain the need for the protease enzyme that was added in step 3 to help purify DNA. **(2)**

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(c) The students thought about obtaining protease enzyme from pineapple juice. Explain why, in the case of trying to obtain a pure sample of leek DNA, this would not be a suitable source of protease. **(2)**

(d) Mention a crucial step that the students' approach lacked**. (2)**

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(e) Identify the procedure that step 6 describes. **(2)**

3.

Students made an attempt to separate and purify DNA from an Upper End Meadow plant. The following actions were taken by the pupils:

1. Combine the detergent and plant sample.

2. Include salt.

3. Add the enzyme protease.

4. Thread the precipitate of DNA onto a glass rod.

(a) Indicate if DNA could be effectively extracted and purified using this procedure. Provide evidence to support your conclusion. **(3)**

4.

At home, a student attempted to extract DNA from a crushed banana. Although DNA dissolves in water, the student realized that in order to release the DNA, they needed to add something to breach the nuclear envelope.

(a) Provide a relevant substance suggestion and an explanation of why it should work for the learner to release the DNA. **(2)**

5.

Strands of polynucleotides are found in DNA molecules.

(a) A polynucleotide strand is created by joining individual nucleotides together. When two nucleotides in a single polynucleotide strand are linked together, what kind of chemical reaction occurs? **(2)**

(b) Identify the substance that is released as soon as the two nucleotides join together. **(2)**

(c) There are two polynucleotide chains in a DNA molecule. Explain the mechanism that holds these two chains together. **(3)**

6.

(a) Describe the arrangement of the nucleotides into the two polynucleotide strands that make up a DNA molecule. **(3)**

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