

GCSE Biology A (Gateway)

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

Question Set 8

1

Students investigate how to extract DNA from peas.

Stage 1:

- Chill 10 cm³ of ethanol. Keep it on ice throughout the method for use in stage 2.
- Make a thick 'soup' by blending 100 cm³ of peas with salt and cold water. Blend for 15 seconds in an electric blender.
- Strain the 'soup' through a mesh strainer and collect the liquid part in a beaker.
- Add 30 cm³ of washing-up liquid and swirl to mix.
- Let the mixture settle for 5–10 minutes in a water bath at 60°C.

- (a) One group of students made a water bath using a beaker of water, thermometer and Bunsen burner. Another group used an electric water bath.

Write down **two** advantages of using an electric water bath.

- ① Easier to control the temperature
② Limited fire risk

[2]

- (b) Low temperatures protect DNA by slowing down the activity of enzymes that destroy DNA. High temperatures break down membranes in the cell.

To extract DNA, some methods use a water bath at 60°C but other methods do not use an increased temperature.

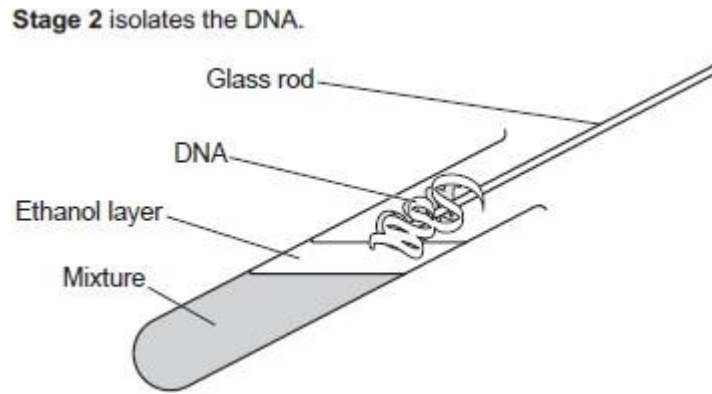
Suggest **two** reasons for the different methods.

For 60°C and higher temperatures: the membranes break down releasing more DNA.

[2]

Against 60°C and higher temperatures: There is an increased risk of DNA breaking down and being destroyed.

(c) **Stage 2** isolates the DNA.



- Pour the mixture collected from stage 1 into a test tube until a third full. Add proteaseenzymes to the test tube.
- Slowly pour cold ethanol at an angle of 45° into the tube. Ethanol will float on top.
- DNA is soluble in water, but salted DNA does not dissolve in ethanol and will form white clumps where the water and ethanol layers meet.
- Twirl a glass rod and the DNA will collect on the rod.
- Dry the sample on a pre-weighed filter paper and measure the mass of product.

Suggest **two** safety precautions which should be taken at stage 2.

Explain why each safety precaution is needed.

Wear face mask to prevent chemicals entering eyes -

Turn Bunsen off as ethanol is flammable

[2]

- (d) Look at the table. It shows the results from the two groups of students in the investigation.

Type of water bath used	Mass of DNA collected (mg)			
	Test 1	Test 2	Test 3	Mean
Beaker of water and Bunsen burner				22.9
Electric	33.6	32.3	33.3	33.1

- (i) Calculate the mean mass collected in the investigation using the electric water bath.

Give your answer to 1 decimal place.

$$\frac{33.6 + 32.3 + 33.3}{3} = 33.067 = \underline{\underline{33.1 \text{ mg}}} \quad [2]$$

- (ii) The range of the three test readings for the beaker of water and Bunsen burner was 3.4.

Does the evidence support using an electric water bath instead of a beaker of water and Bunsen burner?

Explain your answer.

Yes, because there is a greater yield of DNA produced and there is less variation in electric water bath results. [2]

Total Marks for Question Set 8: 10

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