

2025 Bi H1 Q3

Section: DNA and the Genome

Topic: Structure of DNA

Question Summary:

An investigation compares the mass of DNA extracted from different types of fruit.

Each 10 g fruit sample is mixed with salt solution and detergent and incubated in a water bath at 60 degrees C. Ethanol is then added to precipitate the DNA and the mass of DNA is measured using a balance. The entire investigation is repeated.

You are asked which feature improves the **validity** of the investigation.

Worked Solution:

- The **aim** of the investigation is to compare the mass of DNA obtained from different types of fruit.
- For an investigation to be **valid**, the design must allow a fair comparison; that is, all relevant variables must be controlled so that any differences in results are due to the type of fruit only.
- Using a balance to measure mass (option B) is about **accuracy** of measurement, not validity.
- Repeating the entire investigation (option D) is mainly about **reliability** — it checks whether the same pattern of results is obtained again.
- The use of a water bath at 60 degrees C (option C) keeps the temperature the same for every sample. Temperature is an important variable affecting enzyme activity and the breakdown of membranes during DNA extraction.
- By ensuring that all fruit samples are incubated at the same controlled temperature, the experiment more fairly compares DNA mass between fruits. This improves the **validity** of the investigation.

- Therefore, the feature that improves validity is using a water bath to incubate the mixture.

Final Answer: C (using a water bath to incubate the mixture).

Revision Tips:

- **Validity:** does the design allow a fair test of the stated aim? This usually involves controlling key variables (same temperature, same volume, same time).

- **Reliability:** repeat the whole investigation and look for a consistent pattern of results.

- **Accuracy:** use appropriate instruments and careful technique to reduce measurement error.

- In multiple choice questions, link each key term (validity, reliability, accuracy) to the type of improvement it describes so you can quickly eliminate distractors.