

**Model Answers: Hard**

1

The correct answer is **D** because:

- 1 and 4 are  $\beta$ -glucose and  $\alpha$ -glucose; both forms of glucose are reducing sugars (they are aldoses that can act as reducing agents) - hence the positive Benedict's result (brick-red)
- 3 is a tripeptide, hence the positive biuret test result (purple)

Molecule 2 is a triglyceride, but would not be present in the sample if the emulsion test is negative (clear).

2

The correct answer is **A** because:

- It's easiest to look at the most positive observation (solution 4) and the most negative (solution 3) for reducing sugars
- Answers **A** and **B** have suitable values for a reducing sugar forming a brick-red solution
- However, looking at the results for solution 3 it is not possible to determine which option is correct (as both values could be suitable for a negative test result for Benedict's without acid hydrolysis)
- Solution 1 tested more positive for reducing sugar (yellow colour) than solution 2 (green colour), so a higher value would be expected for solution 1 over 2
- In option **B**, solution 2 has a higher reducing sugar percentage than solution 1 which doesn't fit the observations.
- Therefore only answer **A** can be correct.

3

The correct answer is **C** because:

- The test results suggest there are three biological molecules present in the sample - lipids, starch and traces of reducing sugar.
- Molecule 2 is  $\alpha$ -glucose and 3 is a triglyceride.
- Molecule 1 is not starch but cellulose (note how the far-right glycosidic bond partially shown is at  $180^\circ$  relative to the glycoside bond shown in the centre of the diagram).

Although the presence of starch is indicated by the result of the iodine test, the structure of starch is not shown so only answer **C** can be correct.

4

The correct answer is **C** because there is:

- A positive protein test result (purple when Biuret reagent was added)
- A positive reducing sugar result (orange precipitate in the Benedict's test)
- A positive result for the emulsion test for lipids (milky solution)

5

The correct answer is **C** because:

- The solution extracted from sieve tube elements (part of the phloem) will contain sucrose (a non-reducing sugar)
- Non-reducing sugars only produce positive results with Benedict's after acid hydrolysis; and negative results before: options **A** and **C** could be correct.
- There would be no starch present in the sieve tube elements (starch being a large, insoluble molecule) so only answer **C** is correct as a brown colour is observed when the solution was tested with iodine.

6

The correct answer is **B** because:

- The sample tested did not contain any protein or reducing sugar, so molecules 2 (glucose) and 4 (a tripeptide) could not be present in the sample.
- A positive ethanol test suggests that molecule 3 (a triglyceride) would have been present in the sample.
- Molecule 1 is a cellulose molecule; a positive test result with Benedict's for reducing sugar after acid hydrolysis would be possible, but no information is given about this.
- Therefore we only know for sure that molecules 2 and 4 are not present as asked by the question, so answer **B** is correct.

7

The correct answer is **B** because:

- You need to account for the mass of the precipitate produced with Benedict's solution before acid hydrolysis (this forms from any reducing sugars present in the sample) and subtract this from the mass of precipitate produced after acid hydrolysis to find the mass attributed only to non-reducing sugars.
- Sample **B** has 20 mg of reducing sugar precipitate, and 25 mg (45-20) non-reducing sugar precipitate; this is the highest mass of all the samples
  - Sample A = 10 mg non-reducing sugar
  - Sample C = 20 mg non-reducing sugar
  - Sample D = 0 mg non-reducing sugar

8

The correct answer is **B** because:

- Sample 1 will test positive for lipids in the ethanol test (forming a cloudy emulsion) and positive for starch with the iodine test (blue-black)
  - Therefore sample 1 must be Food 4
- Sample 2 will test positive for lipids in the ethanol test (forming a cloudy emulsion), positive for protein in the biuret test (lilac/purple) and negative in the Benedict's test for reducing sugars (blue)
  - Therefore sample 2 must be Food 2
- This means option **B** is the correct answer.

9

The correct answer is **D** because:

- The solution extracted from sieve tube elements (part of the phloem) will contain sucrose (a non-reducing sugar)
- Non-reducing sugars only produce positive results with Benedict's after acid hydrolysis; and negative results before: options **A** and **D** could be correct.
- There would be no starch present in the sieve tube elements (starch being a large, insoluble molecule) so only answer **D** is correct as a brown colour is observed when the solution was tested with iodine.

10

The correct answer is **C** because:

- A solution containing glucose and amylase will test positive when boiled with Benedict's and when Biuret's reagent is added to it
- A solution containing starch and sucrose will test positive when iodine is added and when boiled with Benedict's solution after acid hydrolysis.
- Option **C** would correctly identify solution 1 as containing starch and sucrose, and solution 2 as containing glucose and amylase.