

Biological Molecules – PAG's

1. A student carried out four tests on samples from a beaker of starch and amylase.

Which row, **A** to **D**, would show the correct results if the reaction was still happening?

	Iodine test	Benedict's test	Biuret test	Emulsion test
A	negative	positive	negative	positive
B	positive	negative	positive	positive
C	positive	positive	positive	negative
D	positive	positive	negative	negative

Your answer

[1]

2. An unknown solution of a single sugar was tested. The results were recorded in **Table 9.1**.

Colours observed after testing	
Benedict's test for reducing sugars	Benedict's test for non-reducing sugars
blue	brick red

Table 9.1

Identify the unknown sugar.

- A** fructose
- B** lactose
- C** sucrose
- D** glucose

Your answer

[1]

3. A student tested a range of solutions of known concentrations of reducing sugar using Benedict's solution and colorimetry. Fig. 14.1 shows the calibration curve drawn by the student.

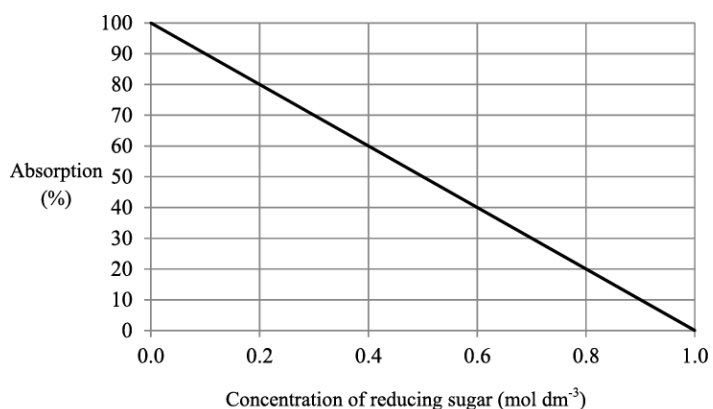


Fig. 14.1

The student then tested four solutions of **unknown** concentrations of reducing sugar. Table 14.1 shows the results:

Solution	P	Q	R	S
Absorption (%)	60	40	70	100

Table 14.1

Select the option that gives the correct sequence of reducing sugar concentrations from **highest** to **lowest**.

- A S, R, P, Q
- B Q, R, P, S
- C S, P, R, Q
- D Q, P, R, S

Your answer

4. After being mixed with iodine, which of the following would show a blue / black colour?

- A potato tuber cells
- B erythrocytes
- C sieve tube elements
- D neutrophils

Your answer

[1]

5. A vet is concerned that a llama is unwell. The vet suspects there may be haemoglobin in the urine of the llama.

Explain how the vet could confirm this suspicion.

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[2]

6. A student attempted to measure the concentration of sucrose in the leaves of a holly bush, *Ilex aquifolium*, using the following method:

- A leaf was removed from the bush and ground with a pestle and mortar.
- The resulting mixture was filtered and 1 cm³ of the leaf filtrate was placed in a boiling tube.
- 1 cm³ of a known concentration of Benedict's solution was added to the boiling tube.
- The boiling tube was gently heated for five minutes.
- The solution was filtered to remove the precipitate.
- The transmission of light through the solution was measured using a calibrated colorimeter.
- A blue filter was used.
- The percentage transmission was converted to a sucrose concentration using a calibration curve for known sucrose concentrations.

Explain why the student's method is invalid.

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[4]

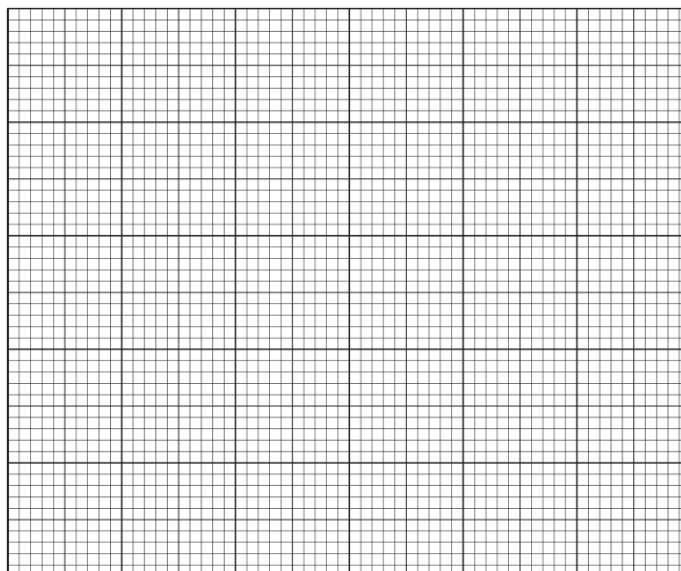
7(a). A group of students decided to investigate the glucose content of three types of fruit juice. They carried out the Benedict's test on known concentrations of glucose solutions and used these to calibrate a colorimeter.

The results of their calibration are shown in **Table 6**.

glucose concentration (mmol dm ⁻³)	% absorbance			
	Trial 1	Trial 2	Trial 3	Mean
1.0	67	68	65	67
2.0	54	52	55	54
3.0	47	46	48	47
4.0	41	41	40	41
5.0	27	25	25	26
6.0	16	16	17	16

Table 6

- i. Plot a graph of the mean % absorbance at each glucose concentration.



- ii. The students were provided with three different fruit juices labelled A, B and C. The Benedict's test was carried out on each fruit juice and samples were prepared for the colorimeter.

Explain how the students would use the calibration curve to estimate the glucose concentration of the fruit juices.

[2]

- (b). The students wrote the following hypothesis:

'The higher the concentration of glucose in the fruit juice, the sweeter it will be.'

- i. Describe how you would carry out a controlled experiment to test this hypothesis **without** using a colorimeter.

[4]

- ii. Suggest one reason why the results for this experiment might **not** support the students' hypothesis.

[1]

8. Lactose is a reducing sugar.

Benedict's reagent can be used to detect the presence of lactose in a solution. A colorimeter can be used to measure the concentration of lactose.

The colorimeter first needs to be calibrated.

Describe how a method that uses Benedict's reagent and a colorimeter could be calibrated to measure the concentration of lactose in an unknown sample.

[4]

9. Glucose and other carbohydrates are present in respiring cells. The concentrations of carbohydrate molecules vary between tissues.

A student conducted tests on three tissues, **A**, **B** and **C**. Table 2 shows the results of these tests.

Tissue	Colour after Benedict's test	Colour after treatment with HCl and Benedict's test	Colour after iodine test
A	red	red	yellow
B	yellow	red	black
C	orange	orange	black

Table 2

Two of the tissues were known to be phloem tissue and liver tissue.

Use the evidence in Table 2 to identify which tissue, **A**, **B** or **C**, is phloem and which tissue is liver. Explain your answer.

Tissue _____ must be phloem because _____

Tissue _____ must be liver because _____

10. A student carried out chemical tests on cabbage leaves to investigate which molecules were present.

The student's method was as follows:

- Add 50cm³ of distilled water to 2 large cabbage leaves and blend into a smooth liquid using a food mixer.
- Place 1cm³ of the blended cabbage leaf liquid into 5 test tubes:
 - Tube 1: Add 5 drops of biuret reagent and mix.
 - Tube 2: Add 2 cm³ of Benedict's solution, mix, then place tube into a water bath for 5 min. Remove and cool.
 - Tube 3: Add 2 drops of iodine solution and mix.
 - Tube 4: Add 2 cm³ of ethanol and mix. Then add 2 cm³ of distilled water and mix.
 - Tube 5: Insert a glucose test strip into the liquid then compare the colour to the colour chart provided (see Fig. 17.2 on the Insert).

i. Name a **type** of food molecule that the student will **not** be able to detect using these chemical tests.

[1]

ii. The table below is a summary of some of the student's findings.

Complete the table by writing in the missing observations and conclusions.

Tube	Observation	Conclusion
1	Protein present
2	Yellow colour
3	Pale brown colour
4	Fat present
5	Glucose concentration small (15 mg dm ⁻³)

[2]

- iii. The student then used a colorimeter to measure the absorbance of the contents of Tube 2.

Explain how the use of a colorimeter could improve the student's conclusion.

[1]

11. The student used a colorimeter to measure the concentration of each substance in the liquid surrounding the cells.

The colorimeter had an analogue display. The reading was indicated by a needle moving across a scale. The smallest divisions on the scale corresponded to 0.1 absorbance unit.

After the investigation the student suggested some improvements.

Draw a line between each of the improvements to the corresponding justification.

Improvement	Justification
Use a colorimeter with a digital display showing absorbance units to 3 decimal places.	To assess repeatability
Check the zero value of the colorimeter with purified water before use.	To assess reproducibility
For each concentration, repeat the measurement of the rate of reaction three times and calculate a mean.	To reduce systematic error
Ask students in several schools to carry out the same investigation.	To reduce random error (uncertainty)
	To increase resolution

[4]

12. Some organisms use a disaccharide called trehalose as a respiratory substrate. Trehalose has a similar structure and very similar chemical properties to sucrose.

Suggest how you could test for the presence of trehalose.

[2]

END OF QUESTION PAPER