CHEMISTRY ONLINE
TUITION

Phone: +442081445350

www.chemistryonlinetuition.com

Email:asherrana@chemistryonlinetuition.com

BIOLOGY

FOUNDATIONS IN BIOLOGY

Level & Board	OCR (A-LEVEL)
TOPIC:	BIOLOGICAL MOLECULES - PAG'S
PAPER TYPE:	QUESTION PAPER - 2
TOTAL QUESTIONS	08
TOTAL MARKS	/21

Biological Molecules – PAG's - 2

1.

One sugar that reduces is lactose. You can use Benedict's reagent to find out if a solution contains lactose. The lactose content can be determined with a colorimeter. The colorimeter must be calibrated first.

(a) Explain how the lactose content of an unknown sample could be determined using a colorimeter and Benedict's reagent calibration procedure. **(4)**

2.

In respiring cells, there is glucose and other carbs. The amounts of glucose molecules differ throughout tissues. Three tissues A, B, and C were tested by a student. These tests' outcomes are displayed in Table 2.

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

It was known that the tissues included liver and phloem tissue.

(a) Determine which tissue (A, B, or C) is liver and which tissue is phloem using the information in Table 2. Give an explanation for your response. **(3)**

3.

To find out what molecules were in cabbage leaves, a student performed chemical tests on them. The following was the student's approach:

- Add 50 cm^3 of distilled water to 2 large cabbage leaves and blend into a smooth liquid using a food mixer.
- Place 1 cm^3 of the blended cabbage leaf liquid into 5 test tubes:
  - Tube **1**: Add 5 drops of biuret reagent and mix.
  - Tube **2**: Add 2 cm^3 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 cm^3 of ethanol and mix. Then add 2 cm^3 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**).

(a) Identify the kind of food molecule that these chemical tests will not allow the student to detect**. (2)**

(b) An overview of some of the student's findings is provided in the table below. Fill in the blanks in the table by adding the observations and conclusions. **(2)**

Tube	Observation	Conclusion
1	.....	Protein present
2	Yellow colour	.....
3	Pale brown colour	.....
4	.....	Fat present
5	.....	Glucose concentration small (15 mg dm^{-3})

(c) The absorbance of the contents of Tube 2 was then measured by the student using a colorimeter. Describe how the student's conclusion might be strengthened by the use of a colorimeter**. (2)**

4.

The concentration of each material in the liquid around the cells was measured by the student using a colorimeter. There was an analog display on the colorimeter. A needle moving over a scale provided the reading. The scale's tiniest divisions matched 0.1 absorbance units.

Following the inquiry, the student made some recommendations for enhancements.

(a) Each improvement should have a line drawn between it and the related justification**. (4)**

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

6.

(a) Trehalose is a disaccharide that is used as a respiratory substrate by certain organisms. Trehalose and sucrose share a lot of structural and chemical similarities. Provide a test method for trehalose detection**. (2)**

7.

Using Benedict's solution and colorimetry, a student evaluated a variety of solutions with known amounts of reducing sugar. The student's calibration curve is displayed in Fig. 14.1.

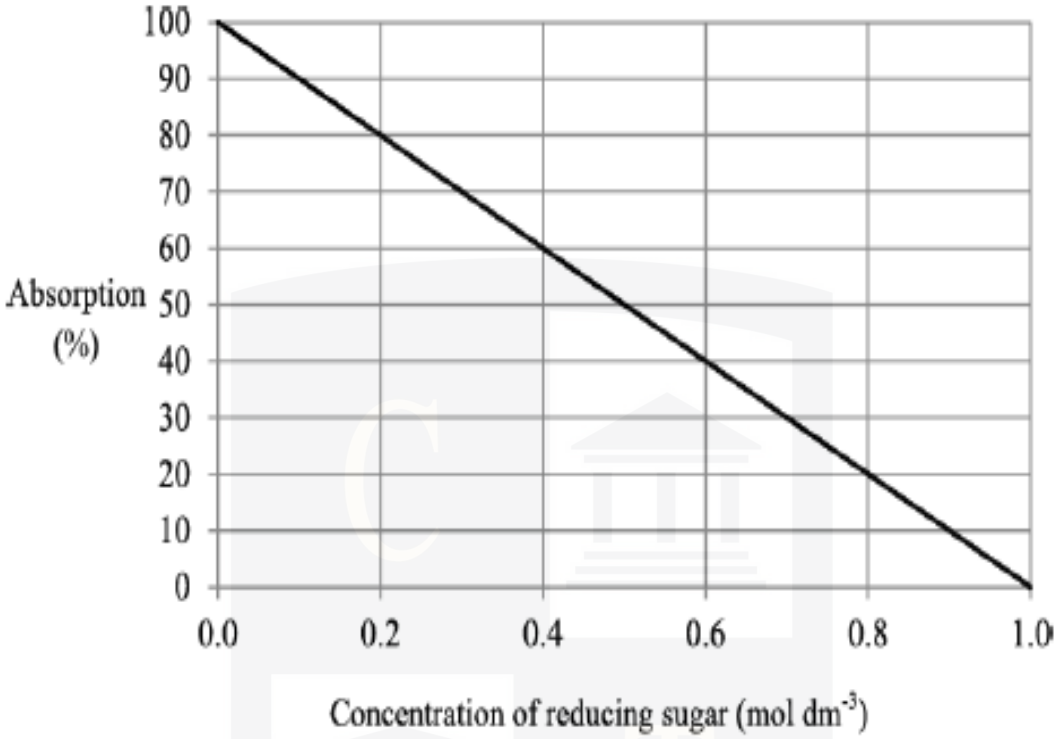

Fig. 14.1

After that, the student tested four solutions with varying amounts of reducing sugar. Table 14.1 displays the findings:

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

Table 14.1

(a) Select the option that gives the correct sequence of reducing sugar concentrations from highest to lowest. **(1)**

A: S, R, P, Q ☐

B: Q, R, P, S ☐

C: S, P, R, Q ☐

D: Q, P, R, S ☐

8.

(a) Which of the following would turn blue or black when combined with iodine? **(1)**

A: Potato tuber cells ☐

B: Erythrocytes ☐

C: Sieve tube elements ☐

D: Neutrophils ☐

DR. ASHAR RANA

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Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
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CONTACT INFORMATION FOR **CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com
- Address: 210-Old Brompton Road, London SW5 OBS, UK