

Answers to 2015 O level Science Biology 5077/5078 Paper 5

In the 2015 Combined Science Biology practical examination, there were 2 parts. The first part involved tests on milk and in the second part candidates were required to label and draw a germinating maize fruit.

First part

Apparatus provided:

1. 3 test tubes
2. Fresh lipase solution
3. Boiled lipase solution
4. sodium carbonate solution
5. bile salts solution
6. bromothymol blue pH indicator
7. milk

Candidates had to add 2 cm³ of milk into each of the 3 test tubes and 2 cm³ of sodium carbonate solution. Next they had to add a few drops of the bromothymol blue indicator into the 3 test tubes and mix until the suspension turned blue.

Candidates were then instructed to add fresh lipase, boiled lipase and bile salt solutions to the test tubes and record the time taken for the indicator to change colour. The following pH table for bromothymol blue was provided.

pH	6	7	8
colour	yellow	green	blue



Test tube	Contents	Colour change	Time taken for colour change	Teacher's comment
1	Sodium carbonate solution, fresh lipase solution , milk and bromothymol blue indicator	Colour changes from blue to yellow-green	12mins	Lipase requires an alkaline condition to work best and the sodium carbonate solution provides a suitable pH of 8 for the lipase. Lipase breaks down the fat in the milk to fatty acids. These fatty acids neutralize the sodium carbonate solution and cause the colour to change to yellow-green. When the pH of the suspension becomes neutral, lipase is unable to breakdown further fat molecules effectively.
2	Sodium carbonate solution, fresh lipase solution, bile salt solution , milk and bromothymol blue indicator	Colour changes from blue to bright yellow	9 mins	Bile salts emulsify the fat in the milk, thereby providing a larger surface area for the lipase to work on. Since bile is an alkaline substance, it is also able to provide lipase with the optimal pH to breakdown all the fat into fatty acids.
3	Sodium carbonate solution, boiled lipase solution, bile salt solution , milk and bromothymol blue indicator	Stays blue/ no colour change	-	Boiling the lipase denatures the enzyme and hence there will be no breakdown of fats. This serves as a control demonstrating that bile salts in the absence of lipase are unable to breakdown fats into fatty acids.

Question:

1. Milk turns sour when left open at room temperature. Propose a method in which you are able to determine if a sample of milk is fresh.

Teacher's comment

Bacteria breakdown the sugar lactose found in milk and produce lactic acid as a by-product. This lactic acid is the reason why milk tastes sour after left in the open. To determine the freshness of a sample of milk, you could add a few drops of bromothymol blue indicator. Fresh milk, having a pH between 7 and 6.5 should give a green or yellow-green colour with bromothymol blue indicator and milk that has turned sour will give a bright yellow colour.

Second part

Candidates were required to draw a germinating maize fruit and label its developing roots and developing leaves. They were also required to calculate the magnification.

Drawing requirements:

- Size and proportion (at least 75% of paper)
- Labels (only label the developing seed leaves and roots)
- Details (presence of root hair)
- Outline (no broken lines)

Magnification: $\frac{\textit{measured size}}{\textit{actual size}} \times$



Germinating maize fruit

