GCSE Biology A (Gateway)

J247/01 B1-B3 and B7 Foundation (Foundation Tier)

Question Set 10

1

The fat in milk is broken down by the enzyme lipase.

A group of students investigate the effect of temperature on this breakdown of fat.

In their investigation they use an indicator called phenolphthalein.

Phenolphthalein is pink in alkali conditions but colourless in pH values below 8.

Step 1 One student puts 5 drops of phenolphthalein and 5 ml of full fat milk into a test tube.

Step 2 She adds 1 ml of lipase and stirs the mixture.

Step 3 She measures the time for the pink indicator colour to disappear.

The other students repeat these three steps but at different temperatures.

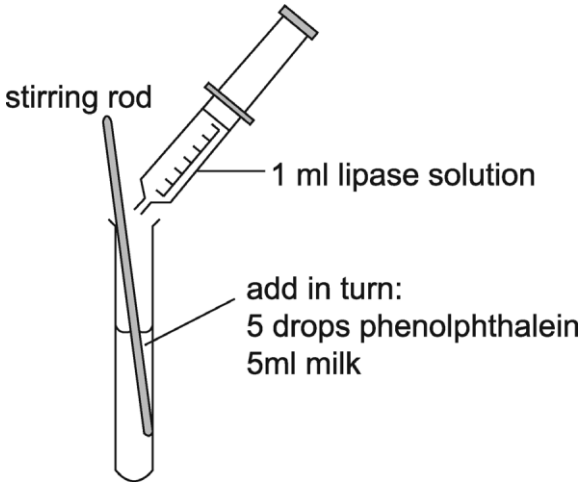

Table 1.1 shows the group's results.

Temperature (°C)	Time for pink colour to disappear (s)
20	480
40	240
60	270
80	960

Table 1.1

(a) The pH falls as the fat in milk breaks down.

Explain why.

This produces acids but they are fatty acids. Acid lowers PH. The more the fat breaks down the more acid is produced.

[2]

(b) Plot a graph of the results in **Table 1.1** and draw a line of best fit.

Time for pink colour to disappear (s)

[5]

(c) Explain why the results at 20°C and 40°C are different.

[3]

20°C is slower reaction because particles are moving more slowly than at 40°C. So there are less frequent collisions.

(d) Explain why the results at 80°C and 40°C are different.

[3]

At 80°C the reaction is slower as the enzymes have denatured and the shape of active site has changed so cannot bind to substrate.

(e) **(i)** One student says that the results show that the optimum temperature for lipase is 40°C.

The teacher says that she **cannot** say for certain that it is 40°C.

Explain why. It could be either side of 40°C.

[1]

(ii) Give **two** modifications that the students could make to their method to find a more accurate value for the optimum temperature.

[2]

Do more repeats and use narrower intervals around 40°C. e.g 30, 40 and 50°C.

(f) The students rounded each time to the nearest 10 seconds.

They rounded the times because they found it difficult to judge exactly when the pink colour had disappeared.

Describe and explain **two** ways the method could be improved to give more accurate measurements.

1 same student doing all observations so consistent judgement.

2 Repeat experiment at each temperature and then use a mean result.

[2]

Total Marks for Question Set 10: 18