Oxford Cambridge and RSA

A Level Biology B

H422/01 Fundamentals of biology

Question Set 13

1. (a) Water is a polar molecule. Molecules of water are attracted to each other.

Fig. 36.1 shows the structure of a water molecule.

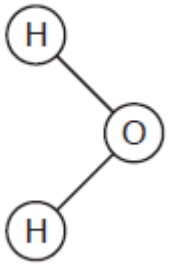

Fig. 36.1

Draw a **second** water molecule on Fig. 36.1, in the position it might take up beside the first water molecule.

Your drawing should show:

- the bond(s) between the two molecules
- the name of each bond
- the charges on each atom.

[Answer on Fig. 36.1]

[3]

(b) (i) Water is required for many metabolic reactions, such as the hydrolysis of starch.

The enzyme that catalyses this reaction, amylase, is commonly used in the food industry. It is produced in large-scale bacterial cultures.

A group of students investigated the amylase activity of five bacterial species.

The bacterial species were treated using the following method:

1. Prepare three nutrient agar plates containing 1% potato starch.
2. Soak five paper discs with cultures of five bacterial species, **A** to **E**.
3. Allow excess liquid to drain from the paper discs and then place onto an agar plate.
4. Repeat steps 1–3 for the other two agar plates.
5. Incubate the agar plates at 25 °C for 3 days.
6. After 3 days, flood the agar plates with reagent **X**.
7. Measure the diameter of any clear zones around the paper discs using a ruler.

Fig. 36.2 shows an agar plate at the end of the investigation.

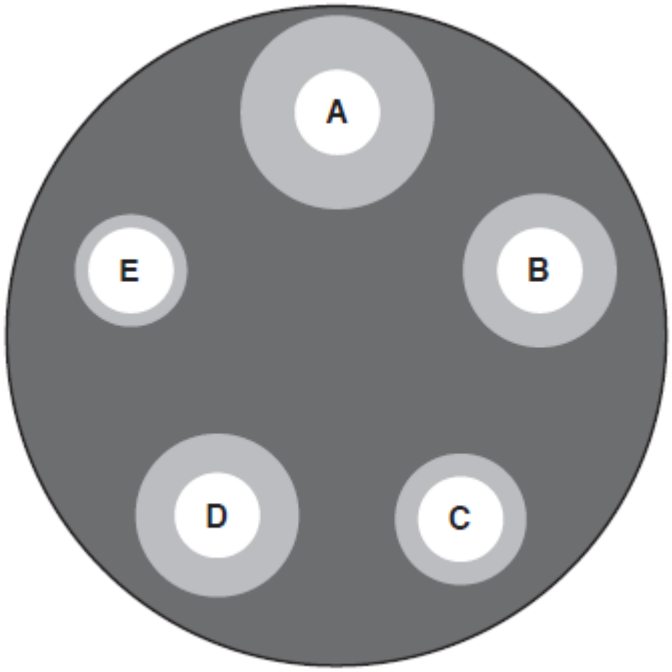

Fig. 36.2

State the **precise** name of the chemical bond in starch that is hydrolysed by amylase. **[1]**

(b) (ii) Reagent **X** was used to indicate the presence or absence of starch in the agar plates.

State the name of this reagent **and** its colour in the presence of starch. **[1]**

(b) (iii) The table below shows the results of the investigation.

Bacterial species	Diameter of clear zone (mm)				
	Plate 1	Plate 2	Plate 3	Mean	Standard deviation
A	23	22	22	22.3	0.6
B	17	20	19	18.7	1.5
C	15	15	14	14.7	0.6
D	19	18	20	19.0	1.0
E	9	12	12	11.0	

Calculate the standard deviation (s) for the data for bacterial species **E.**

$$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

[2]

(b) (iv) The investigation did not include any control experiment.

Suggest **one** control experiment that could have been included in this investigation **and** explain its importance.

[2]

(b) (v) Suggest **one** other way in which the method could be changed to improve the validity of the conclusions.

[1]

Total Marks for Question Set 13: 10

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