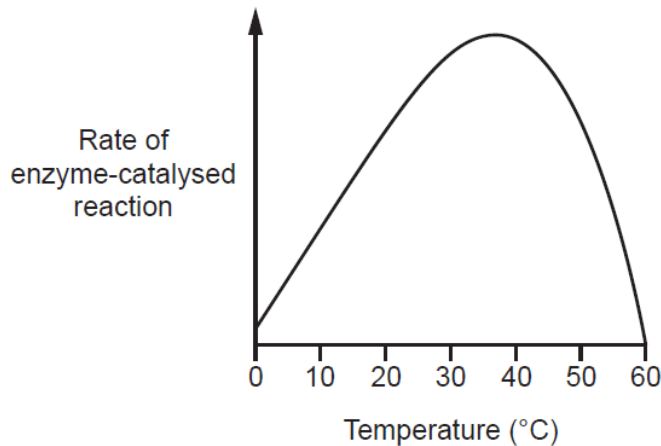


GCSE Biology B (Twenty First Century Science)
J257/04 Depth in biology (Higher Tier)

Question Set 12

Enzymes catalyse reactions in living organisms.

- (a) The graph shows how the activity of a human enzyme changes as the temperature changes.



- (i) Use the graph to explain why it is important for the human body to maintain a constant internal temperature of 37°C. [3]

If the temperature is too low, the enzyme activity would be slow. At 37°C, the enzyme has the highest rate of activity thus it is the optimum temperature which is why the body maintains this temperature. Temperature higher than 37°C leads to decrease in rate of reaction. This is because the enzyme starts to denature and become non-functional.

- (ii) Scientists have found single-celled organisms called thermophiles living around hot vents on the sea floor.

Thermophiles cannot control their temperature. The cell and its contents are the same temperature as the seawater.

The temperature of the seawater around one hot vent is 50°C.

Suggest **and** explain how you would expect the graph to look for an enzyme from a thermophile living around this vent. [2]

Peaks at 50°C.

because the cell temperature is same as seawater - the enzymes are adapted to the high temp

- (iii) The seawater around the vent has a very high concentration of salt. Describe and explain how this could affect the single-celled thermophiles.

[3]

The salt concentration in the cell would be lower than the salt concentration in sea water. Thus, salt would diffuse into the cell down the concentration increasing the intracellular salt level. This would denature the enzymes and damage the cell. However thermophiles probably have a mechanism which pumps the salt out to prevent high intracellular salt concentration and denaturation of enzymes.

- (b) Scientists have been studying two different enzymes in invertebrates.

- Both enzymes break down the same substrate.
- The shape of the active site of each enzyme is the same.
- Each enzyme is coded for by a different gene.
- There are some differences in the sequences of bases in the two genes because of mutations.

Explain how the two enzymes could have the same shaped active site when they are made from genes with differences in their base sequences.

[4]

The genetic code is degenerate so some amino acids may each be coded by more than one codon. Hence although the base sequence may be different, the different codons may code the same amino acid leading to same amino acid chain.

The polypeptide would form bonds the same way and bend into same shape of active site.

Total Marks for Question Set 12: 12

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