

3. Enzymes

Starter Quiz · 课前小测

A-Level Biology

Name: _____ Score: _____

1. Which best describes an enzyme?

- ☐ a globular protein that catalyses a reaction and is not used up
- ☐ a carbohydrate that is broken down in the reaction
- ☐ a lipid used up as the reaction goes
- ☐ a fibrous protein that gives support

2. Why is the initial rate (slope at time zero) the fairest value to compare?

- ☐ the reaction is fastest then, with the most substrate present
- ☐ the reaction has stopped
- ☐ the enzyme has denatured
- ☐ all product has been made

3. What does V_{max} represent?

- ☐ the maximum rate, reached when all active sites are occupied
- ☐ the substrate concentration at the start
- ☐ the rate with no enzyme
- ☐ the optimum temperature

4. Select **all** the correct statements about where enzymes work.

- ☐ Catalase breaks down hydrogen peroxide **inside** the cell (intracellular)
- ☐ Amylase is **secreted** to digest starch outside the cell (extracellular)
- ☐ An extracellular enzyme works inside the cell that made it
- ☐ Because it is a catalyst, an enzyme is not used up and works repeatedly

Tick every correct option.

5. Above the optimum temperature, the rate falls steeply because the enzyme:

- ☐ denatures — its shape changes so the active site no longer fits the substrate
- ☐ is used up
- ☐ gains more kinetic energy
- ☐ becomes a substrate

6. An enzyme has $V_{\text{max}} = 80$ units. At a substrate concentration equal to its K_m , what is the rate?

_____ units

7. An enzyme is specific because:

- ☐ its active site is complementary in shape to only one substrate
- ☐ it can bind any molecule
- ☐ it is made of carbohydrate
- ☐ it is used up by its substrate

8. To stop pH changing while you vary temperature, keep it constant with a _____ solution.

9. A LOW K_m means the enzyme only reaches half its maximum rate at a HIGH substrate concentration.

- ☐ True
- ☐ False

10. In the induced-fit model the active site is completely rigid and never changes shape.

- ☐ True
- ☐ False

1. **a globular protein that catalyses a reaction and is not used up**

Enzymes are globular protein catalysts: they speed reactions and are not used up, so each one works again and again.

2. **the reaction is fastest then, with the most substrate present**

At the start the most substrate is present, so the rate is highest and not yet limited by substrate running out.

3. **the maximum rate, reached when all active sites are occupied**

V_{max} is the top rate; the curve flattens there because every active site is busy.

4. **Catalase breaks down hydrogen peroxide inside the cell (intracellular); Amylase is secreted to digest starch outside the cell (extracellular); Because it is a catalyst, an enzyme is not used up and works repeatedly**

Catalase is intracellular and amylase is extracellular. Extracellular means it works **outside** the cell, so the third statement is false.

5. **denatures — its shape changes so the active site no longer fits the substrate**

Heat breaks the bonds holding the enzyme's shape; the active site changes and can no longer bind the substrate.

6. **40 units**

By definition K_m is the substrate concentration that gives **half** of V_{max} , so the rate is $80 \div 2 = 40$ units.

7. **its active site is complementary in shape to only one substrate**

Specificity comes from the active site's shape being complementary to one substrate and no other.

8. **buffer**

A buffer resists pH change, so pH stays controlled while temperature is the only variable.

9. **False**

The opposite: low K_m means half-speed is reached at **LOW** substrate — a high affinity, gripping the substrate tightly.

10. **False**

That describes lock-and-key. In induced fit the active site moulds around the substrate as it binds — a tighter grip that fits the evidence better.