AP BIOLOGY • EXERCISE SHEET

3.1 Enzymes as Biological Catalysts

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS enzyme 酶 • substrate 底物 • active site 活性位点 • activation energy 活化能 • catalyst 催化剂

Objective

Build the skills to answer exam questions on **enzymes as biological catalysts**.

You must be able to:

- explain that an **enzyme** 酶 lowers the **activation energy** 活化能
- describe the **active site** 活性位点 and enzyme-substrate specificity
- explain the induced-fit model

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Enzymes lower activation energy

An **enzyme** is a biological **catalyst** — it speeds up a reaction by **lowering the activation energy**, without being used up. It does not change whether a reaction is favorable, only how fast it goes.

■ The active site

The **active site** is the part of the enzyme where the **substrate** binds. Its specific shape means each enzyme works on **one** substrate (specificity), like a lock and key.

■ Induced fit

In the **induced-fit** model, the active site changes shape slightly as the substrate binds, gripping it and straining bonds to help the reaction.

■ A worked example

Catalase lowers the activation energy for breaking down hydrogen peroxide, so it reacts far faster; catalase is unchanged and reused.

2 Practice

Now apply the methods above.

2.1 What does an enzyme do to the activation energy? [1]

2.2 What is the active site? [1]

2.3 Why is an enzyme specific to one substrate? [1]

3 Exam-style questions

3.1 An enzyme speeds up a reaction by [1]

A	B
C	D

A raising the activation energy
B lowering the activation energy
C adding energy to the products
D changing ΔG

3.2 An enzyme binds only its specific substrate.

(a) Explain why, in terms of the active site. [2]

(b) Describe the induced-fit model. [2]

3.3 Explain why an enzyme is not used up in the reaction it catalyzes. [2]