

# 2.5 Passive and Active Transport

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 9 marks

## Objective

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Build the skills to answer exam questions on **passive and active transport**.

**You must be able to:**

- distinguish **passive** 被动运输 (no ATP, down the gradient) from **active** 主动运输 (uses ATP, against the gradient)
- give examples of each
- explain the role of the concentration gradient

## 1 Worked examples

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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.

### ■ Passive transport

**Passive transport** moves substances **down** their concentration gradient (high → low) with **no energy** needed. Examples: diffusion, osmosis, facilitated diffusion.

### ■ Active transport

**Active transport** moves substances **against** the gradient (low → high) and **requires ATP**. A pump protein uses energy to push the substance the "wrong" way.

### ■ A worked example

The **sodium-potassium pump** uses ATP to push  $\text{Na}^+$  out and  $\text{K}^+$  in, both against their gradients —active transport.

### ■ Deciding which

Ask: is it moving **down** the gradient (passive, free) or **up** the gradient (active, needs ATP)? That tells you which type it is.

## 2 Practice

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Now apply the methods above.

**2.1** Does passive transport require ATP?

[1]

**2.2** In which direction (relative to the gradient) does active transport move a substance?[1]

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**2.3** Give one example of active transport. [1]

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### 3 Exam-style questions

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**3.1** Active transport differs from passive transport because it [1]

- **A** moves substances down the gradient
  - **B** requires ATP and moves against the gradient
  - **C** never uses proteins
  - **D** only moves gases
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**3.2** A cell pumps calcium ions out against their concentration gradient.

(a) State whether this is active or passive transport. [1]

(b) Explain why ATP is needed. [2]

**3.3** Diffusion of oxygen into a cell needs no energy, but importing glucose against its gradient does. Explain the difference. [2]

### 4 Go further

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You are now ready for the real exam questions on this subtopic:

- work through the **2.5 Passive and Active Transport** lesson on the **Learn** page;
- read the **Passive and Active Transport** section of the AP Biology handout on the **Know** page.

## Solutions

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**2.1** No.

**2.2** Against the gradient (low  $\rightarrow$  high).

**2.3** The sodium-potassium pump (or any pump moving ions against the gradient).

**3.1 B** —requires ATP and moves against the gradient.

**3.2** (a) Active transport. (b) Moving ions against their gradient does not happen spontaneously, so energy from ATP is needed to power the pump.

**3.3** Oxygen moves **down** its gradient (passive, spontaneous, no energy); glucose is moved **against** its gradient, which is not spontaneous and requires ATP (active transport).