

2.5 Passive and Active Transport

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS active 主动运输 • passive 被动运输 • diffusion 扩散 • facilitated diffusion 易化扩散
• osmosis 渗透

Objective

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

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 Na^+ out and 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

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]

2.3 Give one example of active transport. [1]

3 Exam-style questions

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]

Solutions

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).