

## 2.9 Compartmentalization Inside the Cell

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ **Total: 9 marks**

**KEY WORDS** compartments 区室 • membrane-bound organelles 膜结合细胞器  
• organelles 细胞器 • mitochondria 线粒体

### Objective

Build the skills to answer exam questions on **compartmentalization** inside the cell.

**You must be able to:**

- explain how **membrane-bound organelles** 膜结合细胞器 create separate compartments
- state the advantages of compartmentalization
- give examples (lysosome, mitochondrion) of specialized environments

### 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.

#### ■ Compartments inside the cell

Membrane-bound organelles divide the eukaryotic cell into **compartments**, each with its own conditions. This lets different, even incompatible, reactions happen at once.

#### ■ Advantages

- **Separate conditions** — e.g. a lysosome can be acidic inside without harming the rest of the cell.
- **Higher efficiency** — reactants and enzymes are concentrated together.
- **Protection** — dangerous reactions (digestion) are kept contained.

#### ■ A worked example

The **lysosome** keeps its digestive enzymes and low pH inside its membrane, so they break down waste without damaging the cytoplasm.

#### ■ Mitochondria

The **mitochondrion's** inner membrane holds a proton gradient used to make ATP — only possible because the membrane separates two regions.

### 2 Practice

Now apply the methods above.

**2.1** What creates separate compartments in a eukaryotic cell? [1]

**2.2** State one advantage of compartmentalization. [1]

**2.3** Why is it useful for a lysosome to be enclosed by a membrane? [1]

### 3 Exam-style questions

**3.1** Compartmentalization allows a cell to [1]

- **A** carry out only one reaction at a time
- **B** maintain different conditions in different regions
- **C** avoid using membranes
- **D** remove its DNA

**3.2** A lysosome contains digestive enzymes and has an acidic interior.

(a) Explain why enclosing these in a membrane is important. [2]

(b) State one other advantage of keeping reactions in a compartment. [1]

**3.3** Explain how compartmentalization increases the efficiency of a metabolic reaction.[2]

## Solutions

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**2.1** Membrane-bound organelles.

**2.2** Any one: separate conditions, greater efficiency, protection/containment of harmful reactions.

**2.3** So its digestive enzymes and acid are contained and do not damage the rest of the cell.

**3.1 B** — maintain different conditions in different regions.

**3.2** (a) The membrane keeps the enzymes and acid contained, protecting the cytoplasm from being digested. (b) Reactants and enzymes are concentrated together, raising efficiency (or: different reactions can occur at once).

**3.3** Concentrating the enzymes and substrates in one small compartment increases the chance they meet and react, speeding the reaction.