

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	B
C	D

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]