AP BIOLOGY • EXERCISE SHEET

2.9 Compartmentalization Inside the Cell

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

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]

4 Go further

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

- work through the **2.9 Compartmentalization Inside the Cell** lesson on the **Learn** page;
- read the **Compartmentalization Inside the Cell** section of the AP Biology handout on the **Know** page.

Solutions

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.