

4.3 Soil Composition and Properties

Name: _____ Class: _____ Date: _____

Total: 10 marks

Objective

Build the skills to answer exam questions on **soil composition and properties**.

You must be able to:

- classify soil by **texture** 质地 (sand, silt, clay) using the soil triangle idea
- link texture to **water-holding** and drainage
- describe **porosity** 孔隙度 and **permeability** 渗透性

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.

■ Soil particle sizes

Soil texture depends on particle size: **sand** (largest), **silt** (medium), **clay** (smallest). **Loam** is a balanced mix and is best for most crops.

■ Texture and water

- **Sandy** soil —large pores, drains fast, holds little water.
- **Clay** soil —tiny pores, drains slowly, holds much water but can waterlog.
- **Loam** —good balance of drainage and water retention.

■ Porosity and permeability

- **Porosity** —the fraction of pore (empty) space; how much water it can hold.
- **Permeability** —how easily water flows through; high in sand, low in clay.

■ A worked reasoning

A sandy soil drains quickly and dries out fast (high permeability, low water retention), so it needs more frequent watering.

2 Practice

Now apply the methods above.

2.1 Which soil particle is the largest? [1]

2.2 Which soil type holds the most water? [1]

2.3 What is porosity? [1]

3 Exam-style questions

3.1 Sandy soil drains quickly because it has [1]

- **A** small pores and low permeability
 - **B** large pores and high permeability
 - **C** no pores
 - **D** high water retention
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3.2 A gardener compares sandy soil and clay soil.

(a) State which drains faster and which holds more water. [2]

(b) Explain why loam is often best for crops. [2]

3.3 Explain the difference between porosity and permeability. [2]

4 Go further

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

- work through the **4.3 Soil Composition and Properties** lesson on the **Learn** page;
- read the **Soil Composition and Properties** section of the AP Environmental Science handout on the **Know** page.

Solutions

2.1 Sand.

2.2 Clay.

2.3 The fraction of empty (pore) space in the soil.

3.1 B —large pores and high permeability.

3.2 (a) Sandy soil drains faster; clay holds more water. (b) Loam balances drainage and water retention (and holds nutrients), so roots get enough water and air without waterlogging.

3.3 Porosity is how much empty space (water capacity) the soil has; permeability is how easily water flows through it.