

Exercise walk-through

Environmental Effects on Phenotype ■ 5.5

eXercise

You must be able to

- explain that **phenotype** 表现型 depends on genes **and** environment
- give examples (temperature, diet, sunlight)
- distinguish inherited variation from environmental variation

Method — Genes plus environment

An organism's **phenotype** is shaped by both its **genotype** and its **environment**. Two individuals with the same genes can look different if raised in different conditions.

Method — Worked examples

- **Hydrangea flower color** depends on soil pH.
- **Human height** depends on genes **and** nutrition (diet).
- **Arctic fox / Himalayan rabbit fur color** changes with temperature.

Method — Environmental variation

Differences caused only by the environment (like a bodybuilder's muscles) are **not inherited** — they are not coded in the DNA passed on.

Method — Distinguishing the two

Ask: would offspring inherit this difference? Genetic differences are heritable; purely environmental differences are not.

Practice 2.1 ■ 1 mark

Phenotype is determined by genotype and what else?

Solution 2.1

Method: Genes plus environment

Worked steps

The environment **B1**.

Practice 2.2 ■ 1 mark

Give one example of an environmental effect on phenotype.

Solution 2.2

Worked steps

Any one: hydrangea color and soil pH, height and diet, fur color and temperature
B1.

Practice 2.3 ■ 1 mark

Is a suntan an inherited trait? Explain briefly.

Solution 2.3

Worked steps

No — it is caused by sunlight (environment), not coded in DNA, so it is not inherited **B1**.

Exam-style 3.1 ■ 1 mark

Two genetically identical plants grown in different light look different. This shows

- A** a mutation
- B** an environmental effect on phenotype
- C** codominance
- D** meiosis

Solution 3.1

Method: Genes plus environment

- A a mutation
- B an environmental effect on phenotype** 
- C codominance
- D meiosis

Worked steps

B — an environmental effect on phenotype.

Exam-style 3.2 ■ 2 marks

Identical twins are raised in different countries and one is much taller.

- (a) Explain how twins with the same genes can differ in height.
- (b) State whether the height difference would be passed to their children.

Solution 3.2

Method: Genes plus environment

Worked steps

(a) Phenotype depends on genes **and** environment; different diets/nutrition can produce different heights despite identical genes **M1 A1**. (b) No — an environmentally-caused difference is not inherited **B1**.

Exam-style 3.3 ■ 2 marks

Explain how you could tell whether a difference between two organisms is genetic or environmental.

Solution 3.3

Method: Distinguishing the two

Worked steps

Raise them in the **same** environment: any remaining difference is genetic; a difference that disappears was environmental **M1** **A1**.