AP BIOLOGY • EXERCISE SHEET

5.5 Environmental Effects on Phenotype

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

Objective

Build the skills to answer exam questions on **environmental effects on phenotype**.

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

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.

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.

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.

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.

Distinguishing the two

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

2 Practice

Now apply the methods above.

2.1 Phenotype is determined by genotype and what else? [1]

2.2 Give one example of an environmental effect on phenotype. [1]

2.3 Is a suntan an inherited trait? Explain briefly. [1]

3 Exam-style questions

3.1 Two genetically identical plants grown in different light look different. This shows [1]

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

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

(a) Explain how twins with the same genes can differ in height. [2]

(b) State whether the height difference would be passed to their children. [1]

3.3 Explain how you could tell whether a difference between two organisms is genetic or environmental. [2]

4 Go further

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

- work through the **5.5 Environmental Effects on Phenotype** lesson on the **Learn** page;
- read the **Environmental Effects on Phenotype** section of the AP Biology handout on the **Know** page.

Solutions

2.1 The environment.

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

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

3.1 B —an environmental effect on phenotype.

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

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