# Year 10 Science: How genes and environment shape traits and variation

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

## Practice

1. Explain how a gene leads to hair being strong, using the word keratin.

2. Every cell in your body has the insulin gene. Why do only some cells make insulin?

3. A tuatara egg is incubated at a high temperature. Which sex is it most likely to hatch as, and is that caused by genes or environment?

4. Two cloned sheep have identical genes but different body mass. Suggest a reason.

5. Why did many scientists before 1944 think proteins, not DNA, carried inherited information?

## Fix the mistake

6. Correct this statement: "Each trait, like height or eye colour, is controlled by one gene."

7. Correct this statement: "Skin cells make keratin because they have the keratin gene and other cells do not."

8. Correct this statement: "Two cloned sheep have the same genes, so they must look exactly the same."

9. Correct this statement: "A sheep that grew big on good pasture will pass its size on to its lambs."

## Answer key (for parents and tutors)

1. Explain how a gene leads to hair being strong, using the word keratin.
   **The gene holds the code for keratin; the cell reads it and builds keratin, a tough protein that forms hair, so the protein produces the trait.**
2. Every cell in your body has the insulin gene. Why do only some cells make insulin?
   **The gene is switched on only in certain pancreas cells; in other cells it is switched off, so no insulin is made there.**
3. A tuatara egg is incubated at a high temperature. Which sex is it most likely to hatch as, and is that caused by genes or environment?
   **Male, because warmer nests tend to produce males; it is the environment (temperature), not a sex chromosome.**
4. Two cloned sheep have identical genes but different body mass. Suggest a reason.
   **A difference in environment, such as one had better pasture or more food, or one was sick.**
5. Why did many scientists before 1944 think proteins, not DNA, carried inherited information?
   **Proteins come in many more forms than DNA's four bases suggested, so proteins seemed better able to carry complex information until experiments showed otherwise.**
6. Correct this statement: "Each trait, like height or eye colour, is controlled by one gene."
   **Most traits are controlled by many genes adding small effects, which is why height varies smoothly; only a few, such as ABO blood group, depend mainly on one gene.**
7. Correct this statement: "Skin cells make keratin because they have the keratin gene and other cells do not."
   **Almost every cell has the same genes; skin cells make keratin because that gene is switched on in them and off in most other cells.**
8. Correct this statement: "Two cloned sheep have the same genes, so they must look exactly the same."
   **Genes set a range, and differences in food, health and surroundings can still give the clones different traits such as body mass.**
9. Correct this statement: "A sheep that grew big on good pasture will pass its size on to its lambs."
   **Changes caused by the environment are not written into the DNA in sperm and eggs, so the lambs inherit only the parent's genes.**