Name:_____

# Genes, Environments, and Behavior

*Lesson Title: Genes, Environments, and Behavior 1*



**Use Chapter 2: *How Do Genes Work Within Their Environments?* (http://www.aaas.org/spp/bgenes/Chapter2.pdf) to complete the first part of this student sheet.**

Help Hoda figure out children. Match the term with its definition and an application of it.

| Terms | Definition Letter | Application Number |
|---|---|---|
| 1. chromosomes | | |
| 2. genome | | |
| 3. genotype | | |
| 4. natural selection | | |
| 5. phenotype | | |
| 6. protein | | |
| 7. quantitative genetic trait | | |

## Definitions

A. genetic makeup of an individual, or the combination of alleles relevant to a specific trait

B. the visible properties of an organism that are produced by the interaction of the genotype and the environment

C. substances that consist of amino-acid residues joined by peptide bonds; they make up the structure of cells; in the form of hormones, enzymes, and antibodies they direct cell activity; they help transport materials between cells; they help cells communicate with each other; and they affect gene expression

D. all the genetic material in the chromosome needed to create and maintain an organism

E. the process by which members of a species having traits that enable them to take better advantage of their environment survive better; those with the advantageous traits leave more descendents

F. a trait for which the observable phenotype associated with an underlying genotype varies across a population by measurable quantities or degrees

G. the structures in an organism that contain an individual's genes

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## Application of Terms

I. Children vary in their temperaments along many dimensions including calmness and anxiety. They vary in their perceptions of threat, such as the approach of someone with a sharp object, and in their sensitivity to pain, such as the feel of a needle penetrating the skin. These are examples of quantitative genetic traits.

II. The particular combination of alleles any pediatric patient has — his or her genotype — will affect how he or she responds to environmental inputs, such as being in a medical environment.

III. All children are humans and so have quite similar genomes. The human genome is quite similar to the genomes of other species. All living beings with genomes will react, in some fashion or another, to environments.

IV. All children have 46 chromosomes (two sets of 23), though the particular alleles for each gene on their chromosomes may differ. Girls have two X chromosomes and boys have an X and a Y chromosome.

V. Scientists do not know how fearful or calm reactions to the situation of receiving shots may reflect traits that evolved through natural selection over the course of thousands of years because they were advantageous to survival in other, quite different, circumstances.

VI. A child's genes create the template for the series of steps the child's cells follow to create proteins; proteins build and run the child's body; and it is through the body, acting in response to and upon surrounding environments, that a child's behavior manifests itself.

VII. Since each child has a unique genotype, each child will vary in response (will have a different phenotype) in any given situation. To the extent that environmental stimuli vary from one situation to another, phenotypic responses from the same individual also will vary from one situation to another.

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**Use Chapter 3: *How Do Environments Impinge Upon Genes?* ([http://www.aaas.org/spp/bgenes/Chapter3.pdf](http://www.aaas.org/spp/bgenes/Chapter3.pdf)) to complete this part of the student sheet.**

Help Skip understand himself. Match the environmental effect with its definition and the relevant description of effects on Skip's developmental pathway.

| Terms | Definition Letter | Developmental Pathway Number |
|---|---|---|
| 1. developmental noise | | |
| 2. environmentability | | |
| 3. gene/environment interaction | | |
| 4. heritability | | |
| 5. negative gene/environment correlation | | |
| 6. positive gene/environment correlation | | |
| 7. shared environment | | |
| 8. unshared environment | | |

**Definitions**

A. a situation in which the effect of a gene or genes depends on the kind of environment to which it is exposed, or in which the effect of an environment depends on the presence of a particular gene

B. factors that work to make those who experience it dissimilar

C. factors that work to make those who experience it similar

D. the proportion of phenotypic variation among individuals in a specific population that can be attributed to genetic effects

E. the proportion of phenotypic variation among individuals in a specific population that can be attributed to environmental variation

F. variation introduced by minute, random events that occur during development and have a significant cumulative effect on the phenotype

G. when individuals with a genetic propensity for a trait are in environments, or choose environments, that support expression of the trait

H. when individuals with a genetic propensity for a trait are in environments, or choose environments, that inhibit expression of the trait

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## Effects on Skip's Developmental Pathways

I. As a young child, Skip demonstrated a natural athleticism. His father practiced catch with him every day as soon as he could hold a mitt. Skip's job was to exercise the family dog, and they would go on long runs through the countryside together. In summers, his mother often took him to afternoon games of the town's professional baseball team.

II. Depression runs in Skip's family. This mental disorder began to affect Skip after a series of traumatic events including a difficult divorce, the death of his dog, and the receding of his hairline. He had been a happy-go-lucky fellow into his early twenties.

III. In senior high, Skip spent his spare time drinking with friends. The depressive effects of alcohol discouraged Skip and his friends from thinking about or planning for their futures.

IV. Six of the boys on Skip's little league team were left-handed. This was a far greater proportion than one might find in the general population.

V. When Skip was growing up, his family had money troubles. He grew up with the sense that he would never be financially secure, while his brother vowed he would make a different life for himself and worked hard to win an academic scholarship to business school.

VI. Skip's friends who continued to play baseball tended to keep their hair cut short because the coach liked a clean-cut look. His drinking buddies tended to grow their hair long and shaggy.

VII. When he was thirteen, Skip misread the schedule for tryouts to the junior varsity baseball team. He arrived three hours late and as a result he didn't make the roster. As it turned out, he never played ball again.

VIII. When Skip didn't make the junior varsity baseball team, his mother made him get a part-time job. Then his parents both developed medical problems so Skip began working longer hours to supplement the family income. This did not leave him any time to play ball that summer or fall. By the following spring, he was so out of shape he did not try out for the team again.

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