

**A Survey to Evaluate Students' Understanding of Reproduction,
Heredity, Ontogeny, and Acquired Characters
List B**

If the teacher asks you to respond to the following statements in multiple choice format, please read each of the assigned statements. Follow the directions on the answer sheet at the end of List B and mark your degree of confidence that each statement is true accordingly.

1. The biological inheritance that we receive from our parents consists of all the substances and chemical systems present in the fertilized egg from which we developed.
2. The only chemical system present at our birth that we, as adults, can transmit to our offspring consists of the nucleotide sequences in the DNA molecules of our chromosomes.
3. Cancer-producing mutations that occur in the DNA of skin, lung, colon, prostate, or mammary tissues of parents can potentially be passed on to at least some of their children.
4. Parents who abuse the use of drugs, alcohol and cigarettes have a greater chance of inducing these same behaviors in their children than if those same parents had never exposed themselves to such substances, even if their children are raised from birth by foster parents who do not use these substances.
5. People who get little or no physical exercise tend to become weak and are at risk of causing weakness in the muscular and bone development of their newborn children.
6. Children of severely overweight parents might inherit the potential to become overweight, but would not inherit this tendency if their parents had dieted back to normal weight before conceiving children.
7. If parents read profusely and work at retaining most of this knowledge, their children should be more likely to perform better on IQ tests (even if these children don't study as diligently as their parents and receive little or no tutoring from them) than if the parents had not studied so diligently.
8. Because a mother's egg cell is much larger than a father's sperm cell, most female children tend to be more mentally and/or emotionally like their mother than their father.
9. The metabolism of food (energy utilization system) in boys is genetically programmed to be more like that of their fathers than that of their mothers.

10. Fathers who have suffered severe illness from communicable diseases (caused by bacteria or viruses) are more likely to produce genetic susceptibility to these diseases in their children than if these same fathers had not contacted these disease organisms.
11. People who have experienced emotionally/psychologically traumatic events (e.g., posttraumatic stress disorders) are more likely to have children with genetically based emotional or psychological problems than if those same parents had experienced no traumatic events, even if the children are reared from birth in foster homes.
12. People who move to very different environments (e.g., colder climate, new atmospheric allergens, increased population density, distance from contact with old friends, new job stresses, etc.), within one year before having children, will usually be more likely to have environmentally induced changes in their gametes (eggs, sperms) than if they had not moved.
13. People who have prayed diligently for their expected children are able to provide a better biological inheritance for them than if they had not prayed.
14. People who, prior to the conception of children, receive a blood transfusion from a member of a different race, increase their risk of producing children bearing at least some of the characteristics of that other race.
15. Biological evolution is said to occur when an individual changes any of its anatomical, physiological, biochemical or behavioral characteristics in an adaptive response to a new environment.
16. By definition, long-lived individuals have greater “genetic fitness” than shorter-lived individuals of the same species.
17. If a cow gives birth to calf A sired by bull X, and a year later she gives birth to calf B sired by bull Z, the genetic constitutions of the cow and calf B might be contaminated to some extent by genes from bull X.
18. All children may inherit some different gene variants (alleles) from each parent, but (barring mutation) they normally receive exactly the same number of genes from each parent.
19. Genes that were expressed in a given cell type of a mother will, if inherited by children, be expressed in that same cell type of her children regardless of environmental variables.
20. When bacteria die and rupture, they release DNA fragments (sometimes containing whole genes) into their environment. These fragments may be taken up by living cells of the same species (sometimes of different species), become

incorporated into their own DNA, and produce a new phenotype (trait). This process may be thought of as “the inheritance of acquired characters.”

21. All viruses must infect cells to reproduce. The reproduction of some viruses requires that their genetic material (RNA) becomes copied into DNA and incorporated into the DNA of their host cells. Thus, the genetic composition of such cells becomes modified by the acquisition of new genes derived from their environment.
22. It has been scientifically proven in multiple species that specific adaptive gene responses can be turned on or off depending on the kind of food (e.g., sugars) or other environmental variables available to them.
23. At sexual maturity, small pieces of adult animal tissues (called gemules) from different parts of the body (e.g., head, torso, arms, legs, liver, lungs, heart) are transported by the blood stream to the gonads (ovaries and testes) and there become incorporated into gametes (eggs and sperms) during their formation. These gemules become amplified as the embryo grows to regenerate the same general kind of body parts from which they were derived.
24. The distant ancestors of modern sea otters lived on land. When food was scarce, they needed to find new sources of food. Some of them began searching for food on the sea floor. This required them to swim, dive, and hold their breath underwater. Such voluntary actions, in response to specific needs, caused hereditary changes to occur in their inborn nature, such that their offspring inherited a slightly better ability to swim (e.g., foot webbing) and to hold their breath longer. As this process was repeated in each generation, the otters gradually became better able to exploit their aquatic environment and thereby increased their chances of survival. Thus, the modern concept of the way that adaptive evolutionary changes generally occur can be summarized as follows: needs → actions → adaptive hereditary cellular modifications → improved body functions → increased offspring survival rates.
25. The sex of individuals in some species (such as alligators and some lizards) is not determined by X and Y chromosomes, but by the environment (e.g., temperature) in which they are reared.
26. In some animal species (e.g., bees), males develop from unfertilized eggs.
27. As an animal embryo develops from a fertilized egg, various cells lose different genes, causing them to differentiate into specific cell types (e.g., muscle, skin, bone, blood, etc.). For example, the only cell type that makes hemoglobin is the red blood cell (erythrocyte) because it alone retains the genes that code for hemoglobin that were lost in the differentiation of other cell types.

28. The only cells of an adult organism that contain the full set of genes in the fertilized egg from which it developed are the germ-line cells of its gonads (ovaries or testes) that have the ability to produce gametes (eggs or sperms, respectively).
29. Egg cells carry only a sample half of the nuclear genes that are present in other cells of a female's body.
30. Both boy and girl babies normally inherit some genes exclusively from only one of their parents.
31. If the frequency of a trait in a population changes from one generation to the next, this necessitates evolutionary genetic changes in the gene pool.
32. If a woman's blood type is Rh-negative and she gives birth to an Rh-positive child of either sex by man X, it is possible that the survival of each of her subsequent Rh-positive children may be jeopardized whether their father was X or some other man. These facts exemplify the phenomenon called "telegony," i.e., that a female's heredity can be so changed by her first conception that her subsequent children may be affected even if they are sired by other males.
33. Varieties of wheat that are normally planted in the autumn require a prolonged cold spell during winter in order for them to be capable of flowering the next spring, a process called "vernalization." Varieties of wheat planted in the spring do not require cold treatment to flower. The heredity of winter wheat can be changed to that of spring wheat if provided the proper pre-planting environment.

Student's Name _____

Directions: Score each of the assigned statements for your degree of confidence (dc) that the statement is true using the following scale, A to E, given that:

A = the statement is true or very likely to be true; dc = 81–100%

B = the statement is more likely true than false; dc = 61–80%

C = undecided or no opinion or statement appears ambiguous; dc = 41–60%

D = the statement is more likely false than true; dc = 21–40%

E = the statement is false or very likely to be false; dc = 0–20%

Statement Number	Your Confidence Level That Statement Is True				
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