

Appendix 2. Rubric used to score the cheetah question

Cheetahs (large African cats) are able to run faster than 60 miles per hour when chasing prey. How would a biologist explain how the ability to run fast evolved in cheetahs, assuming their ancestors could run only 20 miles per hour?			
	Concept	Full understanding	Partial understanding
1	Phenotypic variation exists in populations; individuals differ	2 points for explicitly mentioning the existence of variation (specifically that some cheetahs run faster than others)	1 point for implicitly mentioning variation OR for mentioning variation caused by development or need OR for a particularly vague description of differences
2	Mutation (or recombination) create variation in individuals.	1 point for mentioning mutation as the source of the “fast” gene or as a source of variation (CANNOT imply a lack of randomness)	
3	Environmental conditions affect the survival and spread of existing traits by creating differential reproduction between individuals.	2 points for explaining that interactions between the trait (speed) and the environment result in fast cheetahs having more offspring	1 point for explaining that the faster cheetahs had higher survival but not directly addressing reproductive success OR for an incomplete or implicit description of the interaction between the trait and the environment
4	Differential reproduction leads to a change in the proportion of individuals that have a trait in the next generation.	1 point for explaining that this process has caused a change in the proportion of fast cheetahs and/or the genetic make-up of the species	
5	The trait is heritable (<i>i.e.</i> , a gene passed on to offspring).	2 points for explaining that the variation is due to genes that are passed from parent to offspring, must specifically mention genes, inheritance, etc. and specify that the genes relate to the trait (speed)	1 point for explaining variation is passed on without mention of genes OR for implying inheritance OR for discussion of genes being passed down within the population (but without reference to individuals)
6	Selection over many generations leads to a change in a trait in a pop.	1 point for explaining that this process must continue many generations, a long period of time, etc.	