

State Science Curriculum Standards for Unit 3: Fur, Feathers, Scales - Insulation			
Level	Exercise 1	Exercise 2	Exercise 3
K-3	K-3.1.1, K-3.1.2, K-3.2.2, K-3.2.3, 1-3.3.1*, K-3.5.1*, K-3.5.2, K-3.14.1*	K-3.12.1	
4-5	4-5.3.1*, 4-5.5.1*, 4-5.5.2, 4-5.14.1*	4-5.5.1, 4-5.5.2, 4-5.14.1, 4-5.14.2* (in part)	4-5.12.1
6-8	7.1.1*, 8.2.1*, 6.5.1, 8.5.1*	8.13.2* (in part), 6.14.1*, 6.14.2, 6.14.5*	8.10.5*, 6.14.2
Life Science	2.1*, 5.1*, 5.3	2.3*,	
Biology I	2.1*, 2.4*, 5.1*, 5.2	2.3	
Biology II		1.1	
Ecology	1.2		4.1, 4.3
Anatomy & Physiology	2.1	5.4	
Chemistry I		2.2	
Chemistry II		3.5	
Physical Science		3.1* (in part – physical changes in the melting ice), 4.2* (in part – light energy), 4.6 (law of conservation of energy)	
Physics		2.1, 2.2, 4.1*, 4.2*	
Environmental Science	1.2		4.3
Sci. Research		2.1, 3.2*, 3.4, 4.3	

* Denotes learning expectations that may not be addressed directly by a particular exercise, but could easily be related to the material covered through the use of additional assignments or activities, or brought into lecture using suggested information below. Teachers of a particular grade level may want to also examine suggestions for grade levels outside their own for further inspiration.

For Teachers K-3

You may wish to stress the animals' need for energy intake in the form of food to help maintain body heat, in addition to adaptations that help them to avoid changes in body temperatures outside their optimal ranges. (Partially fulfills 1-3.3.1: "Recognize the basic requirements of living things.") You may wish to reinforce the fact that the ultimate source of all energy used by organisms on earth is from the sun (addresses K-3.14.1). You may also wish to have students notice differences in the thickness, density, and coloration of the fur of all of the mammals represented in the box (K-3.5.1 "Recognize the differences among plants and animals of the same kind."), as well as think about how such differences may reflect adaptations to the respective animals' environments, seasonality, age etc. (reinforces K-3.5.2).

For Teachers 4-5

You may wish to stress the animals' need for energy intake in the form of food to help maintain body heat, in addition to adaptations that help them to avoid changes in body temperatures outside their optimal ranges. Consider also the storage of energy as fat/blubber used for insulation, as well as energy reserves (4-5.3.1: "Realize that plants and animals use food for energy.") You may also wish to have students think about grouping fur samples in terms of similarities (4-5.5.1), and have them connect this to the animals' environments (reinforces 4-5.5.2). You may wish to reinforce the fact that the ultimate source of all energy used by organisms on earth is from the sun, as well as talk a little bit about the characteristics of light energy (partially fulfills 4-5.14.2), particularly light as electromagnetic waves (6.14.1, 6.14.5). You

may also wish to stress the change of light energy from the sun to chemical energy by producers, which in turn is converted into chemical energy for consumers, with some energy being lost as heat (addresses 6.14.4).

For Teachers 6-8

You may wish to talk about hair and its role as part of the integumentary system (skin). This partially addresses 7.1.1 (“Recognize the difference among cells, tissues, organs, and systems”). You may wish to focus on major biomes of the world, and think about from which biomes each of the mammals represented in the box came (addresses 8.2.1), and connect such information to differences/similarities in the fur samples (reinforces 6.5.1, as well as addresses 8.5.1). You may wish to quiz the students on what type of change takes place in the melting ice in the “Melt Test” in Exercise 2 (a physical change; partially fulfills 8.13.2). Exercise 3b allows for interesting discussion on the conservation of energy (perhaps by having students think about what commercially-available insulation materials are most efficient, based on their R-values), which partially fulfills 8.10.5 (“Analyze approaches to conserving energy and natural resources”).

For High School Teachers

You may wish to talk more in detail about the production of hair, feathers, and scales, and hair/feather/scale anatomy, and layers and structures in the dermis and epidermis. You may also wish to stress how abiotic factors (climate, etc.), as well as biotic factors (need for protection from predators, flight, etc.) have provided selective pressures for the evolution of various body coverings, and how such coverings may be adaptive in various ways. If you have microscopes available, you may wish to have students examine single hairs of the various mammals via microscopy. You could discuss the fact that mammals can often be identified through examination of hair. This is also an excellent jumping point for a really in-depth exploration of the integumentary system in an anatomy & physiology course. You could talk about the major biomes of Earth, and have students think of examples of adaptations of various organisms that live in them, connecting this to the samples of feathers, fur, and scales in the box. This is a great unit to talk about thermodynamics, the law of conservation of energy, and other fundamental physical concepts. You may wish to also look over the suggestions for lower grades, and consider more in-depth exploration of the ideas presented there.