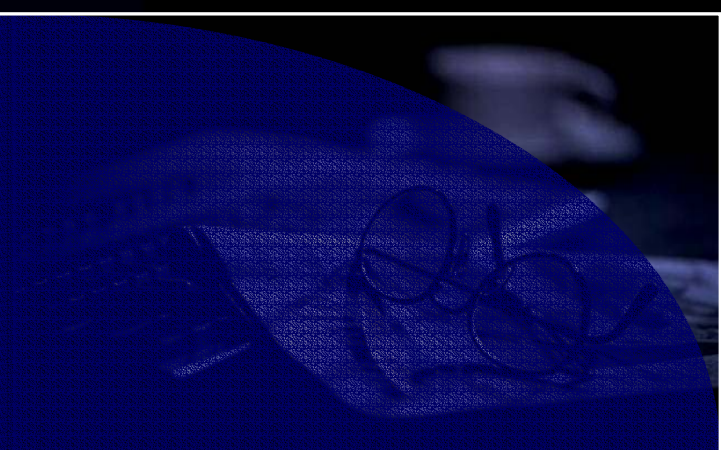


9M Investigating Science...temperature control

lesson

Science Interactive LTD, PO BOX 50764 LONDON NW6 9AT email: sales@science-interactive.co.uk





web: www.science-interactive.co.uk



Survival in cold places

Surviving freezing habitats and conditions requires some highly specialised animal and plant adaptations. Humans are not well adapted to survive cold environments. Animals like *penguins* or *polar bears* have specialised fur insulating their bodies, therefore reducing heat loss to their surroundings. Furthermore, all animals found in cold environments have thick layers of insulating fat underneath their skin. This body fat is also used as an energy source during the very cold winter months. *How does the size of penguins change as you travel south towards the South Pole ?*



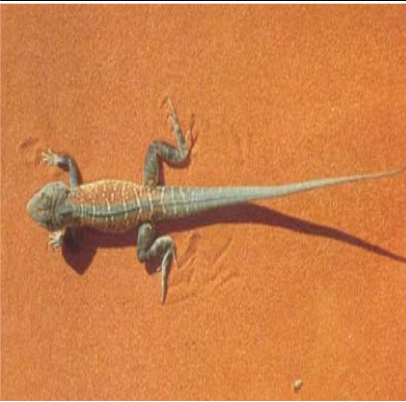
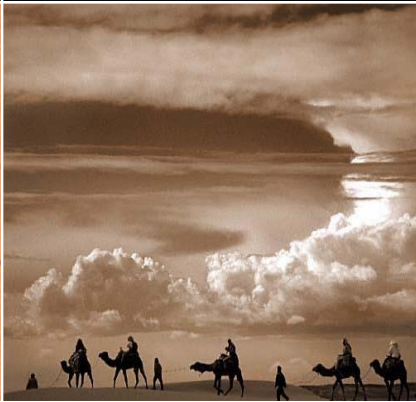
Survival in cold places:

| | Cold environments | Penguins | Lynx and hare | Polar bear |
|---------|---|---|--|--|
| Diagram |  |  |  |  |
| Notes | Cold environments play host to a number of plants and animals which are adapted to survive the very low temperatures. | Humans need to have specialised clothing and sufficient shelter when spending prolonged periods of time in cold environments. Death from hypothermia can occur in minutes. Animals are superbly adapted, with their thick fur and insulating fat. They can also alter their behaviour, for example penguins huddle raising the temperature by some 20°C inside the huddle compared to outside temperatures. | | |

Survival in hot places

Surviving hot habitats and conditions requires some highly specialised animal and plant adaptations. Humans are not well adapted to survive hot environments. Animals like *lizards* have specialised skin which turns a white colour to help reflect the Sun's heat. Lizards also have super efficient kidneys which helps reduce the amount of water that these animals require. Many other animals have specialised behaviours to avoid the heat. This includes being nocturnal. *Name three adaptations that camels have to help them survive in desert environments ?*


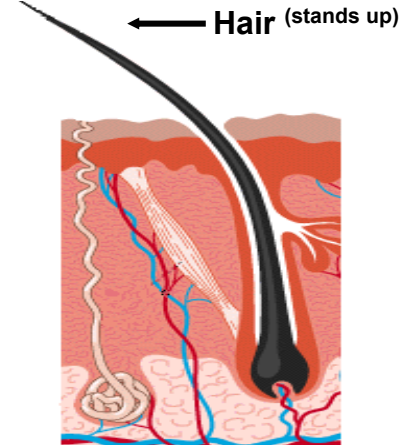
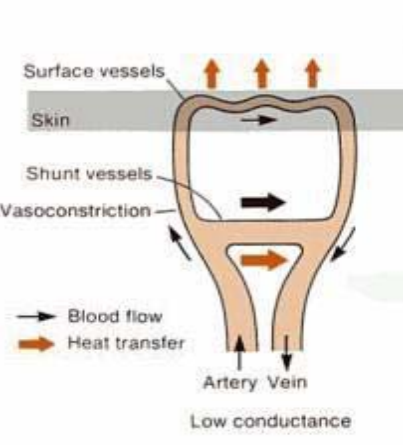

Survival in hot places:

| | Hot environments | Onyx | Lizard | Camel |
|---------|---|---|--|--|
| Diagram |  |  |  |  |
| Notes | Hot environments play host to a number of plants and animals which are adapted to survive the very high temperatures. | Many animals found in hot environments have adaptations that allow them to lose heat from their bodies and conserve water. Animals have short or no hair and are light in colour to help reflect the Sun's heat. They also have very efficient kidneys which reduce the amount of water lost through urination. Many animals also manufacture their own water from the food that they eat | | |

Skin Temperature control in the body one

All warm blooded animals need to control their core body temperature so they can avoid *hyper or hypothermia*. An important role of the skin is either to increase or reduce heat loss to the surroundings. It has a number of strategies to carry out this important function. Our core body temperature needs to be maintained at 37°C so that all our enzymes can function properly. Even small changes in core temperature can have serious effects on how we function.


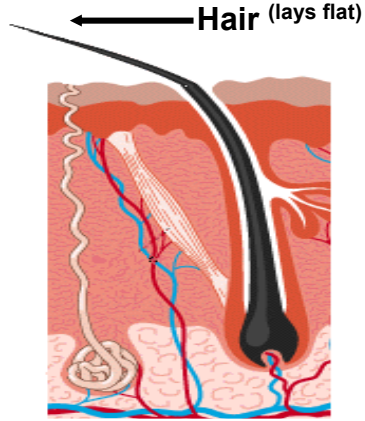
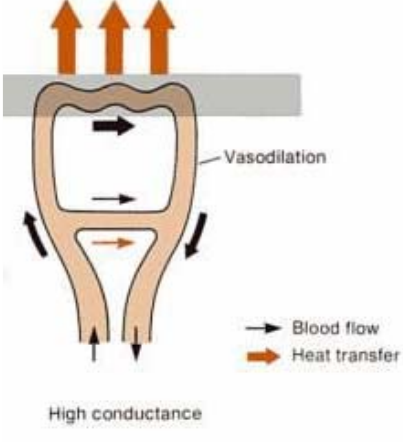

The body's response to cold:

| | Behaviour | Hair | Blood flow | Sweating |
|----------|--|---|--|---|
| Diagram |  |  |  |  |
| Too cold | Behavioural changes include: <i>Seek shelter</i> <i>Put on clothes</i> <i>Huddle</i> <i>Increased appetite</i> | Hairs stand upright and trap air to provide an insulating layer of <i>still air</i> that reduces heat loss from the skin to the environment. This is known as goose bumps ! | Blood flow to the skin and the body's extremities is slowed by <i>vasoconstriction</i> of the blood capillaries, therefore reducing heat loss by radiation to the environment. | All sweating stops, with the skin remaining dry. Less of the body's heat is taken away by water evaporating from the skin's surface to the environment. |

Skin Temperature control in the body two

Even small increases in the core temperature can lead to coma and death. During *hyperthermia*, where core body temperature rises by only 2 to 3°C, digestive enzymes and those enzymes that carry out cellular respiration can begin to denature and cease to function. If the core temperature is not reduced by sweating or increased blood flow to the skin it can be fatal. *Why are the young and old at particular risk of hypo or hyperthermia ?*



The body's response to heat:

| | Behaviour | Hair | Blood flow | Sweating |
|---------|---|--|--|---|
| Diagram |  |  |  |  |
| Too Hot | Behavioural changes include: <i>Seek shade</i> <i>Increase water intake</i> <i>Take off clothes</i> <i>Reduced appetite</i> | Hairs lays flat allowing increased <i>air flow</i> . This reduces the amount of insulation, therefore increasing heat loss from the skin to the environment. | Blood flow to the skin is increased by <i>vasodilation</i> of the blood capillaries. increasing heat loss by radiation to the environment. | Sweating increases with body heat taken away by the evaporating water. During exercise up to two litres per hour can be lost by sweating. |

Skin *Its responses*

Your skin responds to the external environmental conditions, your water intake, the clothes that you are wearing and any exercise that you may be doing. *Look at the two pictures below and consider what is happening to the skin's blood vessels, sweat glands and blood supply in response to the cold and heat. Use the table to give your answers.*

Skin and its responses:

| | Hot summer day | | Cold winters day | |
|----------------------|--|--------------------------|---|--------------------------|
| Diagram |  | |  | |
| | Sweating | Blood supply | Skin hairs | Shivering |
| Summer (hot day) | _____ _____ _____? | _____ _____ _____? | _____ _____ _____? | _____ _____ _____? |
| Winter (Cold day) | _____ _____ _____? | _____ _____ _____? | _____ _____ _____? | _____ _____ _____? |