Biology and Form

Desert tortoise bladder

Rabbit ears

Camel fur (or coyote fur)

Namib beetle ridges and valleys on their back

Saguaro “pleats” or ridges

Rattlesnake scales

Function
Survive for long periods of time without water.
Regulate their temperature in extreme heat
Manage their temperature in extreme heat or cold
Collect water in the desert
Rapid uptake and storage of water
Collect and absorb water

Strategy

A large urinary bladder that can store over 40% of the tortoise's body weight in water, urea, uric acid, and nitrogenous wastes. Water conservation is further aided by an ability to precipitate solid urates in the bladder, allowing water and ions to be reabsorbed while uric acid is eliminated.

Large ears provide an expansive surface area of exposed skin loaded with blood vessels. When the surrounding air temperature is slightly below body temperature, as when it retreats from hot desert sun into shade, the blood vessels in the outer part of its ears widen in a process called vasodilation. This results in greater circulation of warm blood from the body's core to the jackrabbit's ears, where heat is lost to the cooler surrounding air.

Conduct heat from their bodies to the environment by decreasing the insulating value of fur. The belly and shaded parts of legs are shed first providing an area from which to lose body heat. The back has thicker fur that insulates and shades from the overhead sun.

Micro-sized grooves or bumps on the beetle's hardened forewings can help condense and direct water toward the beetle's awaiting mouth, while a combination of hydrophilic (water attracting) and hydrophobic (water repelling) areas on these structures may increase fog- and dew-harvesting efficiency.

Within 24 hours of a storm, the saguaro grows shallow roots to absorb moisture from the soil. The saguaros pleats expand like an accordion, enabling the plant to absorb lots of precious water and store it in an inner layer of sponge-like tissue.

Flatten their bodies and form a tight coil. The scales are networked with microchannels (many tiny grooves). Water seeps into these microchannels and creates a kind of sticky surface for water droplets. This texture slows flow so the animal can drink.

Answer Key

1. Desert tortoise bladder
    a. Function: Survive for long periods of time without water.
    b. Strategy: A large urinary bladder that can store over 40% of the tortoise's body weight in water, urea, uric acid, and nitrogenous wastes. Water conservation is further aided by an ability to precipitate solid urates in the bladder, allowing water and ions to be reabsorbed while uric acid is eliminated.

2. Rabbit ears
    a. Function: Regulate their temperature in extreme heat
    b. Strategy: Large ears provide an expansive surface area of exposed skin loaded with blood vessels. When the surrounding air temperature is slightly below body temperature, as when it retreats from hot desert sun into shade, the blood vessels in the outer part of its ears widen in a process called vasodilation. This results in greater circulation of warm blood from the body's core to the jackrabbit's ears, where heat is lost to the cooler surrounding air.

3. Camel fur (or coyote fur)
    a. Function: Manage their temperature in extreme heat or cold
    b. Strategy: Conduct heat from their bodies to the environment by decreasing the insulating value of fur. The belly and shaded parts of legs are shed first providing an area from which to lose body heat. The back has thicker fur that insulates and shades from the overhead sun.

4. Namib beetle ridges and valleys on their back
    a. Function: Collect water in the desert
    b. Strategy: Micro-sized grooves or bumps on the beetle's hardened forewings can help condense and direct water toward the beetle's awaiting mouth, while a combination of hydrophilic (water attracting) and hydrophobic (water repelling) areas on these structures may increase fog- and dew-harvesting efficiency.

5. Saguaro "pleats" or ridges
    a. Function: Rapid uptake and storage of water
    b. Strategy: Within 24 hours of a storm, the saguaro grows shallow roots to absorb moisture from the soil. The saguaros pleats expand like an accordion, enabling the plant to absorb lots of precious water and store it in an inner layer of sponge-like tissue.

6. Rattlesnake scales
    a. Function: Collect and absorb water
    b. Strategy: Flatten their bodies and form a tight coil. The scales are networked with microchannels (many tiny grooves). Water seeps into these microchannels and creates a kind of sticky surface for water droplets. This texture slows flow so the animal can drink.