



## Winter Survival

1. Birds can handle having very cold feet because:  
a) they have little fluid in the cells of their feet b) their feet are mostly tendons and bone c) they have a countercurrent heat exchange system d) All of the above
2. True or false. There is a special type of fat called “brown fat” that is turned on when you are cold...  
a) True b) False
3. True or False. Ruffed grouse will rest under the snow until severe weather passes.  
a) True b) False
4. Green darner dragonflies make their migration trip over how many generations?  
a) 2 b) 3 c) 4 d) 6
5. Woolly bear caterpillars overwinter under leaf litter and can survive temperatures as low as:  
a) 0 degrees b) -5 degrees c) -8 degrees d) -12 degrees

ANSWERS ON THE REVERSE SIDE!!



# NATURE QUIZ

## Answers...

1. d; 2. a; 3. a; 4. b; 5. c

### HERE IS THE LOW DOWN...

1. Songbirds do get very cold feet: the surface temperature of their toes may be barely above freezing even as the bird maintains its core body temperature above 100°F (38°C). But most birds don't succumb to frostbite because there is so **little fluid in the cells of their feet, and their feet are mostly tendons and bones with little muscle or nerve tissue**. Birds also have a **countercurrent heat exchange system in their legs and feet**—the blood vessels going to and from the feet are very close together, so blood flowing back to the body is warmed by blood flowing to the feet. The newly cooled blood in the feet lowers heat loss from the feet, and the warmed blood flowing back into the body prevents the bird from becoming chilled. And because bird circulation is so fast, blood doesn't remain in the feet long enough to freeze.

2. Brown fat, also called brown adipose tissue, is a special type of body fat that is **turned on (activated) when you get cold**. Brown fat produces heat to help maintain your body temperature in cold conditions. Brown fat contains many more mitochondria than does white fat. Brown fat breaks down blood sugar (glucose) and fat molecules to create heat and help maintain body temperature. Cold temperatures activate brown fat, which leads to various metabolic changes in the body. Most of our fat, however, is white fat, which stores extra energy.

3. **Ruffed grouse “snow roost” during periods of extreme cold**. Snow provides a very effective barrier against severe cold. They will rest under the snow until the severe weather passes. Folks who snowshoe or cross-country ski too close to these snow roosts are often caught off-guard when a grouse explodes out of the snow.

4. The Green Darner's migration pattern resembles the Monarch's in many ways. Just as Monarchs make their trip over several generations, Green Darners spread theirs over **three**. Around February, a first generation of Green Darners in Texas or Mexico will start flying north, where they lay their eggs in ponds and then die. When the new generation hatches, some will fly south in the same year, while some overwinter in the north as nymphs. The dragonflies that go south will also lay their eggs and die, giving way to a new generation that will spend their entire lives living in the south. Then, the cycle continues.

5. The Isabella Tiger Moth, better known as the Woolly Bear, is unusual in that it overwinters as a caterpillar. These caterpillars hatch in the fall and feed late into the season before taking shelter under logs and piles of leaves to stay warm. Still, even under all that insulation, temperatures can reach below freezing. For the average caterpillar, this would be a death sentence. Woolly Bears, however, produce an antifreeze in their blood called glycerol. With this, they can reach temperatures as low as **-8°C** without damaging any cells.