



# Left Out in the Cold: A Case Study in Thermoregulation

by

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## Part I

Joel had been looking forward to his first backpacking trip to the Canadian Rockies for some time. He had some experience in camping and backpacking, but was looking for a new challenge in the mountains and forests of Canada. As he drove to the trailhead to begin his trip, he was a little surprised at the immensity of the mountains and the snow on the peaks this late in the spring.

“We certainly don’t have many of these in Florida,” he thought to himself. As Joel unpacked his equipment, he ran through a mental checklist of the essential gear he had brought to be prepared for his first extended cold weather hike. The last time he had checked the weather reports, they had predicted dry weather and moderate temperatures. “I won’t need all this extra cold weather clothing; it is April after all. I think I’ll lighten my load a little,” he said to himself. He didn’t think it necessary to check with the park rangers again about the weather since he was only going to be gone for the day.

Joel’s hike went well at first. He had handled the steep climbs without too much difficulty and he had been amazed by the scenery and wildlife in the area. But he was a little worried now by the dark, ominous clouds that were gathering quickly to the west. He could feel a cold wind starting to blow and wished he had brought that extra clothing after all. He realized he wasn’t used to the cold and found himself wishing for the Florida sunshine. Soon, snow started to fall lightly and Joel began to worry about dealing with the weather. He thought he should start heading back to his car because he figured he was at least four hours away. He picked up his pace and headed back towards the trailhead.

It was now quite dark and the snow was coming down heavily. The trail was getting hard to follow and Joel wasn’t even sure he was moving in the right direction anymore. He was starting to feel quite cold and rather fatigued. His clothes were wet after he stumbled into a waist-deep creek and he had lost his hat somewhere on the trail. He needed to rest, so he found a large pine tree and sat down clumsily beneath it. Joel had heard stories of people suffering rapid drops in body temperature, known as hypothermia, and he knew he had to find a way to keep warm or he might be in serious trouble.

## Questions

1. What mechanisms of heat loss are contributing to Joel’s feelings of coldness?
2. What two physiologic responses will occur to help Joel maintain a normal body temperature?
3. What mechanisms and/or structures are responsible for initiating and controlling these physiologic responses?

## Part II

Joel was feeling very fatigued and was shivering strongly. His hands and feet were starting to feel cold and it felt like very little blood was getting to his extremities. He felt the need to continue moving, so he began walking as he ate his last energy bar and this seemed to make him feel a little better. Joel continued to walk, hoping something would look familiar and he could find his way back to the trailhead.

### Questions

4. What physiologic response would cause Joel to feel there was little blood flowing to his hands and feet? How does this physiologic response limit heat loss to the environment?
5. Why is Joel shivering so strongly? How does this help to prevent a drop in normal body temperature?

## Part III

Joel was starting to get scared. He realized he was probably lost and was now very cold. His hands and feet were starting to feel numb and his shivering was violent. He was very fatigued and he felt light-headed. He wasn't making much progress because he was stumbling every few feet and he couldn't concentrate very well either. A few minutes later Joel heard what he thought was an engine and then he thought he saw a light climbing up towards him slowly. Suddenly a park ranger appeared on an all-terrain-vehicle. "Are you okay?" the park ranger asked. "We found your car down the hill and figured you might have been caught up here in this storm. We need to get you down to the ranger station and get you warmed up as quickly as we can!" the ranger said. "You need to be careful up here, you never know what the mountains have in store."

### Questions

6. If Joel had not been rescued, what two types of cold injury was he at risk of developing? What are signs and symptoms associated with these conditions?