**Active Learning Exercise 22.1**

to accompany

*Vertebrate Life*, Tenth Edition

Pough • Janis

**Energetic Cost of Hummingbird Migration**

by Scott Parker

Coastal Carolina University

sparker@coastal.edu

**Level of Difficulty:** Medium

**Relevant Terminology:** kilocalorie, carbohydrate, fat

**Activity**

Some ruby-throated hummingbirds do a non-stop migration flight across the Gulf of Mexico for 800 kilometers (about 500 miles). The flight takes 10 hours at an average speed of 80 km/hr (50 mph). This is all the more amazing when you consider the fact that these birds weigh only 3–4 grams (a little more than a penny). This weight includes all of the structural components of the bird as well as all the fuel necessary for the trip.

During flight the birds use about 250 ml of O2 per hour.

Notes:

* 4.82 kcal of energy is liberated per liter of O2
* Energetic content of fat = 9 kcal/g
* Energy content of carbohydrate = 4 kcal/g

1. Calculate the total amount of energy required for the trip.

[Hint: Begin by calculating the energetic equivalent in kcal from the consumption of 1 L of oxygen.]

2. Calculate the amount of fuel required for the trip if fat is used as the metabolic substrate.

3. Calculate the amount of fuel required for the trip if carbohydrate is used as the metabolic substrate.

4. Which fuel, carbohydrate or fat, do you think would be the best energy source for the migration? Explain the rationale for your answer.