

Human Body

Bicycling and Calories



Multiple-Choice Questions

Assumptions

Bicycling and
Calories



In the following questions we assume students know:

- humans need 1500-2500 kcal/day depending on age, gender, and activity level.
- one food calorie (1 Cal) is equal to 1 kcal (1000 cal).

Question 1

Bicycling and
Calories



A cereal bar contains 200 food calories in 50 grams. Which of the following sources has a heat of combustion that is closest to that of the cereal bar?

- A. Natural Gas (methane) ~ 55 MJ/kg
- B. Kerosene ~ 45 MJ/kg
- C. Coal ~ 30 MJ/kg
- D. Wood ~ 16 MJ/kg

Question 1 Answer

Bicycling and
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Question 1 Solution

Bicycling and
Calories



A cereal bar contains 200 food calories in 50 grams. Which of the following sources has a heat of combustion that is closest to that of the cereal bar?

$$200 \text{ Calories} = 200 \text{ kcal}$$

$$(200 \text{ kcal})(4200 \text{ J/kcal}) = 8.4 \times 10^5 \text{ J}$$

$$8.4 \times 10^5 \text{ J} / 0.05 \text{ kg} = 17 \text{ MJ/kg}$$

Therefore, it is comparable with wood.

Question 2

Bicycling and
Calories



Approximately how long could you live off a cereal bar containing 200 Calories?

- A. 30 min
- B. 1 h
- C. 2-3 h
- D. 5-6 h
- E. More than 6 hours

Question 2 Answer

Bicycling and
Calories



Approximately how long could you live off a cereal bar containing 200 Calories?

- A. 30 min
- B. 1 h
- C. 2-3 h
- D. 5-6 h
- E. More than 6 hours

Question 2 Solution

Bicycling and
Calories



Approximately how long could you live off a cereal bar containing 200 Calories?

2000 kcal/day ~ 83 kcal/h

$200 \text{ kcal} / (83 \text{ kcal/h}) = 2.4 \text{ hours}$

Therefore you can live 2-3 hours off of a cereal bar.

Question 3

Bicycling and
Calories



What needs more energy, your body or a refrigerator that consumes 1.2 kWh/day?

- A. Approximately same amount
- B. Refrigerator needs more energy
- C. Human body needs more energy

Question 3 Answer

Bicycling and
Calories



What needs more energy, your body or a refrigerator that consumes 1.2 kWh/day?

- A. Approximately same amount
- B. Refrigerator needs more energy
- C. Human body needs more energy

Question 3 Solution

Bicycling and
Calories



What needs more energy, your body or a refrigerator?

Your body requires 2000 Calories/day or 2000 kcal/day.

$$(2000 \text{ kcal/day})(4200 \text{ J/kcal}) = 8.4 \times 10^6 \text{ J/day}$$

$$(8.4 \times 10^6 \text{ J/day})(1 \text{ day}/86400 \text{ s}) = \mathbf{100 \text{ W}}$$

A refrigerator requires 1.2 kWh/day

$$(1.2 \text{ kWh/day})(3.6 \times 10^6 \text{ J/kWh}) = 4.3 \times 10^6 \text{ J/day}$$

$$(4.3 \times 10^6 \text{ J/day})(1 \text{ day}/86400 \text{ s}) = \mathbf{50 \text{ W}}$$