

Bio-Batteries and Thermoelectric Generators for Wearable Devices

Renewable Energy And Electronics · Answer Key · 18 Questions

1. What is a bio-battery?

- A) A device that stores electrical energy using organic compounds.**
- B) A device that generates power from sunlight.
- C) A device that uses nuclear fusion to produce energy.
- D) A device that stores energy in a magnetic field.

2. What is the primary energy source for most bio-batteries mentioned in the text?

- A) Glucose**
- B) Sunlight
- C) Wind
- D) Fossil fuels

3. How do bio-batteries generate electricity?

- A) Through the enzymatic breakdown of glucose, releasing electrons and protons.**
- B) By converting heat into electrical energy.
- C) Through the combustion of organic materials.
- D) By capturing kinetic energy from movement.

4. Which of the following is NOT an advantage of bio-batteries listed in the text?

- A) Faster charging times compared to other batteries.
- B) High energy density at room temperature.
- C) No leakage or explosions.
- D) Long-term energy storage capabilities.**

5. What are two common types of bio-batteries mentioned?

- A) Enzymatic and Microbial bio-batteries**
- B) Solar and Wind bio-batteries
- C) Lithium-ion and Alkaline bio-batteries
- D) Nuclear and Thermal bio-batteries

6. What is the main function of thermoelectric generators in the context of wearable devices?

- A) To convert body heat into electricity.**
- B) To store electrical energy from a battery.
- C) To regulate body temperature.
- D) To measure heart rate.

7. According to the text, what is a benefit of thermoelectric generators as wearable devices?

A) They provide constant power as soon as they are worn.

- B) They require frequent recharging.
- C) They are bulky and uncomfortable.
- D) They only work when the body is at rest.

8. What is a key feature of the future wearable thermoelectric devices being developed by scientists?

A) They can power devices without a battery.

- B) They are made of rigid materials.
- C) They generate a very high voltage per area.
- D) They are not recyclable.

9. How do modern technological innovations turn the human body into a functional power source, according to the text?

A) By absorbing heat radiated from biochemical activities and converting it into electrical energy.

- B) By using muscle movement to generate electricity directly.
- C) By processing waste products from the body into energy.
- D) By stimulating nerve impulses to create power.

10. What happens to a battery when it is used?

A) It is simultaneously being depleted and will eventually need to be replaced.

- B) It recharges itself automatically.
- C) It generates more power over time.
- D) It becomes more efficient with use.

11. What is a characteristic of the new wearable thermoelectric devices mentioned that makes them environmentally friendly?

A) They are stretchy and can heal themselves when damaged and are fully recyclable.

- B) They use rare earth metals for their construction.
- C) They produce harmful byproducts.
- D) They are designed for single use.

12. In a bio-battery system, what must be regularly supplied for it to continue functioning?

A) Glucose and sufficient biological enzymes.

- B) Water and oxygen.
- C) Sunlight and heat.
- D) External electrical current.

13. To improve the long-term use of bio-batteries and ensure they preserve more energy, what needs to happen?

A) Depleted supplies of glucose and enzymes must be replenished, and released electrons captured and recycled.

- B) The bio-battery should be stored in a cool, dry place.
- C) Only the glucose supply needs to be continuously replenished.
- D) The bio-battery should be used only for short periods.

14. What is the approximate voltage generated by future wearable thermoelectric devices per square centimeter of skin space?

A) About 1 volt

- B) About 10 volts
- C) About 0.1 volt
- D) About 100 volts

15. How does a bio-battery work based on the provided diagram (Figure 7.0)?

A) It relies on the flow of electrons and protons, with enzymes at the cathode terminal utilizing energy to produce water.

- B) It uses chemical reactions to directly generate heat, which is then converted to electricity.
- C) It captures kinetic energy from the movement of internal components.
- D) It stores energy from external electrical sources.

16. What is the role of the separator in a bio-battery construction (Figure 6.0)?

A) To prevent the anode and cathode terminals from interacting directly.

- B) To increase the flow of electrons.
- C) To speed up the breakdown of glucose.
- D) To store the generated electrical energy.

17. Where is the glucose source supplied in a bio-battery system as shown in Figures 6.0 and 7.0?

A) At the anode end.

- B) At the cathode end.
- C) In the electrolyte.
- D) Within the separator.

18. What is a disadvantage of bio-batteries compared to lithium-based electrical batteries?

A) They preserve less amount of energy.

- B) They are more prone to leakage.
- C) They require external power supply.
- D) They are not environmentally friendly.