

**Question Bank**

1. Name the basic components of the battery and discuss its working as galvanic cell and electrolytic cell.
2. Discuss the following battery characteristics:  
a) Cycle life    b) Current    c) Capacity    d) Energy density    e) Electricity storage density
3. Calculate the electricity storage density of a lithium ion battery which stores 1.9 g of lithium. The total weight of the battery is 48.54 g. Give the answer in Ah/Kg. (Gram atomic weight of Li = 7)
4. Discuss the construction and working of Zn-air battery.
5. Calculate capacity, energy density (in J/kg), power density (in W/Kg) of the battery, if 90 g of zinc is used and the battery lasts for 12000 minutes. The battery weight is 120 g and gives steady voltage of 1.4 V. (Given:  $F = 96500 \text{ C/mole}$ , molar mass of Zn = 65)
6. Mention any two advantages and disadvantages of Zn-air battery.
7. Why lithium batteries are very popular? Give construction and working of lithium ion battery.
8. Write the advantages and disadvantages of lithium-ion battery.
9. Why electricity storage density of lithium batteries high? Explain what happens when a Li-ion battery is being recharged.
10. How is fuel cell different from a battery?
11. Discuss the construction and working of  $\text{H}_2\text{-O}_2$  alkaline fuel cell.
12. Define fuel cell. Calculate the efficiency of  $\text{H}_2\text{-O}_2$  alkaline fuel cell. [EMF = 1.28 V,  $\Delta H = -285.8 \text{ kJ/mole}$ ]
13. Calculate EMF of the fuel cell, if efficiency of fuel cell is 85.5% [Given  $\Delta H = -285.8 \text{ kJ/mole}$ ]
14. Why is oxygen sensor placed near the exhaust in an automobile? Justify the use of solid oxide electrolyte in an oxygen sensor. If an oxygen sensor records a voltage of 0.8 V, what does it indicate?
15. What is oxygen sensor? Mention its applications.
16. Explain the construction and working of oxygen sensor.

17. Mention any two advantages and disadvantages of fuel cells.
18. What are supercapacitors? Mention any two reasons of high capacity of supercapacitors.
19. Draw Ragone plot and mark the following energy storage devices in Ragone plot.  
a) Fuel cell      (b) Li-ion battery      (c) Supercapacitors
20. Calculate the energy density of zinc-air battery in Whr/kg, if 5.6 g of Zn is stored in the battery and the weight of the battery is 25.5 g. [Given : voltage of Zn-air battery = 1.3 V, molar mass of Zn = 65.38]
21. A battery using  $\text{MnO}_2$  as electro active material is being used to withdraw a constant current of 3 A. Find out the capacity of the battery and determine how long the battery will last it contains 30 g of  $\text{MnO}_2$  and number of electrons exchanged is 2 (molar mass of Mn = 87)
22. Give examples of batteries which possess the following battery characteristics and justify your answer : a) Long shelf life b) High voltage
23. Write any two advantages and disadvantages of super capacitors.
24. With a neat labeled diagram explain the construction and working of a super capacitor.
25. Why lithium ion battery is safer than lithium battery? Give the reason for high electricity storage density of lithium batteries.
26. Calculate electricity storage density (in Ah/kg) of a lithium battery which stores 1.5 g of Li. The total weight of the battery is 50.45 g.
27. What are the main methods used for hydrogen production?
28. Explain the difference between grey, blue, and green hydrogen.
29. What are the main challenges associated with hydrogen storage?
30. Compare physical and chemical methods of hydrogen storage.
31. Describe the working principle of alkaline water electrolysis.
32. Discuss the advantages and limitations of metal hydrides for hydrogen storage.
33. Give the classification of sensors with an example.
34. Advantages and limitations of potentiometric sensors.
35. Illustrate the construction and working of Glucose biosensor.
36. Advantages and limitations of Glucose biosensors.