**Assignment week 4**

**1. A fuel cell is a type of electrochemical cell**

A. True

B. False

**2. Which of the following can be used as fuel in a fuel cell?**

A. Nitrogen (N2)

B. Hydrogen (H2)

C. Helium (He)

D. Oxygen (O2)

**3. Who invented the first fuel cell?**

A. Francis Bacon

B. Thomas Grubb

C. Leonard Niedrach

D. William Grove

**4. Which of the following is supplied to the cathode of a fuel cell?**

A. Hydrogen

B. Nitrogen

C. Oxygen

D. Chlorine

**5. A fuel cell is an electrochemical device that combines …… and …… to produce ……, with …… and heat as its by-product?**

A. Hydrogen, nitrogen, electricity and water

B. Hydrogen, oxygen, electricity and water

C. Electricity, hydrogen, oxygen and water

D. Water, electricity, hydrogen and oxygen

**6. Why should we focus on fuel cells?**

A. Limitation of fossil energy resources

B. Increase CO2 emission

C. Global warming

D. Transport problem

E. All of above

**7. What are the advantages of hydrogen fuel cell technologies?**

A. Direct energy conversion (no combustion)

B. Low emission

C. Quiet, siting ability

D. Fuel flexibility and small size

E. All of above

**8. What are the drawbacks of hydrogen fuel cell technologies?**

A. High market entry cost, production cost

B. Unfamiliar technology to the power industry

C. Almost no infrastructure and still at level of development

D. None of above

E. All of above

**9. Which of the following is not a fuel cell?**

A. Micro fuel cell

B. Direct-methanol fuel cells (DMFC)

C. Proton-exchange membrane fuel cell (PEMFC)

D. Daniell cell

**10. The existing anode and cathode electrodes are porous made up of ……**

A. Compressed carbon

B. Compressed nitrogen

C. Fiber

D. Plastic

**11. Which of these fuel cells operates at less than 100 C?**

A. (Alkaline fuel cell) AFC and (polymer electrolyte membrane fuel-cell) PEM

B. (Phosphoric acid fuel cell) PAFC

C. (Molten carbonate fuel cell) MCFC

D. (Solid oxide fuel cell) SOFC

**12.** **What is the main characteristics for electrolyte used in hydrogen fuel cell?**

A. Less expensive

B. More efficient

C. Wide operation temperature range

D. All of above

**13. Which of the following is NOT correct for PEMFC?**

A. Solid electrolyte excellent resistance to gas crossover

B. Working temperature ~ 80 C short startup time

C. Can work at high current densities compared to other cells

D. Working temperature ~ 25 C short startup time

**14. What are the disadvantages of AFC fuel cells?**

A. Very clean fuel required

B. CO2 poisoning

C. Significant pressure difference across the membrane is required

D. Large Pt quantity is needed.

E. All of above

**15. Which temperature is quired for SO Fuel cells?**

A. 1000 C

B. 100 C

C. 500 C

D. 700 C

**16. Which of the following statement is correct for the performance of PA fuel cells?**

A. 25-30%

B. 37-42%

C. 70-80 %.

D. 99%

**17. In MC fuel cells, the Li2CO3 and K2CO3 are used as …….**

A. Anode

B. Membrane

C. Electrolyte

D. Cathode

**18. In influence of the support, which of the following statement is correct for smaller particles?**

A. Strong deformation, ellipsoidal shape

B. Big agglomeration

C. Less deformation structure

D. Various morphology

**19.** **Which are the applications of hydrogen fuel cell technologies?**

A. Portable electronics and Automotive

B. Back-up and auxiliary power

C. Distributed generation

D. All of above

**20. To provide a large surface area for catalysis, Pt nanoparticles are used with …….**

A. (Semi-) infinite systems

B. Different surfaces

C. Active carbon

D. Fiber