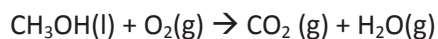


## Redox reactions - revision

### Lesson 7b

- 1) A fuel cell uses methanol in a combustion reaction that produces  $\text{CO}_2$  and  $\text{H}_2\text{O}$  according to the unbalanced chemical equation below.



- a) Using the template shown on the right

- i. label the anode and cathode
- ii. indicate where the methanol reacts and also indicate where the oxygen enters the fuel cell.
- iii. Assuming an acidic electrolyte is used write the half equation that occurs at the anode

\_\_\_\_\_

the cathode

- iv. Assuming an alkaline electrolyte is used write the half equation that occurs at the anode

\_\_\_\_\_

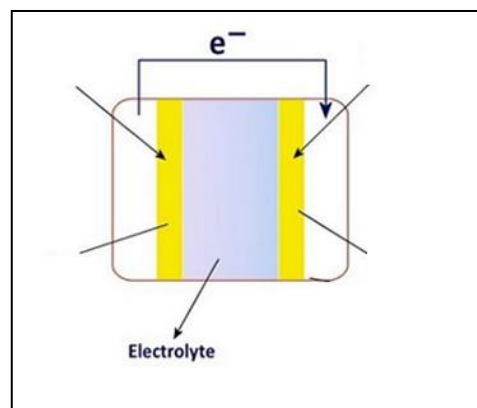
the cathode

\_\_\_\_\_

- v. Discuss how the electrodes of a fuel cell differ to those of a normal galvanic cell.

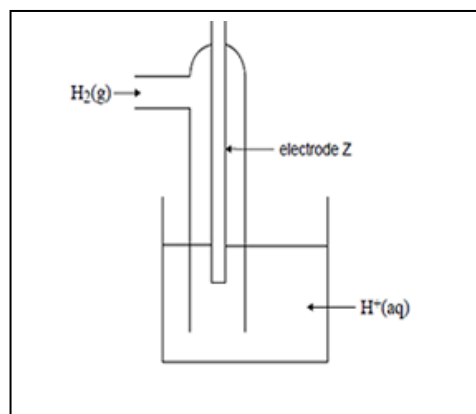
- vi. Can a fuel cell be recharged? Explain your answer.

- b) Some methanol may also be used for electric power for electronic equipment. This can be provided through the fuel cell with an acidic electrolyte, whose cell reaction is identical to the equation given above. An alternative way of generating electricity from methanol is to use it as the fuel for an internal combustion engine driving a generator. Suggest one important reason why the fuel cell would be better than the generator for this purpose.



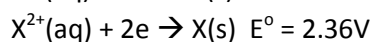
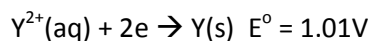
2) The diagram on the right represents a  $\text{H}^+(\text{aq})/\text{H}_2(\text{g})$  half cell for the reaction  $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$

- Identify an appropriate material for electrode Z and give reasons.
- For this half cell to be a **standard** half cell, at what temperature must it operate?
- What should the pH be, for it to operate at standard conditions.



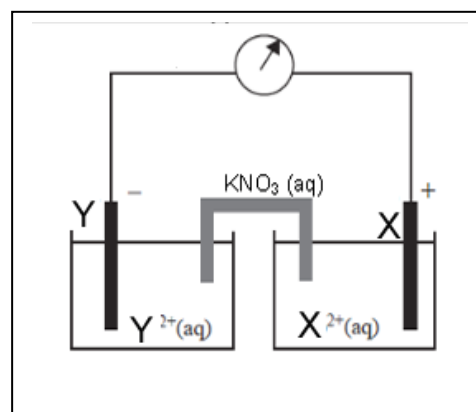
- A galvanic cell consists of the following half cells which have been set up under standard conditions.
  - Half cell 1: the  $\text{H}^+(\text{aq})/\text{H}_2(\text{g})$  half cell described in part a.
  - Half cell 2: a cadmium (Cd) electrode in a solution containing  $\text{Cd}^{2+}(\text{aq})$
 After some time, the pH in half cell 1 has increased. Use this information to identify the species in this galvanic cell which is the stronger reductant and explain how you reached this conclusion.

3) Consider the galvanic cell on the right and the information below.



a) Indicate the

- the direction of electron flow.
- anode and cathode
- the electrode which is increasing in mass as the cell discharges.
- the direction of positive ion flow



b) The following two half cell were set up. Indicate the relative position of the half cell equation below on the  $E^\circ$  table.

