

Friday Worksheet

Name:

Fuel cells worksheet 5

- 1) A hydrogen-oxygen fuel cell uses 1.00×10^{-3} mol of hydrogen gas per minute of operation. What is the current produced by this cell?

Hydrogen releases 2 electrons in either an acidic or an alkaline electrolyte.



Step 2 find the mol of electrons produced.

$\Rightarrow 2 \times 1.00 \times 10^{-3} = 2.00 \times 10^{-3}$

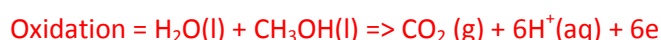
Step 3 find the charge delivered

$\Rightarrow \text{Charge} = 2.00 \times 10^{-3} \times 96500 = 193.0 \text{ C}$

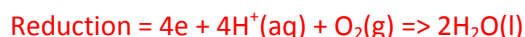
Step 4 Find the current

$\Rightarrow I = C/t = 193.0 / 60 = 3.22 \text{ amperes}$

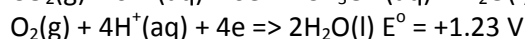
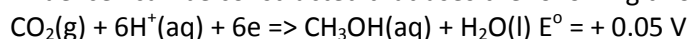
- 2) Liquid methanol is a fuel for small fuel cells that are used to power laptop computers and similar small electrical items. The methanol is oxidised by atmospheric oxygen to carbon dioxide and water using an acidic electrolyte.
- Write half-equation for the reaction taking place at anode



-- Write half-equation for the reaction taking place at cathode



- 3) A fuel cell can be constructed that uses the following two half-reactions.



- a) Label the anode and cathode in the diagram

Anode is A

Cathode is B

- b) Label the direction of electron flow.

From A to B

- c) Label the direction of positive ion flow.

Through the electrolyte from A to B

- d) What are the polarities of each electrode

A = negative

B = positive

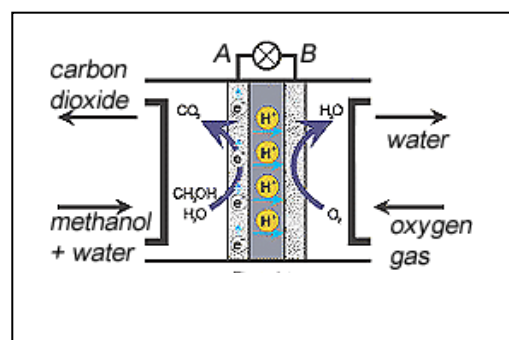
- e) At which electrode, anode, cathode or neither, will

i. H^+ ions be consumed = B

ii. H_2O be formed = B

iii. CO_2 be consumed = neither

iv. methanol be reduced =neither



f) Indicate which of the following statements about this fuel cell are true or false and give an explanation.

A. An external power supply is used to recharge the cell.

Fuel cells cannot be recharged as reactants are continuously supplied.

B. Gaseous products are recycled into the cell to improve efficiency.

Gaseous products are not recycled as they are not used in the reactions

C. Chemical energy is not completely converted into electrical energy.

Correct. Conversion of chemical to electrical energy is never 100% efficient.

D. More H^+ ions are produced at the anode than are consumed at the cathode.

When writing the overall reaction the number of H^+ ions produced at the anode equal the H^+ ions consumed at the cathode.