

## Chemical Energetic

### Past Year Topical Questions

Oct/Nov 2004

(c) Respiration and photosynthesis are two of the processes that determine the percentage of oxygen and of carbon dioxide in the air.

(i) Name another process that changes the percentages of these two gases in air.

[1]

(ii) The equation for photosynthesis is given below.



This is an endothermic reaction.

Complete the reaction for respiration.

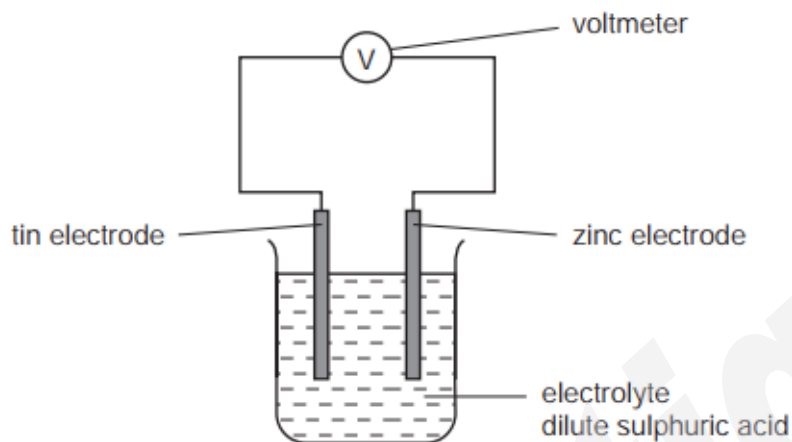


This is an  reaction.

[2]



(b) The following diagram shows a simple cell.



- (i) Predict how the voltage of the cell would change if the tin electrode was replaced with a silver one.

[1]

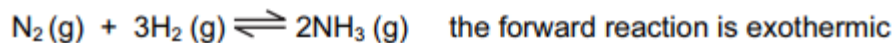
- (ii) Which electrode would go into the solution as positive ions? Give a reason for your choice.

[1]

- (iii) State how you can predict the direction of the electron flow in cells of this type.

[1]

Oct/Nov 2005



- (c) (i) Complete the following table that describes the bond breaking and forming in the reaction between nitrogen and hydrogen to form ammonia.

bonds	energy change /kJ	exothermic or endothermic
1 mole of $\text{N} \equiv \text{N}$ broken	+945	.....
3 moles of .....	+1308	.....
6 moles of $\text{N} - \text{H}$ formed	-2328	.....

[3]

- (ii) Explain, using the above data, why the forward reaction is exothermic.

.....  
.....

[2]

May/June 2006

- 6 (a) Exothermic reactions produce heat energy.

An important fuel is methane, natural gas. The equation for its combustion is as follows.



- (i) In chemical reactions bonds are broken and new bonds are formed.  
Using this reaction give an example of

a bond that is broken, .....

a bond that is formed. .... [2]

- (ii) Explain, using the idea of bonds forming and breaking, why this reaction is exothermic, that is it produces heat energy.

.....  
..... [2]

- (b) Some radioactive isotopes are used as nuclear fuels.

- (i) Give the symbol and the nucleon number of an isotope that is used as a nuclear fuel.

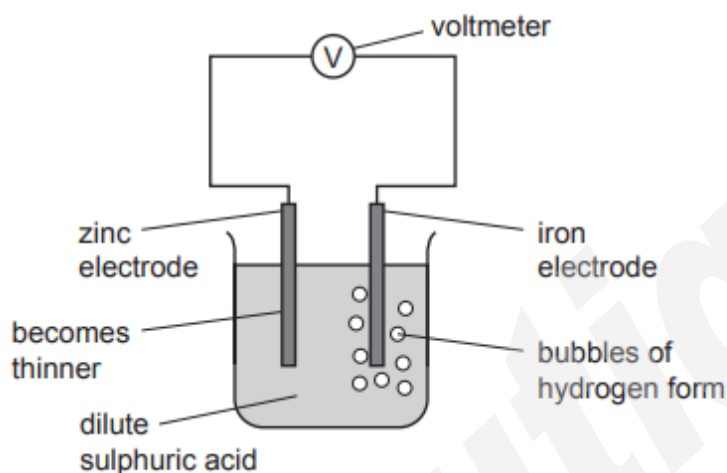
..... [2]

- (ii) Give another use of radioactive isotopes.

..... [1]

(c) Cell reactions are both exothermic and redox. They produce electrical energy as well as heat energy.

(i) The diagram shows a simple cell.



Which substance in this cell is the reductant and which ion is the oxidant?

reductant .....  
 oxidant ..... [2]

(ii) How could the voltage of this cell be increased?

..... [1]

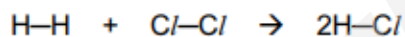
May/June 2009

7 Hydrogen reacts with the halogens to form hydrogen halides.

(a) Bond energy is the amount of energy, in kJ, that must be supplied (endothermic) to break one mole of a bond.

bond	bond energy in kJ/mol
H—H	+436
Cl—Cl	+242
H—Cl	+431

Use the above data to show that the following reaction is exothermic.



.....

.....

.....

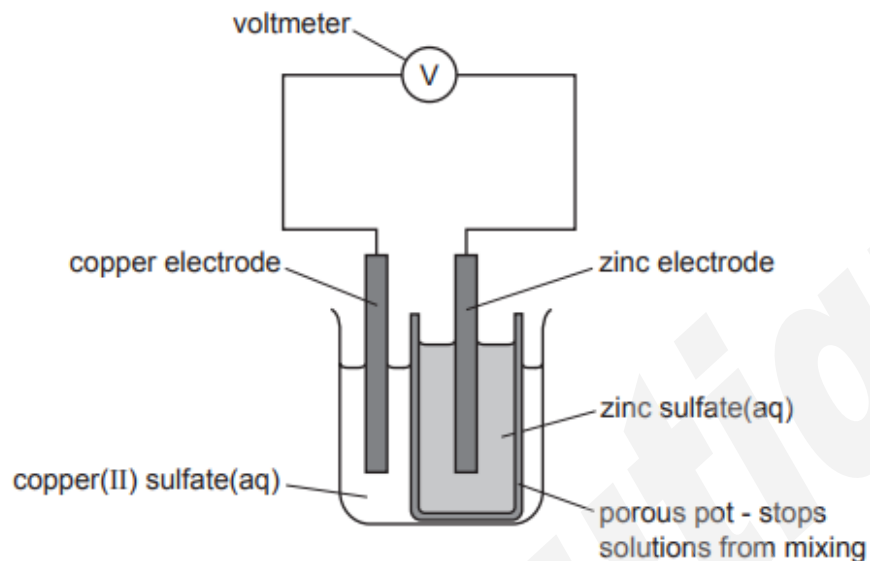
.....

..... [3]



Oct/Nov 2009

- (c) Zinc electrodes have been used in cells for many years, one of the first was the Daniel cell in 1831.



- (i) Give an explanation for the following in terms of atoms and ions.

observation at zinc electrode – *the electrode becomes smaller*

explanation .....

..... [1]

observation at copper electrode – *the electrode becomes bigger*

explanation .....

..... [1]

(ii) When a current flows, charged particles move around the circuit.

What type of particle moves through the electrolytes?

..... [1]

Which particle moves through the wires and the voltmeter?

..... [1]