

Chemistry

Section I – Part B (continued)

Marks

Question 19 (7 marks)

Name ONE type of cell, other than the dry cell or lead–acid cell, you have studied. Evaluate it in comparison with either the dry cell or lead–acid cell, in terms of chemistry and the impact on society. Include relevant chemical equations in your answer.

7

The Gratzel cell, is a battery that is

solar powered, using the energy from the sun.

It is made of ~~liquid~~ an electrolyte ruthenium

~~to dye~~ dye. It replaces fossil fuels so it has

no beneficial environmental impact, and it can

be recharged with the solar energy from the

sun. In time, it will save people money as

it uses free solar energy, that can be recharged.

The dry cell is made up of a zinc casing

anode, a graphite cathode and a zinc and

ammonium chloride electrode. Unlike the Gratzel

cell it is not rechargeable, so it is less environmentally

friendly. Unlike the Gratzel cell it is cheap,

and portable and easy to handle. ~~So~~ It also

~~eliminates~~ replaces fossil fuel energy, but

it poses disposable problems and increases rubbish, and it may leak.

Question 20 (4 marks)

A 0.1 mol L^{-1} solution of hydrochloric acid has a pH of 1.0, whereas a 0.1 mol L^{-1} solution of citric acid has a pH of 1.6.

- (a) State ONE way in which pH can be measured.

1

pH meter.

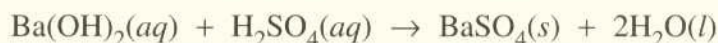
- (b) Explain why the two solutions have different pH values.

3

pH is a measure of the number of dissociated hydrogen ions in a solution. While 0.1 M HCl has the same concentration ^{as} 0.1 M citric acid, the citric acid being a weak acid does not completely dissociate in water and so there are less H^+ ions in solution, thus a different pH.

Question 21 (4 marks)

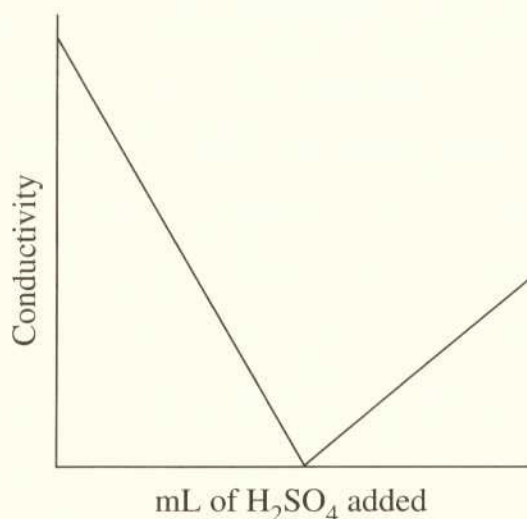
Barium hydroxide and sulfuric acid react according to the following equation:



- (a) Name this type of chemical reaction. 1

Neutralisation

- (b) A 20 mL sample of barium hydroxide was titrated with 0.12 mol L^{-1} sulfuric acid. The conductivity of the solution was measured throughout the titration and the results graphed, as shown. 3



Explain the changes in conductivity shown by the graph.

As H_2SO_4 is added, the H_3O^+ ions are reacting with the OH^- ions in the solution. They react to form $\text{H}_2\text{O}(\text{l})$. A solution with higher conc. of ions has higher conductivity, so as the ions are reacting, the conductivity drops. This is until all the OH^- ions have been used up when we have a neutral solution $\therefore 0$ conductivity. As H_2SO_4 is still added, this begins to increase the concentration of H_3O^+ ions, therefore conductivity increases.