

## 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 button cell using mercury as a source of chemical to generate electric current. The button cell is very portable and small in size. It is widely used in hearing aids and cameras and other portable devices. Since it contains mercury, it is difficult to be disposed as mercury is toxic to living organisms. The invention of this cell has enabled us to be more advanced in technology and brings convenience to us as it is small in size. However it is toxic and precaution must be taken into account in disposal. On the other hand, a dry cell is bigger in size and not ~~the~~ portable as button cell. The dry cell has had a dramatic impact on society as it was the first portable electricity invented. It is widely used for infrequently used devices such as radios, torches and it is not toxic to be disposed of compare to the button cell.

## Question 20 (4 marks)

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

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

1

..... universal indicator .....

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

3

They have different pH values as they ~~are~~ have different strengths. HCl is a strong acid which means it has a higher degree of ionisation. It dissociates more in solution than citric acid and therefore has a higher  $[\text{H}^+]$ . Citric acid does not dissociate as well in solution

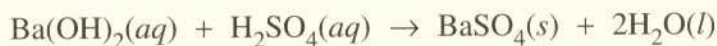
pH  $\rightarrow$   $[\text{H}^+]$

$$\text{pH} = -\log_{10} [\text{H}^+]$$



## Question 21 (4 marks)

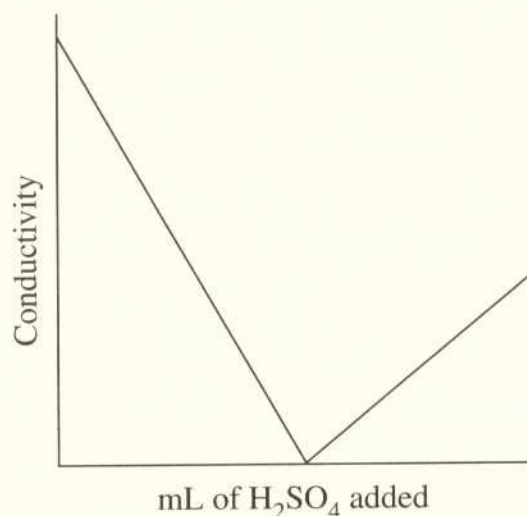
Barium hydroxide and sulfuric acid react according to the following equation:



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

neutralisation

- (b) A 20 mL sample of barium hydroxide was titrated with  $0.12 \text{ mol L}^{-1}$  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.

Initially there are lots of ions in solution that are able to conduct the electricity. As more  $\text{H}_2\text{SO}_4$  is added more  $\text{H}_2\text{O}$  is formed with is not able to conduct as well. As the reaction reaches equivalence the  $\text{H}_2\text{SO}_4$  ions form in excess and are available for conducting electricity again