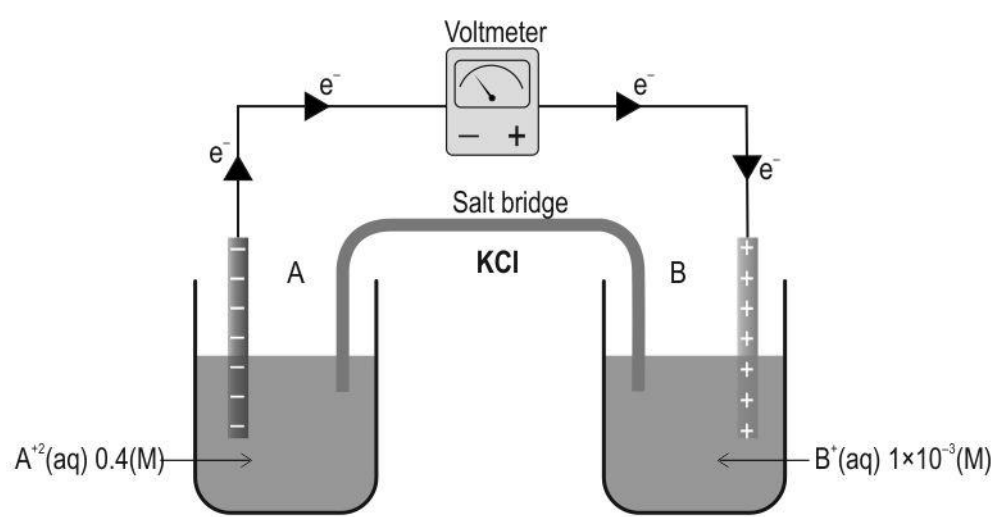
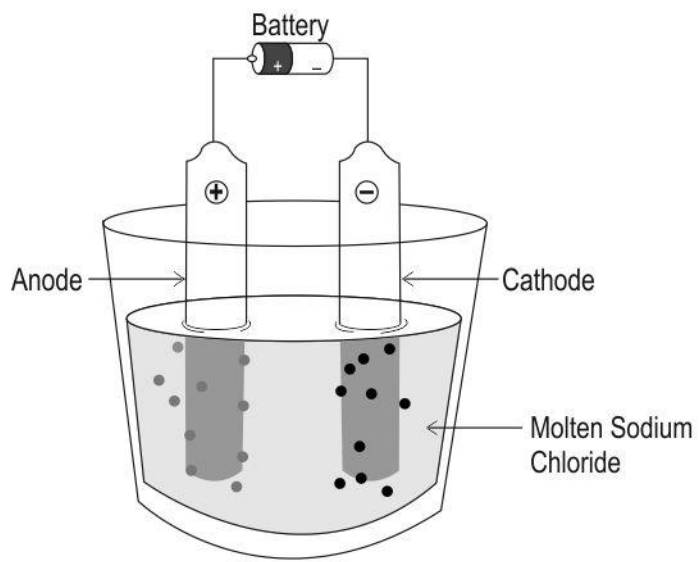


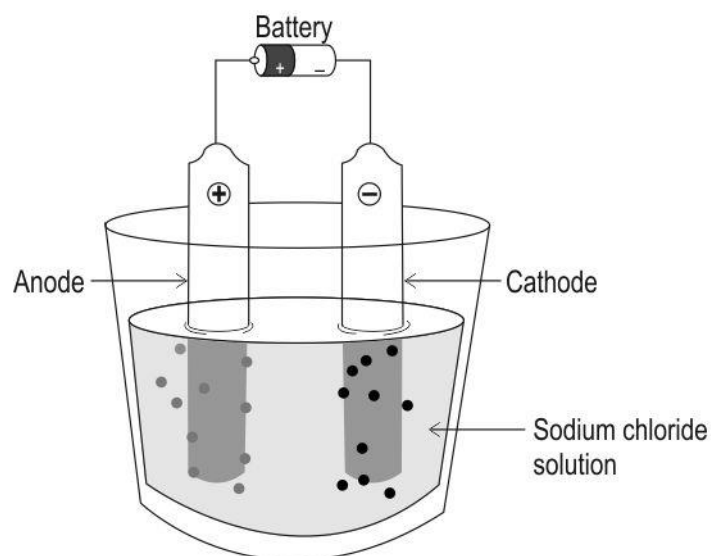
## Electrochemistry

Q.No	Question	Marks
<b>Free Response Questions/Subjective Questions</b>		
Q.2	<p>Calculate the emf of the cell given below at STP:</p>  <p><math>E^\circ(B^+ B) = 0.80 \text{ V}</math>, <math>E^\circ(A^{2+} A) = -2.37 \text{ V}</math></p>	2
Q.3	<p>Look at the diagram and answer the questions that follow:</p>  <p>(i) Identify the ion(s) moving towards the cathode. Give a reason for your choice.</p> <p>(ii) What is the expected product at the anode? Write the reaction(s) occurring at the anode.</p> <p>(iii) Write the net reaction of the process seen in the above diagram.</p> <p>(iv) State the laws that govern the above process.</p>	5

Q.4

Look at the diagram and answer the questions that follow:

5



The electrodes used in the cell are made up of platinum.

(i) What are the product(s) formed at the cathode for the given setup? What factors did you consider to determine the products of electrolysis in the cell given above?

(ii) What is the nature and function of the electrodes seen here?

(iii) Write the electrode reactions if the electrolyte is changed to molten sodium chloride.

### Answer Key: Electrochemistry

Q.No	Answers	Marks
Q.2	<p>The reaction is:</p> $A(s) + 2B^+(1 \times 10^{-3}M) \rightarrow A^{+2}(0.4 M) + 2B(s)$ <p>Substituting the values in Nernst equation,</p> $E = E^\circ - (0.059/2) \log[A^{+2}/[B^+]^2]$ $= 0.80 - (-2.37) - (0.059/2) \log (0.4/(10^{-3})^2)$ $= 3.17 - 0.1652$ $= 3.0047 V$ <p><i>[ Give 1 mark for the correct substitution and 1 mark for the correct answer]</i></p>	2
Q.3	<p>(i) The ions moving towards the cathode are <math>Na^+</math>. The electrolyte is molten sodium chloride, so only one cation (<math>Na^+</math>) is present in the reaction medium.</p> <p><i>[Give 0.5 marks for correctly identified ion and 0.5 marks for the reason.]</i></p> <p>(ii) The product expected at the anode is chlorine.</p> <p>The anode reaction is :</p> $Cl^- \rightarrow \frac{1}{2} Cl_2 (g) + e^-$ <p><i>[Give 0.5 mark for the correctly identified product formed at the anode and 0.5 marks for the anode reaction.]</i></p> <p>(iii) The net reaction for the process is:</p> $2NaCl \rightarrow 2Na + Cl_2 (g)$ <p><i>[Give 1 mark for the correct reaction]</i></p> <p>(iv) The above process is governed by the Faraday's law of electrolysis. They are as follows:</p> <ol style="list-style-type: none"> <li>1. The amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte.</li> <li>2. The amounts of different substances liberated by the same quantity of electricity passing through the electrolytic solution are proportional to their chemical equivalent weights.</li> </ol>	5



	<i>[Give 1 mark for each correct law.]</i>	
Q.4	<p>(i) The product formed at the cathode for the above reaction is sodium hydroxide(NaOH) and hydrogen(H<sub>2</sub>).</p> <p>(a) The products of electrolysis depend on the different oxidising and reducing species present in the electrolytic cell and their standard electrode potentials.</p> <p>(b) Nature of the electrode used.</p> <p><i>[Give 0.5 marks for each correctly mentioned products.Give 1 mark for each correctly mentioned points. The students may write the answer in their own words]</i></p> <p>(ii) The nature of the electrodes are inert. The electrodes do not participate in the chemical reaction but acts only as source or sink for electrons.</p> <p><i>[Give 0.5 marks for identifying the nature of the electrode and 0.5 marks for writing the function of the electrode.]</i></p> <p>(iii) The electrode reactions if the electrolyte is molten NaCl are:</p> <p>Cathode reaction: <math>\text{Na}^+ + \text{e}^- \rightarrow \text{Na}</math></p> <p>Anode reaction: <math>\text{Cl}^- \rightarrow \frac{1}{2}\text{Cl}_2 + \text{e}^-</math></p> <p><i>[Give 0.5 mark for each correct reaction. ]</i></p>	5

