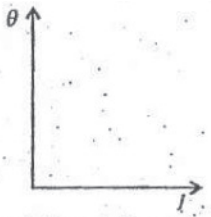
4. (a) A current I is passed through a moving coil galvanometer. Draw a rough sketch to show how the galvanometer deflection θ varies with the current I.



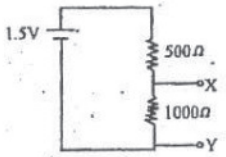
A moving coil galvanometer gives full scale deflection when a current of I mA is passed through it. Internal resistance of the galvanometer is 50Ω

(b) If the galvanometer is calibrated as a voltmeter what will be the maximum potential difference that can be measured with this meter ? *(one line)*

(C) (i) If the above mentioned galvanometer is to be converted to a voltmeter with a full scale deflection of 1 V, show by means of a diagram how you would achieve this. (Clearly label the components with standard symbols.)

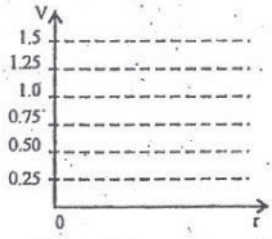
(ii) Calculate the value of the resistor needed. *(2 lines)*

(d) (i) If the voltmeter mentioned in (c) is connected across XY of the circuit shown what will be the reading on the meter. (Neglect the internal resistance of the cell) *(2 lines)*



(ii) Does the voltmeter read the actual value of the potential difference across 1000Ω ? *(2 lines)*

(e) Suppose you are provided with several other voltmeters having different internal resistances r to measure the voltage V across XY. Draw a rough sketch of a curve that you would expect if V is plotted against r.



(f) Suppose you want to construct a voltmeter having a full scale deflection of 1 V and an internal resistance of $10{,}000\Omega$ What is the full scale deflection current of a moving coil galvanometer required for this purpose ? *(one line)*

(g) Give one reason as to why it is practically difficult to increase the internal resistance of the voltmeter mentioned in (f) to extremely large values of the order of $10M\Omega$. *(2 lines)*