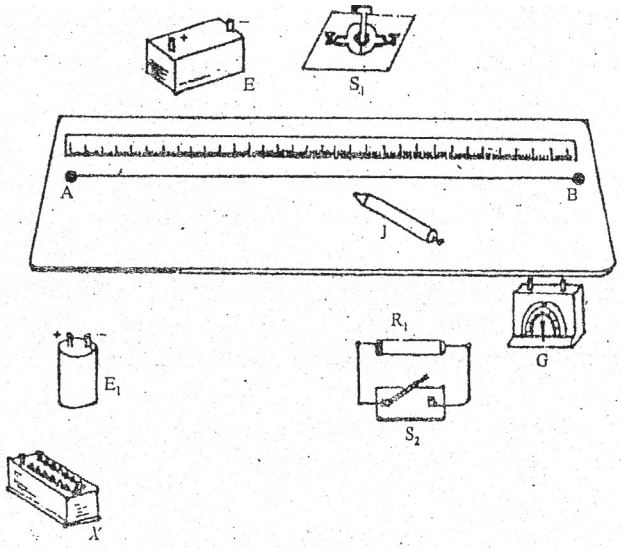
1. Diagram below shows the apparatus which can be used in an experiment to determine the value of the internal resistance r of a cell E_1.



AB - Potentiometer wire
G - centre zero galvanometer
E - accumulator
R_1 - 1 kΩ resistor
S_1 - plug key
S_2 - tap key
X - resistance box
J - sliding key

(a) In the above figure indicate how you would connect the given items to form a suitable electrical circuit, which enables you to determine the internal resistance r of the cell E_1

(b) Why is it advisable to use an accumulator for E ? *(one line)*

(c) What is the purpose of the resistor R_1 ? *(one line)*

(d) When do you close the key S_2? *(one line)*

(e) You are asked to plot a suitable graph in order to determine r. What measurements would you take for this? *(2 lines)*

(f) It is not advisable to connect the resistance box X to the circuit with all resistance plugs closed. Explain why? *(2 lines)*

(g) After making all the connections correctly, a student observes that the dependent variable mentioned in (e) above stays at the same value when the resistance plugs are being removed one by one. What is the most probable reason for the above observation ? *(one line)*

(h) A student says that in order to perform this experiment the e.m.f. of the cell E_1 has to be always less than that of E. Is the above statement true? Give reasons for your answer. *(2 lines)*