

## Physics Tutorial 16(a)

### ***Current of Electricity***

1.
  - (a) Define (i) electric current, (ii) potential difference and (iii) electromotive force as used in an electric circuit.
  - (b) The Earth as a whole carries negative charges. On a day with fine weather the total charge on the surface of the Earth is  $5.5 \times 10^5$  C. The Earth revolves around the Sun at a distance of  $1.5 \times 10^{11}$  m once a year. Estimate the average electric current along the orbit.
  - (c) It is estimated that the average quantity of electric charge transported in a lighting flash is 30 C. If the energy liberated is  $2.1 \times 10^{10}$  J, what is the p.d. involved?  
[17 mA,  $7.0 \times 10^8$  V]
2. A torch is rated as '2.5 V, 0.03 A'.
  - (a) How much charge flows through the bulb in 1 hour when it is operating at its rated current?
  - (b) At what rate is electrical energy dissipated in the bulb when it is operating at its rated voltage?
  - (c) What is its resistance under operating condition?  
[108 C, 0.075 W, 83  $\Omega$ ]
3.
  - (a) Define resistance.
  - (b) An aluminium wire of length 15 m is to carry a current of 25 A with a potential drop of no more than 5 V along its length. What is the minimum acceptable diameter of this cable?
  - (c) Calculate the resistance per metre of constantan wire of diameter 0.35 mm. What length of this wire would be needed to make a '12 V, 30 W' heater filament?  
(Resistivity of aluminium =  $2.8 \times 10^{-8}$   $\Omega$ m and  
resistivity of constantan =  $4.8 \times 10^{-7}$   $\Omega$ m)  
[ $1.64 \times 10^{-3}$  m,  $5.0 \Omega\text{m}^{-1}$ , 96 cm]
4. Page 190,Q42 (J76/I/5)
5. Page 192,Q63(a) (N91/III/4 part)
6. A battery is connected in series with a  $2.0 \Omega$  resistor and a switch S. A high resistance voltmeter reads 12.5 V when the switch is open but 8.1 V when the switch is closed. What is the internal resistance of the battery?  
[1.1  $\Omega$ ]