

The photograph shows a statue of Buddha in Sri Lanka, which is protected by a lightning conductor.

© Valery Shanin/123RF

- (a) During a storm, a potential difference of  $2.7\text{ MV}$  was generated between a cloud and the top of the lightning conductor on the statue. A flash of lightning passed between the cloud and the lightning conductor, producing a current of  $25\text{ kA}$  for a time of  $7.5\text{ ms}$ .

Calculate the energy transferred by the lightning strike.

(3)

Energy transferred = .....

- (b) The lightning conductor is a length of copper wire with a diameter of  $1.2 \times 10^{-2}\text{ m}$  and a resistance of  $4.3 \times 10^{-3}\ \Omega$ . It runs along the back of the statue from the base to a height of  $1.5\text{ m}$  above the top of the statue.

A guidebook claims that the statue is over  $30\text{ m}$  high.

Assess the validity of this claim.

resistivity of copper =  $1.7 \times 10^{-8}\ \Omega\text{ m}$

(4)

- (c) Give a reason why the lightning conductor should be taller than the statue.

(1)

(Total for Question 5 = 8 marks)