

## AS Level HW questions - characteristics curves

**Q1.** In an attempt to investigate how the resistance of a filament lamp varies with current through the lamp, a student obtains the results shown in the table.

voltage /V	0.50	1.50	3.00	4.50	6.00	12.00
current /A	0.51	1.25	2.00	2.55	2.95	4.00
resistance / $\Omega$						

- (a) Complete the table by calculating the corresponding values of resistance. (2)
- (b) (i) Plot a graph of resistance against current for the filament lamp.
- (ii) Use your graph to estimate the resistance of the filament lamp when no current flows through the lamp.
- (iii) Use your graph to determine the change in the resistance of the filament when the current increases from 0 to 1.0 A and from 1.0 A to 2.0 A
- (iv) Calculate the power dissipated in the lamp filament when the current through the filament is 1.0 A and 2.0 A. (8)
- (c) Using information from part (b)(iv), explain why the change in resistance of the filament is less for a current change of 0 to 1.0 A than for a current change of 1.0 A to 2.0 A. Do **not** attempt any calculation. (2)

**(Total 12 marks)**

- Q2.** (a) Sketch the characteristic of a silicon semiconductor diode for forward bias and reverse bias. (Indicate approximate values on the voltage axis). (4)
- (b) Describe, with reference to the characteristic you have drawn, how the resistance of the diode changes with the voltage across the diode. (3)

**(Total 7 marks)**

- Q3.** (a) On the same diagram axes sketch the  $I$ - $V$  characteristics for **two** components, A and B, both of which obey Ohm's law. Component B has a lower resistance than component A. Label your characteristics clearly as A and B. (2)
- (b) Sketch the  $I$ - $V$  characteristic for a silicon semiconductor diode, giving any relevant voltage values. (3)
- (c) Sketch the  $I$ - $V$  characteristic of a filament lamp. Explain the shape of this characteristic. (6)

**(Total 11 marks)**  
**[30 MARKS TOTAL]**