Fundamentals of Nanoelectronics, I: The New Perspective

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L1.3 Quiz

Answers

1.3. Why Electrons Flow

1.3a. The current through an ***elastic resistor*** can be written in terms of a conductance function G(E) and the Fermi functions in the two contacts f_1 and f_2, as

(a) $$I = \frac{1}{q}\int_{-\infty}^{+\infty} dE\, G(E)\left(f_1(E) - f_2(E)\right)$$

(b) $$I = \frac{1}{q}\int_{-\infty}^{+\infty} dE\, G(E)\left(f_1(E) + f_2(E)\right)$$

(c) $$I = \frac{1}{q}\int_{-\infty}^{+\infty} dE\, G(E)\, f_1(E)(1 - f_2(E))$$

(d) $$I = \frac{1}{q}\int_{-\infty}^{+\infty} dE\, G(E)\,(1 - f_1(E))\, f_2(E)$$

(e) $$I = \frac{1}{q}\int_{-\infty}^{+\infty} dE\, G(E)\, f_1(E)\, f_2(E)$$

1.3b. The reason we can write the current in an elastic resistor simply as a sum over independent energy channels is that

(a) no heat is generated inside the channel

(b) no heat is generated anywhere

(c) an electron does not change its energy inside the channel

(d) an electron does not change its energy from one terminal of the battery to the other

(e) none of the above