Thermoelectricity, Atoms to Systems
L1.1 Quiz
Answers

1.1a. 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) $$I = \frac{1}{q}\int_{-\infty}^{+\infty} dE\, G(E)\, f_1(E)\, f_2(E)$$

1.1b. The conductance of an ***elastic resistor*** can be written in terms of a conductance function G(E) and the equilibrium Fermi function f_0 as

(a) $$\int_{-\infty}^{+\infty} dE\, G(E)\frac{1 - f_0(E)}{kT}$$

(b) $$\int_{-\infty}^{+\infty} dE\, G(E)\frac{f_0(E)}{kT}$$

(c) $$\int_{-\infty}^{+\infty} dE\, G(E)\left(-\frac{\partial f_0(E)}{\partial E}\right)$$

(d) $$\int_{-\infty}^{+\infty} dE\, G(E)\frac{1 + f_0(E)}{kT}$$

(e) $$\int_{-\infty}^{+\infty} dE\, G(E)\frac{f_0(E)(1 + f_0(E))}{kT}$$