

Solutions to Selected Exercises

Chapter 2

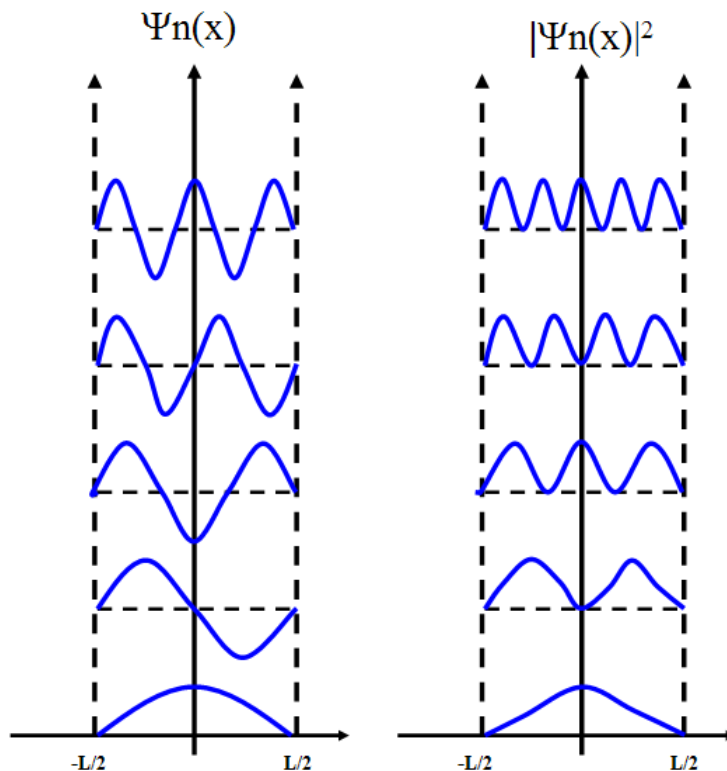
- 2.1) (i) 5040 ms^{-1} (use steel data in Table 2.1); (ii) 25 Hz; (iii) 2.5 Hz; (iv) 2.5, 5.0, 7.5 GHz.
- 2.2) (i) If you use Stoke's Law, you will get an unreasonably high answer ($\sim 10^5 \text{ ms}^{-1}$); (ii) $c = 0.23 \text{ kgm}^{-1}$, $mg - cv^2 = m \frac{d^2x}{dt^2}$; (iii) 0.12 ms^{-1} .
- 2.3) $\approx 340 \text{ nm}$.

Chapter 3

- 3.1) 4.8 nm.
- 3.2) $E = n^2 h^2 / (8mL^2)$.

$$\psi_1(x) = A \cos\left(\frac{\pi x}{L}\right), \psi_2(x) = B \sin\left(\frac{2\pi x}{L}\right), \psi_3(x) = C \cos\left(\frac{3\pi x}{L}\right),$$

$$\psi_4(x) = D \sin\left(\frac{4\pi x}{L}\right), \psi_5(x) = E \cos\left(\frac{5\pi x}{L}\right)$$



- 3.3) 0.5 nm.

3.4) 12.75 eV.

3.5) (iv).

3.6) 1.03×10^{-3} .

Chapter 4

4.1) Gds

4.2)

Chapter 5

5.1) Sfa

5.2) ljh

Chapter 6

6.1) (i) $3kT$; (ii) 4250K (above melting temp of Si).

6.2) $2.41 \times 10^5 \text{ eV}^{-1}$.

6.4) Equal contributions to the total resistance from the contacts and ballistic conductor (see equation 6.22).

6.5) $< 50 \text{ nm}$.

Chapter 7

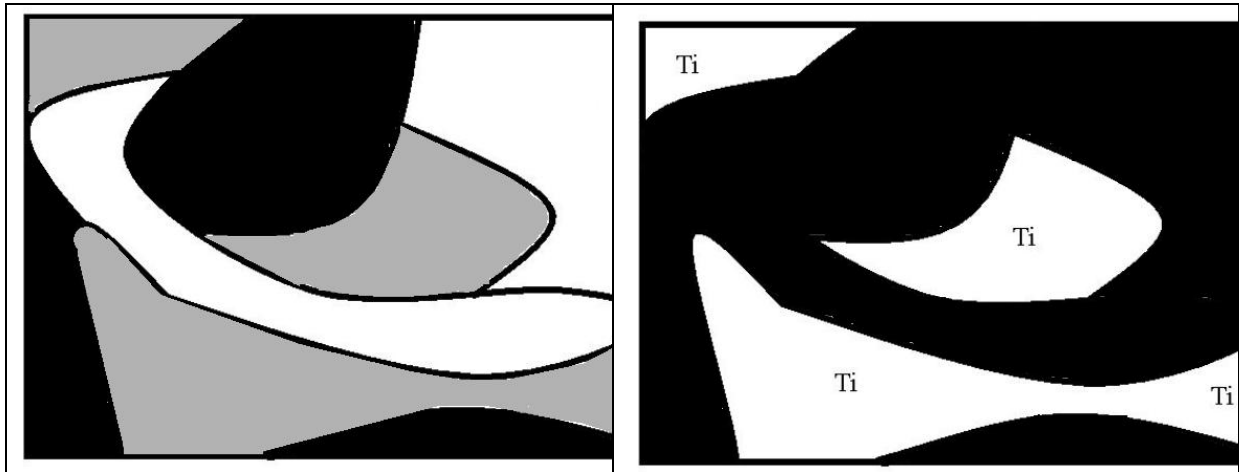
7.1)

Chapter 8

8.1) 0.85 micron.

8.2)

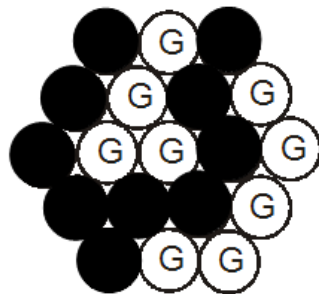
(a) Pb regions appear bright, Ti regions appear grey and B regions appear dark.	(b) 4.5 keV is Ti X-ray so only Ti regions appear bright, the rest dark.
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8.3) 0.0116.

8.4)

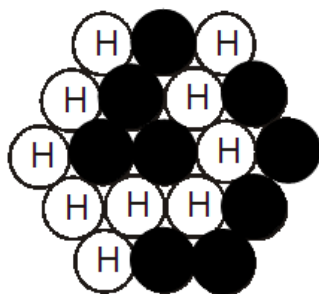
(a)



G atoms revealed

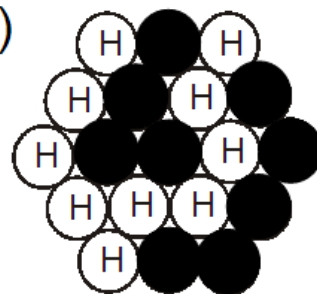
(b) No image

(c)



H atoms revealed

(d)



H atoms revealed

8.5) 0.5 μm .

8.6) (i) 3.54 pN , (ii) 706.3 $\mu\text{m/s}$.