7. (a) Eq. 42-5 gives

$$N(E) = \frac{8\sqrt{2}\pi m^{3/2}}{h^3} E^{1/2}$$

for the density of states associated with the conduction electrons of a metal. This can be written

$$n(E) = CE^{1/2}$$

where

$$C = \frac{8\sqrt{2}\pi m^{3/2}}{h^3} = \frac{8\sqrt{2}\pi(9.109 \times 10^{-31}\,\text{kg})^{3/2}}{(6.626 \times 10^{-34}\,\text{J}\cdot\text{s})^3} = 1.062 \times 10^{56}\,\text{kg}^{3/2}/\text{J}^3 \cdot \text{s}^3 \ .$$

Now, $1\,\text{J} = 1\,\text{kg}\cdot\text{m}^2/\text{s}^2$ (think of the equation for kinetic energy $K = \frac{1}{2}mv^2$), so $1\,\text{kg} = 1\,\text{J}\cdot\text{s}^2\cdot\text{m}^{-2}$. Thus, the units of C can be written $(\text{J}\cdot\text{s}^2)^{3/2}\cdot(\text{m}^{-2})^{3/2}\cdot\text{J}^{-3}\cdot\text{s}^{-3} = \text{J}^{-3/2}\cdot\text{m}^{-3}$. This means

$$C = (1.062 \times 10^{56}\,\text{J}^{-3/2}\cdot\text{m}^{-3})(1.602 \times 10^{-19}\,\text{J/eV})^{3/2} = 6.81 \times 10^{27}\,\text{m}^{-3}\cdot\text{eV}^{-3/2} \ .$$

(b) If $E = 5.00\,\text{eV}$, then

$$n(E) = (6.81 \times 10^{27}\,\text{m}^{-3}\cdot\text{eV}^{-3/2})(5.00\,\text{eV})^{1/2} = 1.52 \times 10^{28}\,\text{eV}^{-1}\cdot\text{m}^{-3} \ .$$