Here are my answers to Problem 27, Chapter 7.

Starting from

$$\psi(x,t) = \int_{-\infty}^{\infty} A(p) \exp[i(px - Et)/\hbar] dp$$

with

$$A(p) = \frac{a^{1/2}}{\hbar(2\pi)^{3/4}} \exp[-a^2(p-p_o)^2/4\hbar^2],$$

I find that

$$\psi(x,t) = \left(\frac{2}{\pi}\right)^{1/4} \frac{1}{\sqrt{a + i2\hbar t/ma}} \exp[\frac{ip_o}{\hbar}(x - \frac{p_o t}{2m})] \exp[-\frac{(x - p_o t/m)^2}{(a^2 + i2\hbar t/m)}]$$

and

$$|\psi(x,t)|^2 = \sqrt{\frac{2}{\pi}} \frac{1}{\sqrt{a^2 + 4\hbar^2 t^2/m^2 a^2}} \exp[-\frac{2(x - p_o t/m)^2}{(a^2 + 4\hbar^2 t^2/m^2 a^2)}].$$

Note that I have used a slightly different notation than the book. To convert between notations, use the following definitions

$$C = \frac{a^{1/2}}{\hbar(2\pi)^{3/4}}$$

and

$$\alpha = \frac{a^2}{4}.$$

To find $\psi(x,t)$, I followed a similar derivation used in the chapter for the case that $t = 0$. You are welcome to use the integrals given in Appendix B of the text, such as

$$\int_{-\infty}^{\infty} e^{-q^2} dq = \sqrt{\pi}.$$