Clearly state any assumptions you make while solving the problems. Good luck!

1. Multiple slit interference

Consider a setup consisting of two parallel screens, separated by distance d.
The first screen has very narrow slits on it, while the second screen is used for imaging. The separation between the slits (s) is much smaller than the distance between the screens (d).
Figures 1a and 1b show the first screen with 2 and 3 slits, respectively. A monochromatic light source is used to illuminate the first screen from the back, as shown in the figures.

a) How would the projected image (intensity distribution) on the second screen look for 2 slits on the first screen?

b) What about the intensity distribution on the second screen in case of 3 slits on the first screen? How is it different from the result in (a)?

c) How would the image on the second screen look for N slits on the first screen, where N is an arbitrary positive integer? (Same as in parts (a) and (b), assume that the separation between neighboring slits is s.)

d) Do you expect the central point (O) of the second screen to be bright or dark for an arbitrary N? Why?

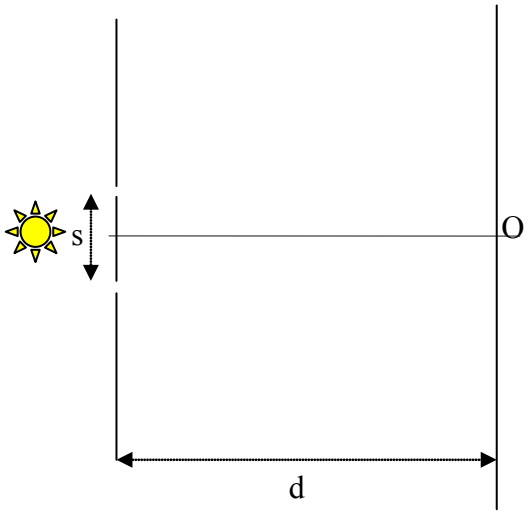

Figure 1a

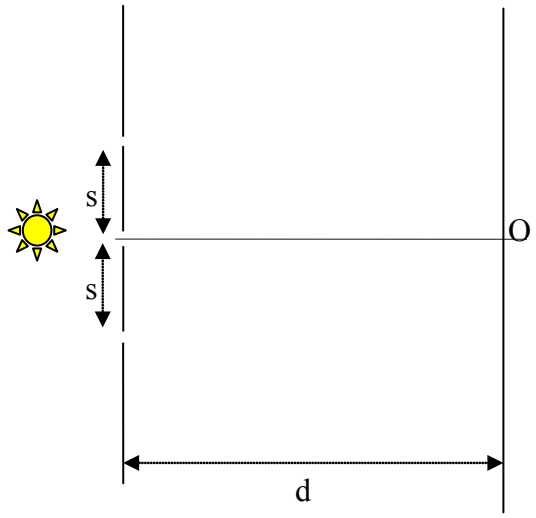

Figure 1b

2. Quantum box

Suppose there is a tiny, quantum box with dimension L, and a particle with mass m confined inside of it. What can you tell about the momentum of this particle?