

2.46

Eind með massa m á hring með geisla L .
 Lotubandið bylgjufall $\psi(x+L) = \psi(x)$

Notum ekki þekkinguokkar á jöfnu Schrödinger í
 2 ~~þ~~ 3 viddum

$$-\frac{\hbar^2}{2m} \frac{d^2}{dx^2} \psi = E\psi$$

Notum að $x = R\phi = \frac{L\phi}{2\pi}$, þar $L = 2\pi R$, $\phi \in [0, 2\pi]$

$$-\frac{\hbar^2}{2mR^2} d_\phi^2 \psi(\phi) = E\psi(\phi) \rightarrow d_\phi^2 \psi = -K^2 \psi$$

með

$$K = \frac{\sqrt{+2mR^2 E}}{\hbar}$$

(2)

Lösuir jäfnur em

$$\psi = A e^{\pm iM\phi}, \quad M = 0, \pm 1, \pm 2$$

og þess vegna $K^2 = M^2$ og orku gildin

$$M^2 = \frac{2mR^2 E}{\hbar^2} \rightarrow E_M = \frac{\hbar^2 M^2}{2mR^2} = \frac{\hbar^2 4\pi^2 M^2}{2mL^2}$$

Orku lögsta ástandið, grunnástandið með $M=0$, $E_0=0$
Einfalt, en öll hin eru tvöföld

Stöðnun

$$\int_0^L dx |\psi|^2 = \frac{L}{2\pi} \int_0^{2\pi} d\phi |\psi|^2 = \frac{L}{2\pi} \int_0^{2\pi} d\phi |A|^2 = |A|^2 \frac{L}{2\pi} = 1$$

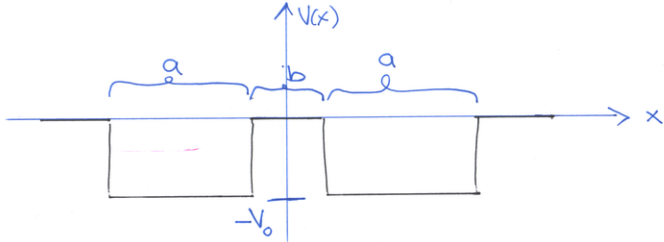
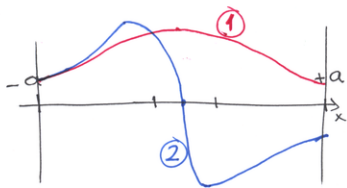
$$\rightarrow A = \sqrt{\frac{2\pi}{L}} \quad \left(= \sqrt{\frac{1}{R}} \right)$$

3

Lotubindingin kemur þrjú veg fyrir að bandna
ástandin verði öll að vera einföld

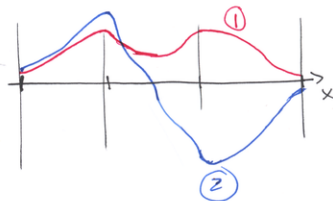
En grunnástandið $\psi_{M=0}$ er einfalt!

2.47

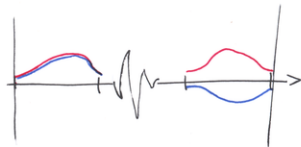
a) $b=0$ 

$$E_1 = \frac{\pi^2 \hbar^2}{2m(2a)^2}$$

$$E_2 = \frac{4\pi^2 \hbar^2}{2m(2a)^2}$$

 $b \approx a$ 

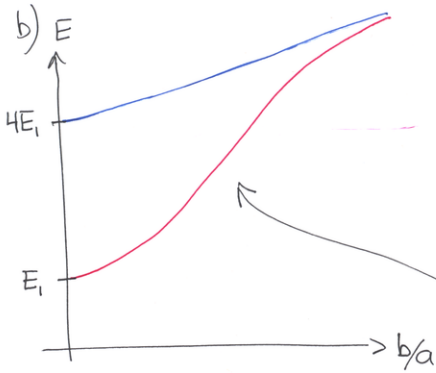
$$E_2 > E_1$$

 $b \gg a$ 

notum sama
orka fyrir

① og ②

$$E_1 \sim E_2$$



c) Rafindin lottar ota kerfissis með því orð
daga þrumana saman