

1. Give some experimental support of Einstein energy-mass relations.   
 10%

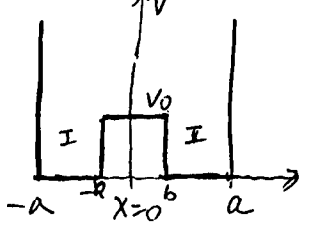
2. Give experimental prove that angular momentum is spatially quantized.   
 10%

3. Discuss the spin precession in a magnetic field.   
 10%

4. What would be the energy splittings of atomic levels (with  $S$  and  $L$ ) in a magnetic field  $B$ .   
 15%

5. In the process of  $\pi + d \rightarrow n + n$ .   
 20%   
 15%   
 The pion has spin 0,  $d$  has spin 1. the orbital angular momentum between  $\pi + d$  is zero. (a) What could be the orbital angular momentum between the two neutrons?   
 (b) If the parity of  $d$  is "+", parity of  $n$  is "+", what would be the parity of  $\pi$ ?   
 (use angular momentum conservation and parity conservation)

6. We have a potential shown in the figure.   
 15%



$$\begin{cases} V = V_0 & \text{for } |x| \leq b \\ V = 0 & \text{for } b \leq |x| \leq a \\ V = 0 & \text{for } |x| > a \end{cases}$$

a particle originally in I will be found in II in latter time and then in I. i.e. oscillates between these two regions.   
 Explain!

7. Discuss (a) ~~Meissner~~ Meissner effect. (b) ~~Schro~~ Synchrotron radiation.   
 10%

8. Discuss <sup>that</sup> the energy levels of the solid will ~~be~~ <sup>emerge into</sup> band structure.   
 (Qualitatively)   
 10%