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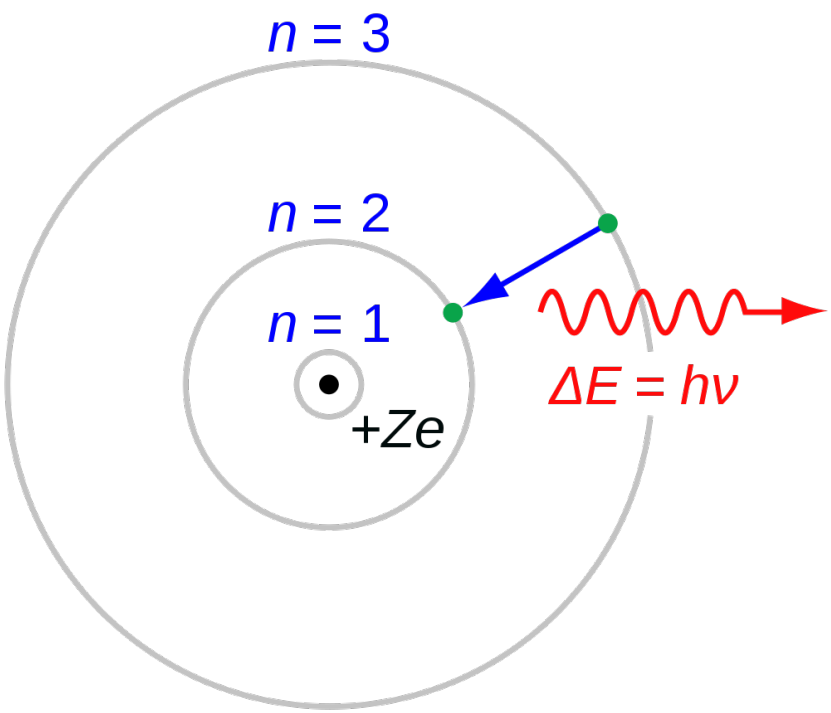
Quantum Mechanics

Summer School on Particle Physics

Exercise I
Balmer series spectral lines



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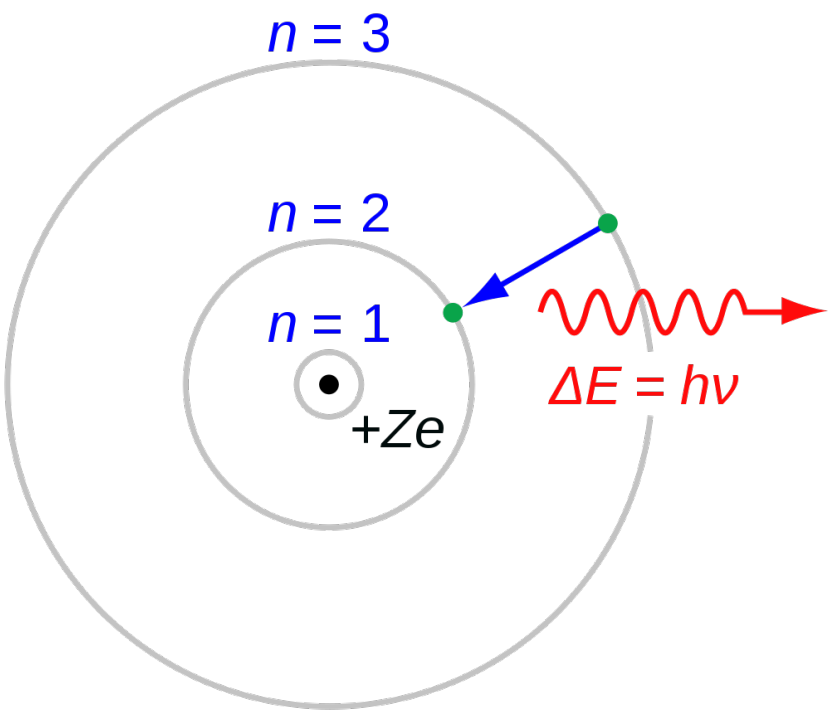


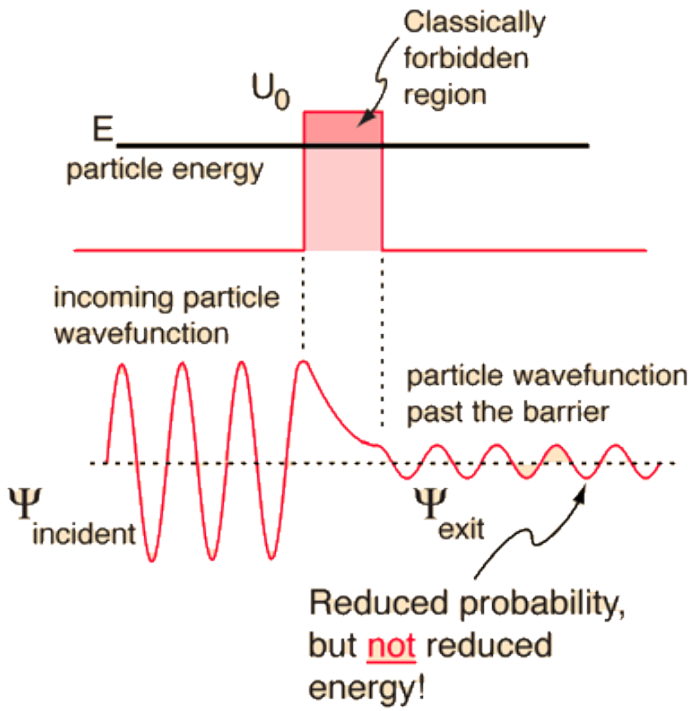
Remember that:

$$\lambda_{4\to 2} = 486.1 \text{ nm}$$
$$\lambda_{3\to 2} = 656.3 \text{ nm}$$

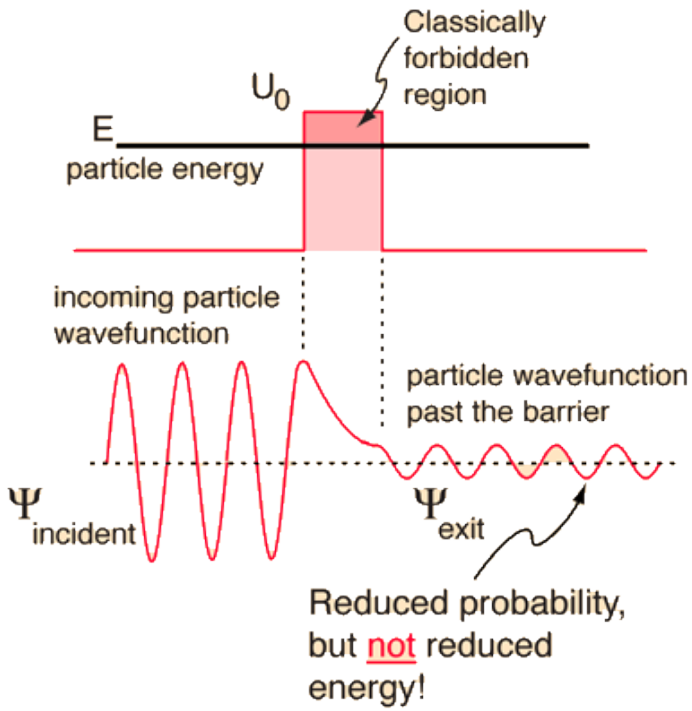
Useful formulae:

$$r_n \propto n^2 \quad U_{Coul} \propto -\frac{1}{r}$$
$$\Delta E_\gamma = h\nu \propto \frac{1}{\lambda}$$

Exercise II
Quantum tunneling



Exercise II
Quantum tunneling



Schroedinger + sanity:

$$\psi_{inc} = A\exp^{ik_1x} + B\exp^{-ik_1x}$$
$$\psi_{tun} = C\exp^{-k_2x}$$
$$\psi_{exit} = D\exp^{ik_1x}$$

Compute

- k_1, k_2 using the time independent Schroedinger equation
- A,B and D in terms of C,E,U_0 imposing continuity
- Check that there is a phase shift between ψ_{inc} and ψ_{exit}