Physics hour 12

1) Verschränkung

A) $|\phi\rangle = (|H\rangle + |V\rangle) \otimes (|\uparrow\rangle + |\downarrow\rangle)$ nicht verschränkt

B) $|\phi\rangle = |H\rangle \otimes |\uparrow\rangle + |V\rangle \otimes |\downarrow\rangle$ verschränkt

C) $|\phi\rangle = |H\rangle \otimes |\uparrow\rangle + |V\rangle \otimes |\uparrow\rangle$ nicht verschränkt

$= (|H\rangle + |V\rangle) \otimes |\uparrow\rangle$

D) $|\phi\rangle = |H\rangle \otimes (|\uparrow\rangle + |\downarrow\rangle)$ nicht verschränkt

E) $|\phi\rangle = |H\rangle \otimes |\downarrow\rangle - |V\rangle \otimes |\uparrow\rangle$ verschränkt

2) H-Atom I

$$\Delta E = E_{Ry} \cdot \underbrace{z^2}_{z=1} \cdot \left(\frac{1}{m^2} - \frac{1}{n^2}\right) = 13{,}6 \cdot 1{,}6 \cdot 10^{-19}\, C \cdot V \cdot \left(\frac{1}{4} - \frac{1}{16}\right)$$

$$= 4{,}1 \cdot 10^{-19}\, J$$

3) H-Atom II

$$h \cdot f = h \cdot \frac{c}{\lambda} = \Delta E$$

$$\rightarrow \lambda = \frac{h \cdot c}{\Delta E} = \frac{6{,}62 \cdot 10^{-34}\,\text{J}\cancel{\text{s}} \cdot 3 \cdot 10^{8}\,\text{m}/\cancel{\text{s}}}{4{,}1 \cdot 10^{-19}\,\text{J}} = 484\ \text{nm}$$

4) H-Atom III

$$r_n = a_B \cdot \frac{n^2}{Z} = 0{,}5 \cdot 10^{-10}\,\text{m} \cdot 50^2 = 125\ \text{nm}$$

$Z = 1$

5) Quantenzahlen im Schrödinger-Atom

A) $n = 100$; $\ell = 0$; $m = 0$; $m_s = -\frac{1}{2}$ ✓

B) $n = 3$; $\ell = 1$; $m = 2$; $m_s = -\frac{1}{2}$ ✗

C) $n = 2$; $\ell = 2$; $m = 0$; $m_s = \frac{1}{2}$ ✗

D) $n = 5$; $\ell = 4$; $m = -4$; $m_s = \frac{1}{2}$ ✓

E) $n = 5$; $\ell = 4$; $m = 3$; $m_s = 1$ ✗

6) Pauli-Prinzip I

5d-Orbital : $n = 5$; $\ell = 2$; $m = -2, -1, 0, 1, 2$: Anzahl = 5

Elektronen ↑↓ ; ↑↓, ↑↓, ↑↓, ↑↓ × 2

$10 e^-$

7) Pauli-Prinzip II

$n = 4$

		Anzahl	× 2 (↑↓)
• $\ell = 0$:	$m = 0$	1	2
• $\ell = 1$:	$m = -1, 0, 1$	3	6
• $\ell = 2$:	$m = -2, -1, 0, 1, 2$	5	10
• $\ell = 3$:	$m = -3, -2, -1, 0, 1, 2, 3$	7	14 +
			$32 e^-$

8) Elemente I

Kalium : 19 Protonen

9) Elemente II

$[Kr]\ 5s^2\ 4d^{10}\ 5p^6 \triangleq Xe$