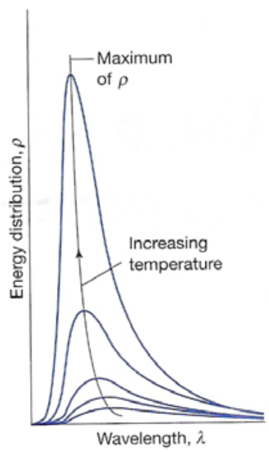
Minimum requirements for **underneath of your pillow**. However, **write your own summary**! You need to know the story behind the equations…
The summary is not necessarily directly related to your exams. I may ask you to explain concepts rather than memorizing equations. However, you have to know some of them.

Be aware of typos.

CLASSIC EXPERIMENTS

Blackbody radiation



$$E = nh\nu;\; n = 0,1,2,3,\ldots$$

Which led to:

$$R(\lambda) = \frac{2\pi hc}{\lambda^5}\,\frac{1}{e^{hc/\lambda kT} - 1}$$

$$T\lambda_{\max} = const$$ Wien's displacement law

$$E_{tot} = \int_0^\infty R(\lambda)d\lambda \approx T^4$$ Stefan-Boltzmann's law

Photoelectric effect

Experimental results:
threshold frequency n0
n0 depends on substance
light intensity ~ # of photoelectrons
Ekin independent of light intensity

Quantization of light

$$E_{photon} = h\nu$$

particle – wave duality

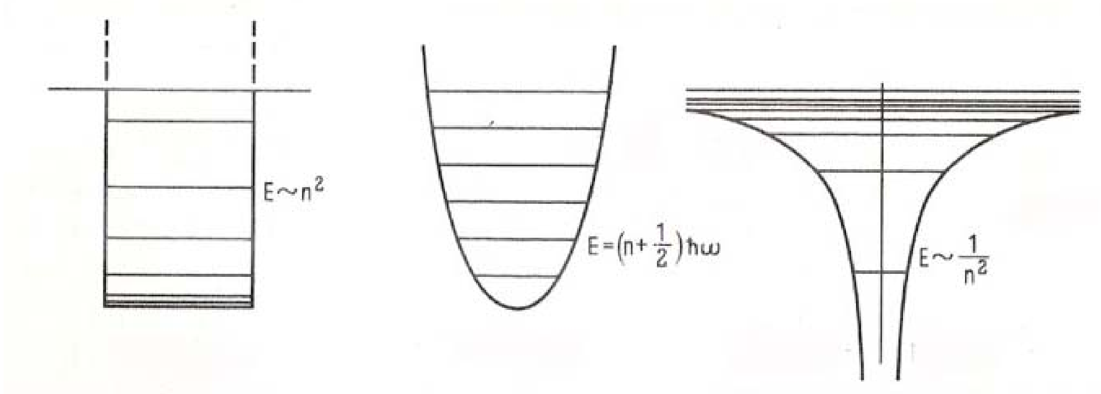
Photoelectric effect

$$E_{kin} = h\nu - \phi$$

Emission/absorption spectra & Bohr's model

$$\bar{\nu} = \frac{1}{\lambda} = R_\infty \left(\frac{1}{n'^2} - \frac{1}{n^2}\right)$$

"Simple potentials" and the corresponding eigenvalues



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Particle in a 1D box

$$|\psi|^2 = \tfrac{2}{a}\sin^2\left(\frac{n\pi x}{a}\right)$$

$$E = \frac{h^2}{8ma}n^2 \approx n^2$$

$$E_0 = E(n=1)$$

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Harmonic oscillator

Look it up & write your own summary

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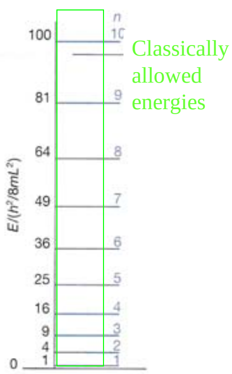

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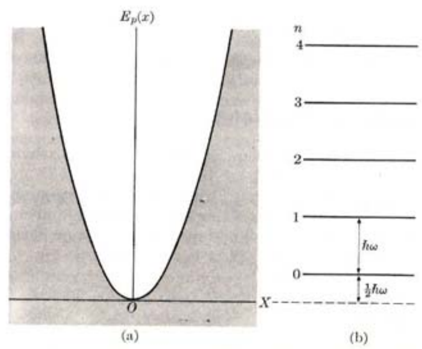

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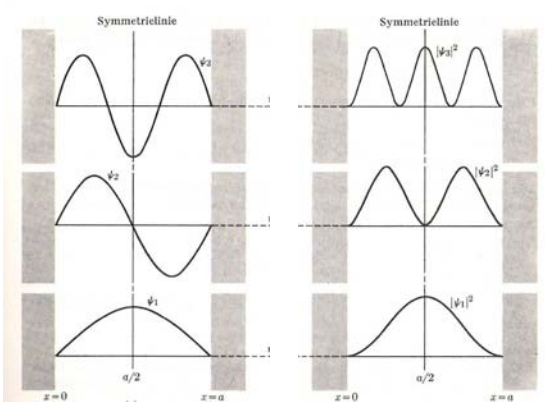

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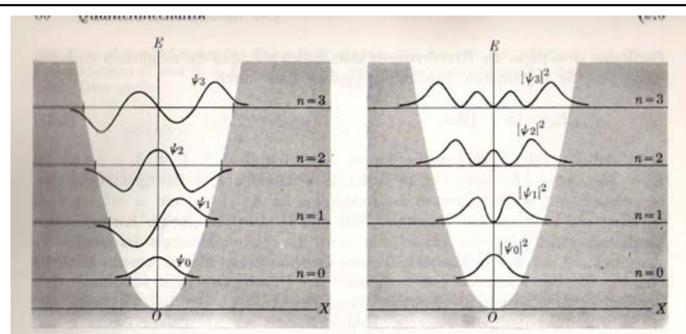

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wave functions	**probabilities**
$\Psi = \Psi(x_1, y_1, z_1, x_2, y_2, z_2, \ldots, t)$ $= \Psi(\vec{r}_i, t)$ $= e^{-iEt/\hbar}\psi(\vec{r})$ $\psi = \psi(x_1, y_1, z_1, x_2, y_2, z_2, \ldots) = \psi(\vec{r}_i)$	$P = \int \lvert\Psi^2\rvert d\tau$

SCHRÖDINGER EQUATION

$$-\frac{\hbar}{i}\frac{\partial\Psi}{\partial t} = -\frac{\hbar^2}{2m_i}\frac{\partial^2\Psi}{\partial x_i^2} + V\Psi$$ (time dependent)

$$-\frac{\hbar^2}{2m}\frac{\partial^2\psi(x)}{\partial x^2} + V(x)\psi(x) = V(x)\psi(x)$$ (time independent)

with operators

$$\hat{H} \equiv -\frac{\hbar^2}{2m}\nabla^2 + V$$ (Hamilton operator)

$$-\frac{\hbar}{i}\frac{\partial\Psi}{\partial t} = \hat{H}\Psi$$ (time dependent) $$\hat{H}\psi = E\psi$$ (time independent)

Eigenvalues	
The possible results in a measurement of a physical/chemical quantity are the Eigenvalues of the corresponding observable.	$\hat{M}\Psi = c\Psi;\ \Psi$is Eigenfunction of the operator $\hat{M}$ with Eigenvalue c.

Averaging
… what was this all about ?

OPERATORS

observable		operator	
name	symbol	symbol	operation
position	x	$\hat{X}$	multiply by x
momentum	p_x	$\hat{p}_x$	$-i\hbar \frac{\partial}{\partial x}$
kinetic energy	K_x	$\hat{K}_x$	$-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}$
potential energy	V(x)		
total energy	E		
angular momentum	$Lx=yp_z-zp_y$		

Approximation methods

Variation theorem

The true ground state energy, i.e., the eigenvalue of the time-independent Hamilton operator $\hat{H}$ of a quantum-mechanical system obeys

$$\frac{\int_\tau \phi^* \hat{H} \phi \, d\tau}{\int_\tau \phi^* \phi \, d\tau} \geq E_{gr,true}$$