

# Things to remember.

## Numerical data

- $M_p \approx M_n \approx 1 \text{ GeV}$ , but  $M_n > M_p$
- Approximate values of:  $m_e \approx 0.5 \text{ MeV}$ ,  $m_\mu \approx 100 \text{ MeV}$ ,  $m_\pi \approx 140 \text{ MeV}$ ,  $m_K \approx 500 \text{ MeV}$ ,  $M_W \approx 80 \text{ GeV}$ ,  $M_Z \approx 90 \text{ GeV}$
- Quark content of  $p, n, K, \pi$
- Quark charges, hierarchy of quark masses
- Nuclear levels up to 4 levels of the Shell Model ( $1s_{1/2} - 1d_{5/2}$ )

# Things to remember. Formulae

$$E^2 = p^2 + m^2, E = m\gamma, p = m\beta\gamma \dots$$

General form of Yukawa potential

Scattering amplitude 
$$f(\vec{q}) = \frac{-g^2 \hbar^2}{|\vec{q}|^2 + M_X^2 c^2}$$

Two definitions of luminosity:  $L = N n_b v_i$  and  $L = \frac{n N_1 N_2 f}{A}$

$$\Gamma = \frac{\hbar}{\tau} \quad R_{nucl} \approx 1.2 A^{1/3} \text{ fm}$$

Interaction, absorption or collision length 
$$l = \frac{1}{n\sigma}$$

Radiation length formula 
$$-\frac{dE}{dx} = \frac{E}{L_R} \Rightarrow E = E_0 \exp(-x/L_R)$$

Cerenkov condition and angle 
$$\beta > \frac{1}{n} \quad \cos\theta_C = \frac{1}{\beta n}$$