# **UBC Physics 102**

#### Lecture 3

**Rik Blok** 



## Outline

- ▷ Nuclear reactions
- ▷ Radiation damage
- Dosimetry
- $\triangleright$  End



Definition: nuclear reaction



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### Interactive Quiz: PRS 03a



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## **Nuclear reactions, contd**

#### **Definition:** *nuclear fission*

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#### **Definition:** *nuclear fusion*

The joining of several nuclei into a single, larger nucleus.



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- Ions in cells interfere with normal cell processes.
- Cell may cease to function or perform harmful function (eg. unregulated reproduction).



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### **Definition:** Curie, Ci

Unit of activity.

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#### Definition: Absorbed dose

 Radiation energy deposited, E, per unit mass of absorbing material, m.

$$dose_{abs} = \frac{E}{m}.$$





#### Discussion: Quality Factor, QF

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- (Quality factor (QF) will be provided on tests if needed.)







#### Definition: Effective dose

 Absorbed dose rescaled by QF to reflect biological damage.

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- **Definition:** rem and Sievert, Sv
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$$1 \text{ rem} = 1 \text{ rad} \times 1 \text{ QF}$$
  
 $1 \text{ Sv} = 100 \text{ rem.}$ 



#### **•** Example: Ch. 43 Pr. 42

- Fifty rads of α-particle radiation is equivalent to how many rads of X-rays in terms of biological damage?
- $QF(\alpha) = 20$ , QF(X-rays) = 1.



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 Now we want to find x, the absorbed (real) dose of X-rays that produces the same effective dosage,

$$x = \frac{\text{dose}_{\text{eff}}}{\text{QF}(X\text{-rays})} = \frac{1000 \text{ rem}}{1 \text{ QF}} = 1000 \text{ rad.} \quad \Box \qquad \_$$



#### Interactive Quiz: PRS 03b



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#### Interactive Quiz: Feedback

