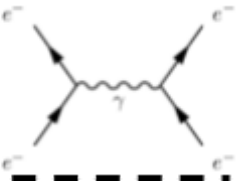
# Particles and Waves

## Nuclear Reactions



1) In the list of nuclear isotopes shown on the left write down:
   a) the number of protons
   b) the number of neutrons
   c) the number of nucleons

$^{7}_{3}\mathrm{Li}$ $^{131}_{54}\mathrm{Xe}$ $^{239}_{94}\mathrm{Po}$ $^{235}_{92}\mathrm{U}$

2) In the nuclear reactions shown below, name the particles x and y or z emitted at each stage.

a) $^{238}_{92}U \xrightarrow{x} {}^{234}_{90}Th \xrightarrow{y} {}^{234}_{91}Pa$

b) $^{218}_{84}Po \xrightarrow[x]{} {}^{214}_{82}Pb \xrightarrow[y]{} {}^{214}_{83}Bi \xrightarrow[z]{} {}^{214}_{84}Po$

c) $^{207}_{81}Ti \rightarrow {}^{207}_{82}Pb + {}^{a}_{b}X$

3) A nuclear physicist at CERN in Geneva has this nuclear reaction equation in her notebook:

$$^{210}_{84}Po \xrightarrow{\alpha} {}^{x}_{y}E$$

Determine the values of x and y. Use the values of x and y to identify element E.

4) In this nuclear decay chain find the values of x,y and z.

$$^{218}_{x}Rn \xrightarrow[\alpha]{} {}^{y}_{84}Po \xrightarrow[\beta]{} {}^{214}_{z}Pb \xrightarrow[\beta]{} {}^{214}_{86}Bi$$

5) An isotope emits an alpha particle as shown

$$^{241}_{95}Am \rightarrow {}^{p}_{r}Q + \alpha$$

a. Determine the values of p and r
b. Use the data book to determine the element Q

6) In the nuclear decay equation below determine the values of x, y and z

$$^{214}_{X}Pb \rightarrow {}^{y}_{83}Bi + {}^{0}_{z}e$$

7) In a nuclear decay reaction the nucleus Thorium 232 emits an alpha particle.

$$^{232}_{90}Th \longrightarrow {}^{Q}_{R}P + \alpha$$

Determine the values of Q and R. Determine the name of the element represented by the letter P.

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Answers.

1) | 3p, 4n and 7 nucleons | 54p, 77n and 131 nucleons | 94p, 145n and 239 nucleons | 92p, 143n and 235 nucleons.

2) (a) x = alpha, y = beta, (b) x = alpha, y = beta and z = beta, (c) beta particle.

3) Mass number = 206, atomic number = 82, nucleus is lead Pb

4) X = 86, y = 214 and z = 85

5) P = 237, r = 93 and nucleus is neptunium Np~

6) Z = -1, y =214 and x = 82

7) Q = 228, R = 88 and P = Radium Ra

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