5.1(c) Nuclear reactions

MCQs

1. D $^{230}_{92}Y$

$^{234}_{92}X \rightarrow {}^{4}_{2}\alpha + 2\,{}^{0}_{-1}\beta + {}^{230}_{92}Y$ + energy (ans)

2. C 91

$^{238}_{92}U \rightarrow {}^{4}_{2}\alpha + {}^{234}_{90}Th$ + energy

$^{234}_{90}Th \rightarrow {}^{0}_{-1}\beta + {}^{234}_{91}Pa$ + energy

∴ proton number of protactinium = 91 (ans)

3. C $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + {}^{4}_{2}He$

4. D X – 2 Y – 6

Let the unstable nucleus by A.

During β decay when a beta particle is formed, a neutron changes into a proton and a high-energy electron.

$^{X+Y}_{X}A \rightarrow {}^{(X+2)+(Y-2)}_{X}A + 2\,{}_{-1}\beta$

During α decay, an α particle with 2 neutrons and 2 protons is formed.

$^{(X+2)+(Y-2)}_{X}A \rightarrow {}^{(X+2-4)+(Y-2-4)}_{X}A + 2\,{}^{(2+2)}_{0}\alpha$

Hence the number of protons is X – 2
and the number of neutrons is Y – 6 (ans)

Questions – 5.1(c)

1. (a)

β-particles are deflected to the positive plate, hence charges flow. (ans)

(b)

Change in nucleon number = 218 – 210 = 8

Assume that $^{218}_{84}Po$ emits 2 α-particles:

$^{218}_{84}Po \rightarrow 2\left({}^{4}_{2}He\right) + n\left({}^{0}_{-1}e\right) + {}^{210}_{82}Pb$

84 = 4 + (- n) + 82

n = 2

∴ 2 α-particles and 2 β-particles have been emitted. (ans)

2. (a)

Mass number = 43

Proton number = 21 (ans)

(b)

$^{43}_{21}Z \rightarrow {}^{39}_{19}X + {}^{4}_{2}\alpha$ (ans)

3. Summarizing the information on the decays of the isotopes,

$^{228}_{88}Ra \rightarrow {}^{4}_{2}\alpha + {}^{224}_{86}Rn$

$^{224}_{86}Rn \rightarrow {}^{4}_{2}\alpha + {}^{220}_{84}Po$

$^{224}_{86}Rn \rightarrow 2\,{}^{4}_{2}\alpha + {}^{216}_{82}Pb$

$^{216}_{82}Pb \rightarrow {}^{0}_{-1}\beta + {}^{216}_{83}Bi$

Isotope	Nucleon number	Proton number	Neutron number
Radium	228	88	140
Radon	224	86	138
Polonium	220	84	136
Lead	216	82	134
Bismuth	216	83	133

(ans)