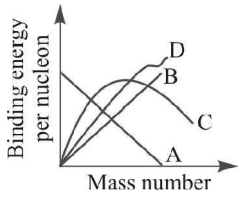
27

Nuclei

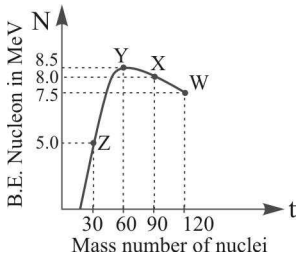
Diagram Based Questions :

1. Binding energy per nucleon plot against the mass number for stable nuclei is shown in the figure. Which curve is correct?



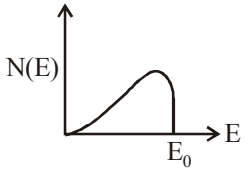
(a) A (b) B
(c) C (d) D

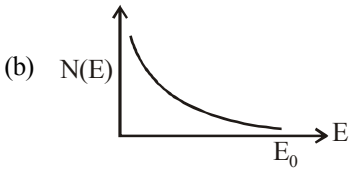
2. Binding energy per nucleon versus mass number curve for nuclei is shown in the figure. W, X, Y and Z are four nuclei indicated on the curve. The process that would release energy is

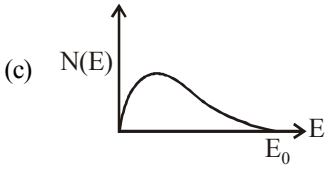


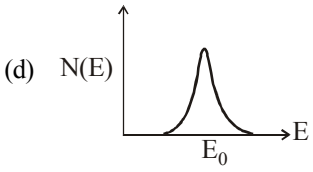
(a) $Y \rightarrow 2Z$ (b) $W \rightarrow X + Z$
(c) $W \rightarrow 2Y$ (d) $X \rightarrow Y + Z$

3. The energy spectrum of β-particles [number N(E) as a function of β-energy E] emitted from a radioactive source is

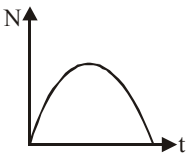
(a) 

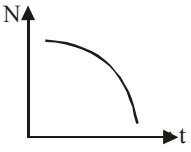
(b) 

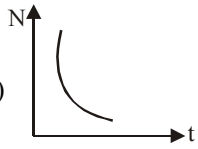
(c) 

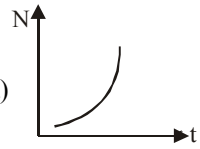
(d) 

4. Radioactive element decays to form a stable nuclide, then the rate of decay of reactant is

(a) 

(b) 

(c) 

(d) 

Solution

1. **(c)**

2. **(c)** Energy is released in a process when total binding energy (BE) of products is more than the reactants. By calculations we can see that this happens in option **(c)**.
Given $W = 2Y$
BE of reactants = 120 × 7.5 = 900 MeV
BE of products = 2 × (60 × 8.5) = 1020 MeV.

3. **(c)** The range of energy of β-particles is from zero to some maximum value.

4. **(c)** No. of nuclide at time t is given by

$$N = N_o e^{-\lambda t}$$

Where N_o = initial nuclide

thus this equation is equivalent to $y = ae^{-kx}$

thus correct graph is