CH # 19 NUCLEAR PHYSICS

Some important Formulae:
i) $A = Z + N$ i) $E = mc^2$

19.1: The nucleus of nitrogen contains 9 neutrons. Find the charge number if its mass number is 16.

GIVEN:
Number of neutron = N = 9
Mass number = A = 16

REQUIRED:
Charge number = Z = ?

SOLUTION:
$A = Z + N$
$Z = A - N$
$Z = 16 - 9$
$Z = 7$

19.2: The mass of $_6C^{12}$ nucleus is found to be 0.164 x 10^{-27}Kg less than its constituents. Calculate the energy released.

GIVEN:
Mass = m = 0.164 x 10^{-27}Kg

REQUIRED:
Energy released = ?

SOLUTION:
$E = mc^2$
$E = (0.164 \times 10^{-27})(3 \times 10^8)^2$
$E = 0.164 \times 10^{-27} \times 9 \times 10^{16}$
$E = 1.147 \times 10^{-11}$J

19.3: How much energy will be released when 15gm of mass is completely transformed into energy.

GIVEN:
Mass = m = 15gm = 15 x 10^{-3}Kg

REQUIRED:
Energy released = ?

SOLUTION:
$E = mc^2$
$E = (15 \times 10^{-3})(3 \times 10^8)^2$
$E = 15 \times 10^{-3} \times 9 \times 10^{16}$
$E = 1.35 \times 10^{-15}$J

19.4: Radium has half-life of 1600 years. How much of 60gm radium would be left after 4800years.

GIVEN:
Half-life of radium = 1600 years
Mass of radium = m = 60gm

REQUIRED:
Radium left after 4800 years = ?

SOLUTION:
$$\text{Number of half} - \text{lives} = \frac{4800}{1600}$$
Number of half-lives = 3
First half life = ½ x 60 = 30gm
Second half-life = ½ x 30 = 15gm
Third half-life = ½ x 15 = 7.5gm
7.5gm radium will be left after 4800 years.

19.5: Half-life of radon is 3.82 days. How much of a 100gm sample of radon would be left after 7.64 days.

GIVEN:
Half-life of radon = 3.82days
Mass of radon = m = 100gm

REQUIRED:
Radon left after 7.64 days = ?

SOLUTION:
$$\text{Number of half} - \text{lives} = \frac{7.64}{3.82}$$
Number of half-lives = 2
First half life = ½ x 100 = 50gm
Second half-life = ½ x 50 = 25gm
25gm radon will be left after 7.64 days.