PHYSICS

BOOKS - R G PUBLICATION

NUCLEI

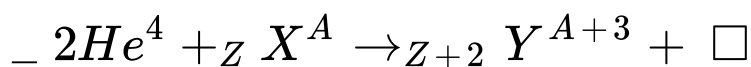## Exercise

1. What is the change of atomic number Z of a nucleus when it emits a β particle?

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2. Complete the nuclear reaction -

$$_{-}2He^4 +_Z X^A \rightarrow_{Z+2} Y^{A+3} + \square$$

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3. What is an α-particle?

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4. If you free a neutron from a nucleus, it will decay into three particles. Two of them are proton and electron. What is the third particle?

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5. What is impact parameter?

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6. In a certain star, three alpha particles undergo fusion in a single reaction to form $_6^{12}C$ nucleus. Calculate the energy released in this reaction in MeV. Given: m($_2^4$He)=4.002604 u and m($_6^{12}C$)=12.000000 u.

7. What is nuclear fission and nuclear fusion?

8. Define 1 curie unit of radio-activity. What do you mean by 'half life'?

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9. Explain mass defect and binding energy.

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10. If m $\left(^{14}_{7}N\right)$=14.00307u, calculate the binding energy of the nitrogen nucleus in

MeV. mH=1.00783 a.m.u., m n=1.0087 a.m.u.; m

N=14.00307 a.m.u.

11. How is energy produced inside the Sun?

12. How much energy should be given to uranium to eject one proton from its nucleus?

Given $_{-}92^{238}U = 238.05079a\mu$

$- \ 91^{237}Pa = 237.0512a\mu$

$- \ 1^{1}H = 1.00783$amu,1mu=931.5MeV

13. Mention the relative positions of X-Rays and γ-Rays in the EM wave spectrum and give examples of their usage.

14. How was the neutron discovered by James Chadwick?

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15. By which process does a Cobalt nucleus change into a Nickel nucleus?

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16. Some scientists have predicted that glob al nuclear war on the earth would be followed a severe "Nuclear Winter". What might be the basis of this prediction?

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17. Derive an expression for the mean life of radioactive substance.

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18. Write down different sets of reaction of proton -proton cycle of fusion reaction in the sun.

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19. Briefly describe the working of a nuclear reactor.

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20. Give one example each of Alpha, Beta and Gamma decay.

21. Fill in the blanks

The radius of nucleus is smaller than the radius of an atom by a ____

22. Fill in the blanks

Almost the entire mass of an atom is concentrated in_____.

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23. What is the mass of one atom of C–12 in grams?

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24. Fill in blanks

An atom is almost _____

25. Fill in the blanks

The density of nuclear matter is___.

26. Write a short note on discovery of neutons.

27. Write the mass of a neutron.

28. What is mass number? Give examples.

29. What is nuclear reaction? Define.

30. How many coulomb charge is carried by 1kg of electron?

31. what is nuclear force ?

32. What is the difference between Helium atom and α particle?

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33. What is the order of nuclear density?

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34. Explain mass defect and binding energy.

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35. How binding energy related with mass defect?

36. What is the ratio of volume of atom and volume of nucleus?

37. Which one of $3X^7$ and $3Y^4$ likely to be more stable?

38. What is atomic number and mass number?

39. What do you mean by Q value of a nuclear reaction?

40. What do you mean by critical size?

41. How is the half life of a radioactive substance related to its average life?

42. State radioactive decay law.

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43. What are the unit of radioactive elements.

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44. What is the S.I. unit of radioactivity ?

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45. What is atomic mass unit ? Describe.

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46. What is isotopes? Give examples.

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47. Write the names of isotopes of hydrogen. What is the mass ratio of these isotopes?

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48. What is a proton? Write the mass of a proton.

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49. "Einstein gave the famous mass energy equivalence relation $E = mc^2$."Describe.

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50. Calculate the energy equivalent of 10g of substance.

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51. Write a short note on nuclear binding energy.

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52. Find out the mass of $_8^{16}O$ and compare the result with the mass found from mass spectroscopy experiments.

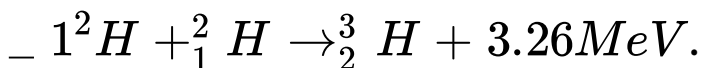**53.** Write the nuclear reaction equations for α decay of $_{88}^{226}Ra$ and β^+ decay of $_6^{11}C$.

54. The half life of $38^{90}Sr$ is 29 years. What is the disintegration rate of 25 mg of this isotope?

55. How long can an electric lamp of 60w be kept glowing by fusion of 1.0kg of deutenium? Taking the fusion reaction as

$$- 1^2H +_1^2 H \rightarrow_2^3 H + 3.26MeV.$$

56. Obtain the binding energy (in MeV) of a nitrogen nucleus $\left(^{14}_{7}N\right)$ given $m\left(^{14}_{7}N\right)$ =14.00307

57. What is nuclear fission and nuclear fusion?

58. What is red giant?

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59. What is Alpha decay, Beta decay and gamma decay? Write with examples.

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60. Deduce the equation $R = R_0 e^{-\lambda t}$

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61. Define half life of a radioactive substance.

Deduce an expression for it.

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62. Define nuclear chain reaction. Explain.

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63. What is nuclear fission and nuclear fusion?

64. What is packing fraction and explain ?

65. What is meant by artificial radioactivity? Give some example?

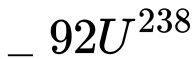**66.** State and explain the laws of radioactivity?

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67. The half life of radioactive radon is 3.8 days.

What is the time at the end of which 1/20th of

the Radon sample will remain undecayed.

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68. Calculate the nuclear mass density in $_{92}U^{238}$ Take $R_0 = 1.5 fermi$ and $mass of each \nu celar = $ 1.6xx10^(-27)`kg.

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69. Express 16 mg mass into equivalent energy in electron volt.

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70. Plot the binding energy per nucleon E_{bn} versus the mass number A for a large number of nuclei. What are the main features noticed from the plot.

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71. What is a nuclear reactor. Describe its working with a schematic diagram.

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72. What is fission? Give an example.

73. Deduce the equation $R = R_0 e^{-\lambda t}$

74. Draw a graph of exponential decay of a radio active species.

75. What is half life? Deduce its relation with λ.

76. Find the energy Q released in this reaction.

$$1H^2 + 1H^2 \rightarrow Q +_2 He^4$$
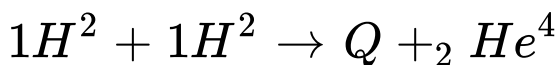
77. What is the role of moderator in nculelar reactor?

78. Calculate the number of protons and neutrons in $92U^{235}$

79. Describe the properties of nuclear force.

80. Why is the density of nucleus more than that of the atom?
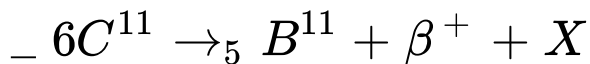
81. A radioactive substance decays to 1/16 th of its initial mass in 40 days. The half life of the substance, in days, is?

82. From the following nuclear rection find the value of X.

$$_- 6C^{11} \rightarrow_5 B^{11} + \beta^+ + X$$

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83. What is the angular momontum of electron in n^{th} orbit?

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