

Section A

- Write the answer of the following questions. [Each carries 1 Mark] [10]
- How long can an electric lamp of 100 W be kept glowing by fusion of 2 kg of deuterium ? Take the fusion reaction as ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_2\text{He} + n + 3.27 \text{ MeV}$
 - Suppose, we think of fission of a ${}^{56}_{26}\text{Fe}$ nucleus into two equal fragments, ${}^{28}_{13}\text{Al}$. Is the fission energetically possible? Argue by working out Q of the process. Given $m({}^{56}_{26}\text{Fe}) = 55.93494 u$ and $m({}^{28}_{13}\text{Al}) = 27.98191 u$
 - The fission properties of ${}^{239}_{94}\text{Pu}$ are very similar to those of ${}^{235}_{92}\text{U}$. The average energy released per fission is 180 MeV. How much energy, in MeV, is released if all the atoms in 1 kg of pure ${}^{239}_{94}\text{Pu}$ undergo fission ?
 - How long can an electric lamp of 100 W be kept glowing by fusion of 2.0 kg of deuterium ? Take the fusion reaction as ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_2\text{He} + n + 3.27 \text{ MeV}$
 - Given the mass of iron nucleus as 55.85 u and A = 56, find the nuclear density.
 - Obtain approximately the ratio of the nuclear radii of the gold isotope ${}^{197}_{79}\text{Au}$ and the silver isotope ${}^{107}_{47}\text{Ag}$.
 - Describe the nuclear force and its characteristics.
 - Explain the process of thermonuclear fusion as a source of energy in the Sun and stars.
 - The Q value of a nuclear reaction $A + b \rightarrow C + d$ is defined by $Q = [m_A + m_b - m_C - m_d]c^2$ where the masses refer to the respective nuclei. Determine from the given data the Q-value of the following reactions and state whether the reactions are exothermic or endothermic.
 - ${}^1_1\text{H} + {}^3_1\text{H} \rightarrow {}^2_1\text{H} + {}^2_1\text{H}$
 - ${}^{12}_6\text{C} + {}^{12}_6\text{C} \rightarrow {}^{20}_{10}\text{Ne} + {}^4_2\text{He}$
 Atomic masses are given to be :

 $m({}^2_1\text{H}) = 2.014102 u$

 $m({}^3_1\text{H}) = 3.016049 u$

 $m({}^{12}_6\text{C}) = 12.000000 u$

 $m({}^{20}_{10}\text{Ne}) = 19.992439 u$
 - From the relation $R = R_0 A^{1/3}$, where R_0 is a constant and A is the mass number of a nucleus, show that the nuclear matter density is nearly constant (i.e. independent of A).
 - Write and explain the Einstein theory of special relativity.

OPEN STUDENT FOUNDATION**CHAPTER 13****Physics (Class 12)
PRACTICE SHEET DAY 13****Date : 27/02/24**

Section [A] : 1 Marks Questions

No	Ans	Chap	Sec	Que	Universal_Queld
1.	-	Chap 13	S8	5	QP23P11B1211_P2C13S8Q5
2.	-	Chap 13	S9	21	QP23P11B1211_P2C13S9Q21
3.	-	Chap 13	S9	18	QP23P11B1211_P2C13S9Q18
4.	-	Chap 13	S9	17	QP23P11B1211_P2C13S9Q17
5.	-	Chap 13	S9	11	QP23P11B1211_P2C13S9Q11
6.	-	Chap 13	S10	20	QP23P11B1211_P2C13S10Q20
7.	-	Chap 13	S10	19	QP23P11B1211_P2C13S10Q19
8.	-	Chap 13	S10	18	QP23P11B1211_P2C13S10Q18
9.	-	Chap 13	S10	11	QP23P11B1211_P2C13S10Q11
10.	-	Chap 13	S10	13	QP23P11B1211_P2C13S10Q13

OPEN STUDENT FOUNDATION

CHAPTER 13

Physics (Class 12) PRACTICE SHEET DAY 13

Date : 27/02/24

Section A

- Write the answer of the following questions. [Each carries 1 Mark] [10]

1. How long can an electric lamp of 100 W be kept glowing by fusion of 2 kg of deuterium ? Take the fusion reaction as ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_2\text{He} + n + 3.27 \text{ MeV}$

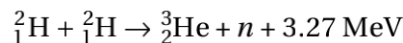
⇒ $t = 4.99 \times 10^4 \text{ year}$

2. (a) Suppose, we think of fission of a ${}^{56}_{26}\text{Fe}$ nucleus into two equal fragments, ${}^{28}_{13}\text{Al}$. Is the fission energetically possible? Argue by working out Q of the process. Given $m({}^{56}_{26}\text{Fe}) = 55.93494 u$ and $m({}^{28}_{13}\text{Al}) = 27.98191 u$

(b) The fission properties of ${}^{239}_{94}\text{Pu}$ are very similar to those of ${}^{235}_{92}\text{U}$. The average energy released per fission is 180 MeV. How much energy, in MeV, is released if all the atoms in 1 kg of pure ${}^{239}_{94}\text{Pu}$ undergo fission ?

⇒ Try Yourself

3. How long can an electric lamp of 100 W be kept glowing by fusion of 2.0 kg of deuterium ? Take the fusion reaction as



⇒ Try Yourself

4. Given the mass of iron nucleus as 55.85 u and A = 56, find the nuclear density.

⇒ Try Yourself

5. Obtain approximately the ratio of the nuclear radii of the gold isotope ${}^{197}_{79}\text{Au}$ and the silver isotope ${}^{107}_{47}\text{Ag}$.

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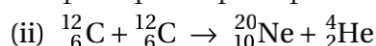
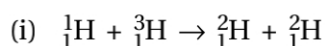
6. Describe the nuclear force and its characteristics.

⇒ Try Yourself

7. Explain the process of thermonuclear fusion as a source of energy in the Sun and stars.

⇒ Try Yourself

8. The Q value of a nuclear reaction $A + b \rightarrow C + d$ is defined by $Q = [m_A + m_b - m_C - m_d]c^2$ where the masses refer to the respective nuclei. Determine from the given data the Q-value of the following reactions and state whether the reactions are exothermic or endothermic.



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►► Try Yourself

9. From the relation $R = R_0 A^{1/3}$, where R_0 is a constant and A is the mass number of a nucleus, show that the nuclear matter density is nearly constant (i.e. independent of A).

►► Try Yourself

10. Write and explain the Einstein theory of special relativity.

►► Try Yourself