CHEMISTRY

NCERT - FULL MARKS CHEMISTRY(TAMIL)

NUCLEAR CHEMISTRY

Solved Problems

1. After 24 hours, only 0.125 g out of the initial quantity of 1g of a radioisotope remains

behind. what is half-life period?

2. Half-life period of a radioactive element is 100 seconds. Calculate the disintegration constant and average life period. How much time will it take for 90% decay?

3. The half-life of cobalt - 60 is 5.26 years. Calculate the % activity remaining after 4 years.

4. Wooden artifact and freshly cut tree are having 7.6 and 15.2 counts $\min^{-1} g^{-1}$ of carbon $\left(t^{1/2} = 5700 \text{years}\right)$ respectively. Calculate the age of the artifact.

5. Half life period of a radio active element is 1500 years. Find the value of disintegration constant interms of second.

6. Calculate the number of α and β particles emitted in the conversion of $90^{Th^{232}}$ to $82^{pb^{208}}$.

7. The atomic masses of Li, He and proton are 7.01823 amu, 4.00387 amu and 1.00715 amu respectively. Calculate the energy evolved in the reaction, $3^{Li^7} + 1^{HA^1} \rightarrow 22^{He^4} + \triangle$ E

Given 1 amu = 931 MeV.

8. Calculate the number of neutrons in the remaining atom after emission of an α particle from $92^{X^{238}}$ 、 atom. also report the mass

number and atomic number of the product atom.

9. Determine the average life of U^{238} having $t^{1/2}$ = 140 days.

10. The activity of a radioactive isotope falls to 12.5% in 90 days. Calculate the half life and
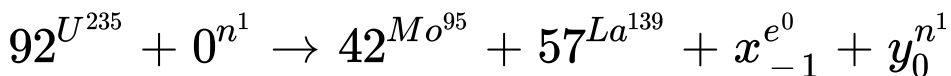
decay constant.

11. Calculate Q value of the following nuclear reaction $13^{Al^{27}} + 2^{He^4} \rightarrow 14^{Si^{30}} + 1^{H^1}$ + Q. The exact mass of $13^{Al^{27}}$ is 26.9815 amu, $14A^{Si^{30}}$ is 29.9738, 2^{He^4} is 4.0026 amu and 1^{H^1} is 1.0078 amu.

1. On neutron bombardment fragmentation of U-235 occurs according to the equation

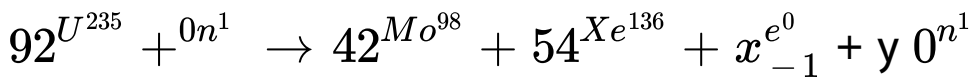$$92^{U^{235}} + 0^{n^1} \rightarrow 42^{Mo^{95}} + 57^{La^{139}} + x^{e^0}_{-1} + y^{n^1}_0$$

Calculate the values of x and y.

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2. On neutron bombardment fragmentation of U-235 occurs according to the equation.

$$92^{U^{235}} + {}^{0}n^{1} \rightarrow 42^{Mo^{98}} + 54^{Xe^{136}} + x^{e^{0}}_{-1} + y\,0^{n^{1}}$$

Calculate the values of x and y.

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Self Evaluation

1. The phenomenon of radioactivity was discovered by

A. Madam curie

B. Pierre curie

C. Henry Becquerel

D. Rutherford

Answer:

2. The most penetrating radiations are

A. α rays

B. β rays

C. γ rays

D. all are equally penetrating

Answer:

3. In the nuclear reaction, $92X^{232} \rightarrow 89Y^{220}$, the

number of α and β particles emitted are

A. $7\alpha, 5\beta$

B. $6\alpha, 4\beta$

C. $3\alpha, 3\beta$

D. 8α, 6β

Answer:

4. Which one of the following particles is used to bombard $13^{Al^{27}}$ to give $15^{p^{30}}$ and a neutron

A. α particle

B. deuteron

C. proton

D. neutron

Answer:

5. Radioactivity is due to

    A. Stable electronic configuration

    B. Stable nucleus

    C. Unstable nucleus

    D. Unstable electronic configuration

Answer:

6. In the nuclear reaction, $92X^{232} \rightarrow 89Y^{220}$, the number of α and β particles emitted are

A. 3α and 3β

B. 5α and 3β

C. 3α and 5β

D. 5α and 5β

Answer:

7. $92^{U^{235}}$ nucleus absorbs a neutron and disintegrates into $54^{Xe^{139}}$, $38^{Sr^{94}}$ and x. What will be the product x?

A. 3 neutrons

B. 2 neutrons

C. α particle

D. β particle

Answer:

8. Assertion: The ionision power of β-particle is less compared to α-particle but their penetrating power is more.

Reason: The mass of β-particle is less than the mass of α-particle.

    A. Increase of one proton only

    B. Decrease of one neutron only

C. Both (a) and (b)

D. None of these

Answer:

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9. Which of the following is used as a moderator and coolant in nuclear reaction?

A. Water

B. Deuterium

C. Some compound of uranium

D. Cadmium

Answer:

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10. What is half life period.

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11. Write two difference between chemical reaction and nuclear reaction.

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12. Why do you mean be Q value of nuclear reaction ?

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13. What are the types of nuclear reaction. Give example for each type.

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14. What is Radio carbon dating?

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15. What is binding energy of a nucleus? Give its expression.

16. What is nuclear fusion? How do nuclear fusion reactions differ from fission reactions?

17. What is thermo chemical reactions?

18. Explain the uses of radio isotopes in medicine field.

19. How many α and β particles will be emitted by an element $84^{A^{218}}$ is changing to a stable isotope of $82^{B^{206}}$
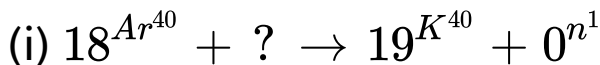
20. Calculate the decay constant for Ag^{108} if its half life is 2.31 minutes.

21. Complete the following nuclear reactions

(i) $18^{Ar^{40}} + ? \rightarrow 19^{K^{40}} + 0^{n^1}$

(ii) _____ $+ 1^{H^1} \rightarrow 2^{He^4} + 2^{He^4}$

(iii) $88^{Ra^{236}} \rightarrow ? + 2^{He^4}$

(iv) $92^{U^{238}} \rightarrow 56^{Ba^{143}} + $ _____ $+ 0^{n^1}$
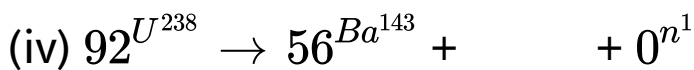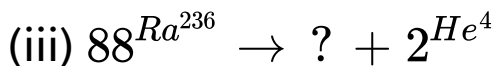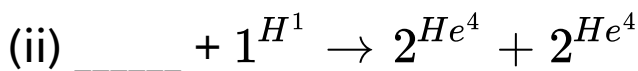
22. $92^{U^{238}}$ undergoes a series of changes by emitting α and β particles and finally $82^{pb^{206}}$ is formed. Calculate the number of and particles emitted during the change.

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23. The atomic mass of Th is 232 and its atomic number is 90. In terms of its radioactivity six α and four β particles are emitted. What is the
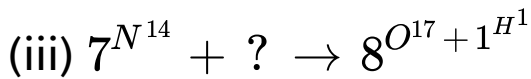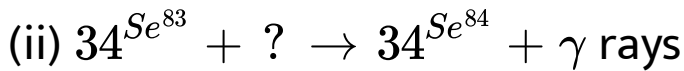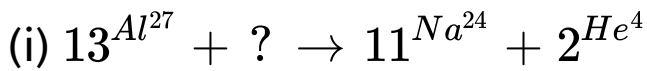
mass number and atomic number of the product.

24. Calculate the average life of $79^{Au^{198}}$ leaving $t^{1/2} = 150$ days.

25. Predict the bombarding projectile in the following nuclear reactions

(i) $13^{Al^{27}} + ? \rightarrow 11^{Na^{24}} + 2^{He^4}$

(ii) $34^{Se^{83}} + ? \rightarrow 34^{Se^{84}} + \gamma$ rays

(iii) $7^{N^{14}} + ? \rightarrow 8^{O^{17}} + 1^{H^1}$

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26. The decay constant for $6^{C^{14}}$ is 2.31×10^{-4} year-1 calculate the half life period.

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