CHEMISTRY

NCERT - NCERT CHEMISTRY(GUJRATI)

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 ga^{-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, $3^{Li^7} + 1^{H^1} \rightarrow 22^{He^4} + \triangle$ E Given 1 amu = 931 MeV.

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8. Calculate the number of neutrons in the remaining atom after emission of an α particle from $92X^{238}$、 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, $14^{Si^{30}}$ 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

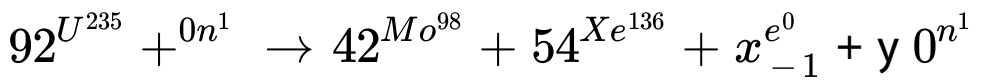$$92^{U^{235}} + 0^{n^1} \rightarrow 42^{Mo^{95}} + 57^{La^{139}} + x^{e^0}_{-1} + y^{n^1}_0$$
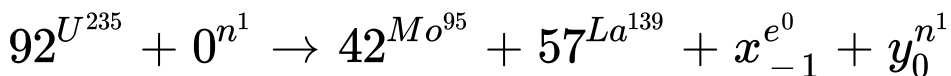
Calculate the values of x and y.

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

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

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 Becquerrel

D. Rutherford

Answer:

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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:

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5. The reaction $5^{B^8} \rightarrow 4^{Be^8}$ takes place due to

A. α decay

B. β decay

C. electron capture

D. positron decay

Answer:

6. Radioactivity is due to

    A. Stable electronic configuration

    B. Stable nucleus

    C. Unstable nucleus

    D. Unstable electronic configuration

Answer:

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

    A. 3α and $3\ \beta$

    B. $5\ \alpha$ and 3β

    C. 3α and 5β

    D. 5α and 5β

Answer:

▶

8. $_{92}U^{235}$ 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:

9. Loss of a β-particle is equivalent to

A. Increase of one proton only

B. Decrease of one neutron only

C. Both (a) and (b)

D. None of these

Answer:

10. Which of the following is used as neutron absorber in the nuclear reactor?

A. Water

B. Deuterium

C. Some compound of uranium

D. Cadmium

Answer:

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11. What is half life period.

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

13. What is Q value of a nuclear reaction?

14. State two uses of radio carbon dating.

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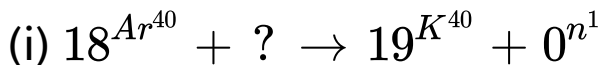
16. Calculate the decay constant for Ag^{108} if its half life is 2.31 minutes.

17. 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) $92A^{U^{238}} \rightarrow 56^{Ba^{143}} +$ _____ $+ 0^{n^1}$
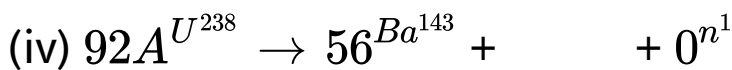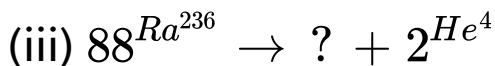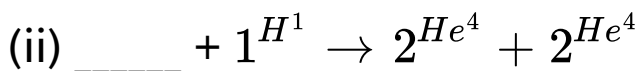
18. Calculate the number of α and β particles emitted in the conversion of $90^{Th^{232}}$ to $82^{pb^{208}}$.

19. 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.
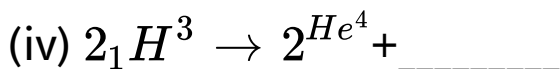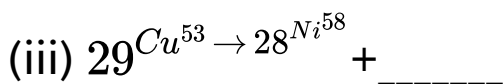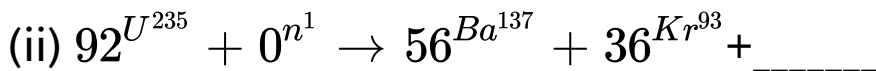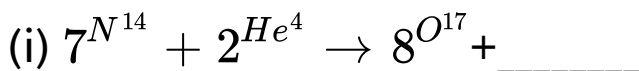
20. Calculate the average life of $79A^{Au^{198}}$ leaving $t^{1/2}$ = 150 days.

21. Complete the following

(i) $7^{N^{14}} + 2^{He^4} \rightarrow 8^{O^{17}} + _____$

(ii) $92^{U^{235}} + 0^{n^1} \rightarrow 56^{Ba^{137}} + 36^{Kr^{93}} + _____$

(iii) $29^{Cu^{53}} \rightarrow 28^{Ni^{58}} + _____$

(iv) $2_1 H^3 \rightarrow 2^{He^4} + _____$

22. 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) $7^{N^{14}} + ? \rightarrow 8^{O^{17}} + 1^{H^1}$
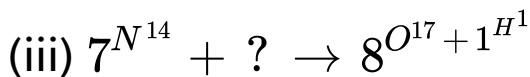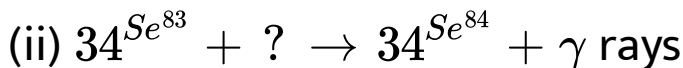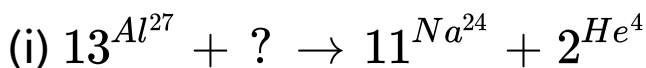
23. The decay constant for $6^{C^{14}}$ is 2.31×10^{-4} year-1 calculate the half life period.

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