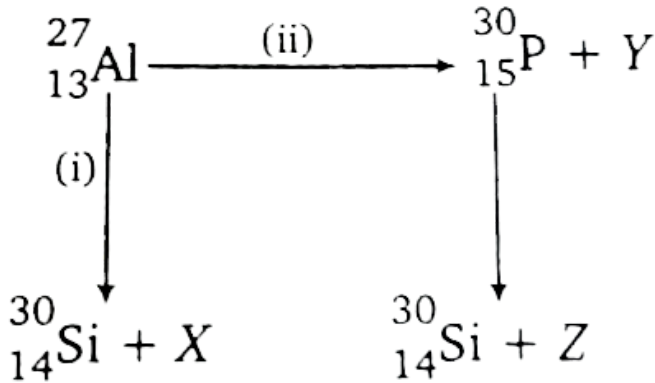# CHEMISTRY

BOOKS - IIT-JEE PREVIOUS YEAR (CHEMISTRY)

NUCLEAR CHEMISTRY

Jee Main And Advanced

1. Bombardment of aluminium by $\alpha-$ particle leads to its artificial disintegration in two ways, (i) and (ii) as shown.

Products X, Y and Z respectively, are

$$_{13}^{27}\text{Al} \xrightarrow{\text{(ii)}} {}_{15}^{30}\text{P} + Y$$

(i)

$$_{14}^{30}\text{Si} + X$$

$$_{14}^{30}\text{Si} + Z$$

A. proton, neutron, positron

B. neutron, positron, proton

C. proton, positron, neutron

D. positron, proton, neutron

Answer: A

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2. A positron is emitted from $._{11} Na^{23}$. The ratio of the atomic mass and atomic number of the resulting nuclide is

    A. $22/10$

    B. $22/11$

    C. $23/10$

    D. $23/12$

Answer: C

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3. . ^{23} Na is the more stable isotope of Na. Find out the process by which . $^{24}_{11}$ Na can undergo radioactive decay.

A. β^- emission

B. $\alpha -$ emission

C. $\beta^+ -$ emission

D. K-electron capture

Answer: A

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4. The number of neutrons accompanying the formation of . $_{54} Xe^{139}$ and . $_{38} Sr^{94}$ from the absorption of a slow

neutron by $_{92}U^{235}$, followed by nuclear fission is

A. 0

B. 2

C. 1

D. 3

Answer: B

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5. $_{13}Al^{27}$ is a stable isotope. $_{13}Al^{29}$ is expected to disintegrate by

A. α $-$ emission

B. $\beta-$ emission

C. positron emission

D. proton emission

Answer: B

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6. The radiations from a naturally occuring radioactive substance as seen after deflection by a magnetic field in one direction are

a.Only α-rays b. Only β-rays

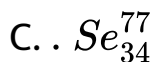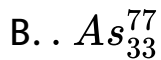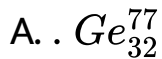c. Both α-and $\beta-$ rays d. Either α-or β-rays

A. definitely alpha rays

B. definitely beta rays

C. both alpha and beta rays

D. either alpha rays or beta rays

Answer: C

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7. An isotope of $Ge \, _{32}^{76}$ is

A. . Ge_{32}^{77}

B. . As_{33}^{77}

C. . Se_{34}^{77}

D. . Se^{78}_{34}
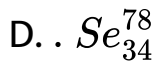
Answer: A

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8. If uranium (mass number 238 and atomic number 92) emits an $\alpha -$ paticle, the produc has mass number and atomic number

A. 236 and 92

B. 234 and 90

C. 238 and 90

D. 236 and 90

Answer: B

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9. A plot of the number of neutrons (n) against the number of protons (p) of stable nuclei exhibits upward deviation from linearity for atomic number, $Z > 20$. For an unstable nucleus having n/p ratio less than 1, the possible mode (s) of decay is (are)
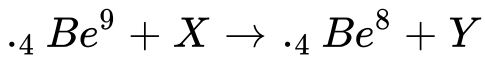
A. $\beta^- - \text{decay}(\beta - \text{emission})$

B. orbital or K- electron capture

C. neutron emisson

D. $\beta^+ - \text{dacay}(\text{positron emission})$

Answer: (B, D)

10. In the nuclear transmutation

$$._4 Be^9 + X \rightarrow ._4 Be^8 + Y$$

(X, Y) is / are

    A. (γ, n)

    B. (p, D)

    C. (n, D)

    D. (γ, p)

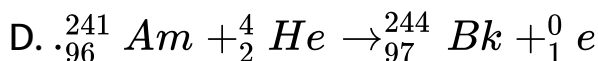**Answer:** (A, B)

11. Decrease in atomic number is observed during :
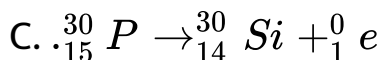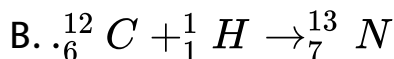
A. alpha emission

B. beta emission

C. positron emission

D. electron capture

Answer: (A, B, C)

12. The nuclear reactions accompanied with emission of neutron (s) are

A. $._{13}^{27} Al +_2^4 He \rightarrow_{15}^{30} P$

B. $._6^{12} C +_1^1 H \rightarrow_7^{13} N$

C. $._{15}^{30} P \rightarrow_{14}^{30} Si +_1^0 e$

D. $._{96}^{241} Am +_2^4 He \rightarrow_{97}^{244} Bk +_1^0 e$
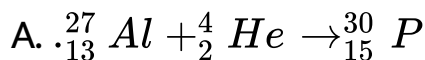
Answer: (A, D)

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13. Assertion (A) : Nuclide AI_{13}^{30} is less stable than Ca_{20}^{40}

Reason (R) : Nuclide having odd number of proton and

neuctrons are generally unstable

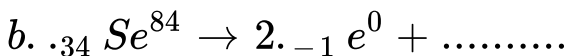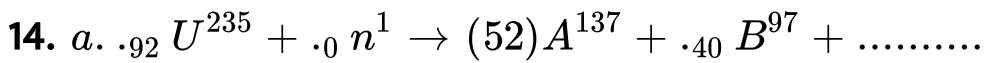A. Statement I is true , Statement II is true, Statement II is the correct explanation of Statement I

B. Statement I is true, Statement II is true, Statement II is not the correct explanation of Statement I

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true

Answer: B

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14. $a.\ _{92}U^{235} + _{0}n^{1} \rightarrow (52)A^{137} + _{40}B^{97} + \ldots\ldots\ldots$

$b.\ _{34}Se^{84} \rightarrow 2._{-1}e^{0} + \ldots\ldots\ldots$

A. Statement I is true , Statement II is true, Statement II is the correct explanation of Statement I

B. Statement I is true, Statement II is true, Statement II is not the correct explanation of Statement I

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true

Answer: $_{0}^{2}n^{1}, _{36}Kr^{82}$

15. A radioactive nucleus decays by emitting one alpha and two beta particles, the daughter nucleus is ..... Of the parent.

A. Statement I is true , Statement II is true, Statement II is the correct explanation of Statement I

B. Statement I is true, Statement II is true, Statement II is not the correct explanation of Statement I

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true

Answer: isotope

16. The number of neutrons in the parent nucleus which gives N^{14} on beta emission is ....

    A. Statement I is true , Statement II is true, Statement II is the correct explanation of Statement I

    B. Statement I is true, Statement II is true, Statement II is not the correct explanation of Statement I

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true

Answer: eight

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17. Elements of the same mass number but of different

atomic number are known as ....

A. Statement I is true , Statement II is true,

Statement II is the correct explanation of

Statement I

B. Statement I is true, Statement II is true, Statement

II is not the correct explanation of Statement I

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true

Answer: isotope

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18. An element $_-(z)M^A$ undergoes an $\alpha-$ emission followed by two successive $\beta-emission.$ The element formed is ......

A. Statement I is true , Statement II is true, Statement II is the correct explanation of Statement I

B. Statement I is true, Statement II is true, Statement II is not the correct explanation of Statement I

C. Statement I is true, Statement II is false

D. Statement I is false, Statement II is true

Answer: zM^{A-4}

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19. The periodic table consists of 18 groups. An isotope of copper, on bombardment with protons, undergoes a nuclear reaction yielding element X as shown below. To which group, element X belongs in the periodic table ?

$$_{.29} Cu^{63} + _{.1} H^1 \rightarrow 6._0 n^1 + _{.2} He^4(\alpha) + 2._1 H^1 + _{.Z} X^A$$
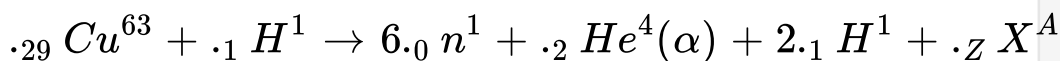
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20. Calculate the number of neutrons emitted when $_{.92} U^{235}$ undergoes controlled nuclear fission to $_{.54} Xe^{142}$ and $_{.38} Sr^{90}$.

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21. Calculate the number of α- and β-particles emitted when $_{.92}U^{238}$ into radioactive $_{.82}Pb^{206}$.

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22. $_{.92}X^{234} \dfrac{-7\alpha}{-6\beta}Y$. Find out atomic number, mass number of Y and identify it.

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23. $_{.92}U^{238}$ is radioactive and it emits α and β particles to form $_{.82}Pb^{206}$. Calculate the number of α and β particles emitted in this conversion.

An ore of $_{.92}U^{238}$ is found ot contain $_{.92}U^{238}$ and

$_- (82)Pb^{206}$ in the weight ratio of $1:0.1$. The half- life - period of $._{92} U^{238}$ is $4.5 \times 10^9 yr.$ Calculate the age of the ore.

24. Write a balanced equation for the reaction of N^{14} with $\alpha -$ particles.

25. $._{90} Th^{234}$ disintegrates to give $._{82} Pb^{206} Pb$ as the final product. How many alpha and beta particles are emitted during this process ?

26. In $\beta - \mathrm{decay},$ the total number of particles in the

nucleus

    A. decreases by four

    B. decreases by two

    C. remains the same

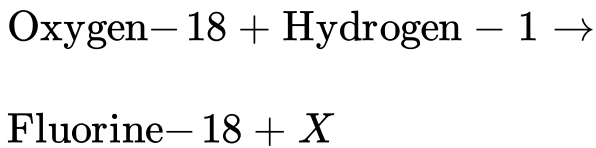   D. increases by one

Answer: C

27. Fluorine- 18 is one of the radioactive nuclides utilised in Positron Emission Tomography (PET) scans. Fluorine-18 can be synthesized by bombarding oxygen-18 nuclei with hydrogen-1 nuclei,

$$\text{Oxygen}-18 + \text{Hydrogen}-1 \rightarrow$$

$$\text{Fluorine}-18 + X$$

What is the identity of the other product, X, in this reaction?

    A. Alpha particle

    B. Beta particle

    C. Positron

    D. Neutron

Answer: D

28. Which of the following Statement is/are not true?

   A. Among radioactive rays, α − rays has the highest

   penetrating power

   B. Penetrating power of β − rays is greater than

   γ − rays

   C. α − rays is not deflected in magnetic field

   D. α − rays has highest momentum among

   radioactive rays

Answer: (A, B, C)

29. Whichl of the following statement regarding a $\gamma-$ rays is / are correct ?

A. It has the maximum penetrating power among all

radioactive rays

B. It is an energy particle

C. It has the maximum range in air

D. It is deflected in a magnetic field

Answer: (A, B, C)

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

A. Water

B. D_2O

C. Some compounds of uranium

D. Cadmium

Answer: (B, D)

31. Assertion U-235 is unstable isotope of uranium.

Unergo α − decay.

Reason α − decay is observed with all radioactive isotopes having atomic number greater than 82.

    A. Both Assertion and Reason are correct and

       Reason is the correct explanation of the Assertion

    B. Both Assertion and Reason are correct but Reason

       is not the correct explanation of Assertion

    C. Assertion is correct but Reason is incorrect

    D. Assertion is incorrect but Reason is correct

Answer: A

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32. Assertion C-14 undergo $\beta - $ decay

Reason It has more neutrons than that required for stability

A. Both Assertion and Reason are correct and Reason is the correct explanation of the Assertion

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion

C. Assertion is correct but Reason is incorrect

D. Assertion is incorrect but Reason is correct

Answer: A

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33. Match the quantity of Column I with the quantity of Column II.

{:("Column I"" " "Column II"),((A)_(92)U^(235)" "(p)"Undergoalpha-dacay"),

((B)_(11)Na^(23)+n^(1)to_(12)Mg^(24)+e^(-)" " (q)"Undergobeta-decay"),((c)_(5)B^(9)" "(r)"Undergo positron emisson"),(" "(t)"Undergo electron capture"):}`

A. Both Assertion and Reason are correct and Reason is the correct explanation of the Assertion

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion
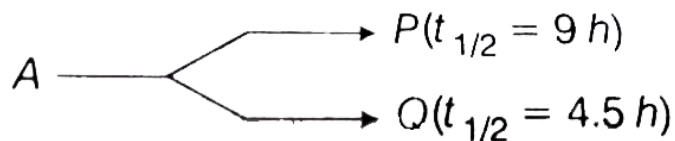
C. Assertion is correct but Reason is incorrect

D. Assertion is incorrect but Reason is correct

Answer: $A \rightarrow p, q; B \rightarrow s; C \rightarrow r, t; D \rightarrow p, q$

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Chemistry

1. A radioactive isotope A undergoes simultaneous decay to two different nuclei as

$$A \overset{\longrightarrow}{\searrow} \begin{array}{l} P(t_{1/2} = 9\,h) \\ Q(t_{1/2} = 4.5\,h) \end{array}$$

Assuming that initially neither P nor Q was present,

after how many hours, amount of Q will be just double to the amount of A remaining?

A. Both Assertion and Reason are correct and Reason is the correct explanation of the Assertion

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion

C. Assertion is correct but Reason is incorrect

D. Assertion is incorrect but Reason is correct

Answer: 6

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2. The number of $\beta -$ particles emitted in the following nuclear reaction is

A. Both Assertion and Reason are correct and Reason is the correct explanation of the Assertion

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion

C. Assertion is correct but Reason is incorrect

D. Assertion is incorrect but Reason is correct

Answer: 4

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