

Nuclei

- Assertion (A):** When a beam of highly energetic neutrons is incident on a tungsten target, X-rays will be produced.

Reason (R): Neutrons do not exert any electrostatic force on electrons or nucleus of an atom.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false
- Assertion (A):** Strong nuclear force holds protons inside nucleus.

Reason (R): Strong nuclear force is not a fundamental force.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false
- Assertion (A):** Consider the following nuclear reaction of an unstable ${}^{14}_6\text{C}$ nucleus initially at rest. The decay ${}^{14}_6\text{C} \longrightarrow {}^{14}_7\text{N} + {}^0_{-1}\text{e} + \bar{\nu}$. In a nuclear reaction total energy and momentum is conserved experiments show that the electrons are emitted with a continuous range of kinetic energies upto some maximum value.

Reason (R): Remaining energy is released as thermal energy.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false
- Assertion (A):** The Q value of nuclear process is $Q = \text{total final binding energy} - \text{total initial binding energy}$.

Reason (R): The Q value of nuclear reaction initially appears in form of kinetic energy of products.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false
- Assertion (A):** The effective mass of β -particles when they are emitted is higher than the mass of electrons obtained by Milikan oil-drop experiment.

Reason (R): β -particle and electron, both are similar particles.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false
- Assertion (A):** If number of protons in a nucleus is more than number of neutrons present, the nucleus is unstable.

Reason (R): Electrostatic force between two protons in a nucleus dominates over the nuclear force between them.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false
- Assertion (A):** Nucleus having more binding energy is more stable

Reason (R): Stability increases with increase in number of nucleons.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false



8. **Assertion (A):** Fe^{56} nucleus is more stable than U^{235} nucleus.

Reason (R): Binding energy of Fe^{56} nucleus is more than binding energy of U^{235}

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

9. **Assertion (A):** Electron capture occurs more often than positron emission in heavy elements.

Reason (R): Heavy elements exhibit radioactivity.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

10. **Assertion (A):** Strong nuclear force is fundamental quark-quark interaction.

Reason (R): Strong nuclear force is shortest range force in nature.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

11. **Assertion (A):** The value of Rydberg constant is independent of mass of nucleus.

Reason (R): Electrons revolve around stationary nucleus of atom.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

12. **Assertion (A):** Fragments produced in the fission of ${}_{92}^{235}\text{U}$ are radioactive.

Reason (R): The fragments have abnormally high proton to neutron ratio.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

13. **Assertion (A):** The binding energy per nucleon, for nuclei with atomic mass number $A > 100$ decreases with A .

Reason (R): The nuclear forces become weaker for heavier nuclei.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

14. **Assertion (A):** All protons have non zero magnetic moment.

Reason (R): All nuclei have non zero magnetic moment.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

15. **Assertion (A):** Rydberg constant varies with mass number of a given element.

Reason (R): The reduced mass of electron depends on the mass of the nucleus.

- (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
- (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are false

- 16. Assertion (A):** Although elements are different, their nuclei are of the same size.
Reason (R): Nuclear density is not same for all nuclei.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 17. Assertion (A):** Neutrons penetrate matter more readily as compared to protons.
Reason (R): Neutrons are slightly more massive than protons.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 18. Assertion (A):** Energy released in one fusion process is less than the energy released in a single fission event.
Reason (R): Fusion is a weaker source of energy than fission.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 19. Assertion (A):** Fragments produced in fission of ^{235}U are radioactive.
Reason (R): The entire mass of atom is concentrated in the nucleus.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 20. Assertion (A):** Nuclear forces are charge dependent forces.
Reason (R): Nuclear forces are attractive forces.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 21. Assertion (A):** A nuclei has more mass than the sum of the masses of the individual nucleons in them.
Reason (R): In nuclei, number of neutrons is less than the number of electrons.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 22. Assertion (A):** Isotopes of an element can be separated by using a mass spectrometer.
Reason (R): Separation of isotopes is possible because of the difference in electron numbers of isotopes.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 23. Assertion (A):** Nuclear binding energy per nucleon is in the ${}^9_4\text{Be} > {}^7_3\text{Li} > {}^4_2\text{He}$.
Reason (R): Binding energy per nucleon increases linearly with difference in number of neutrons and protons.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false



- 24. Assertion (A):** Energy is released when heavy nuclei undergo fission or light nuclei undergo fusion.
Reason (R): For heavy nuclei, binding energy per nucleon increases with increasing Z while for light nuclei, it decreases with increasing Z .
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 25. Assertion (A):** Size of nucleus determined electron scattering and α -scattering are same.
Reason (R): Electron scattering or by α -scattering is controlled by distribution of charge in nucleus.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 26. Assertion (A):** It is very easy to detect neutrino in nature.
Reason (R): It has high affinity to interact with matter.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 27. Assertion (A):** More energy is released in fusion than fission per nucleon.
Reason (R): More number of nucleons takes part in fusion.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 28. Assertion (A):** Deuterium is a good moderator of fast neutrons.
Reason (R): Fast neutrons transfer 90% of their kinetic energy to the nuclei of the moderator in an elastic collision.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 29. Assertion (A):** Beryllium, can be used as a moderator in nuclear fission reactor.
Reason (R): A fast moving electron on collision with a light stationary particle loses most of its energy in nuclear reactor.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
- 30. Assertion (A):** Nuclear force is short range while gravitation and electric force are universal.
Reason (R): Nuclear force does not follow inverse square law.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false



ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	2	3	3	2	2	3	4	3	2	4	2	3	3	3	1	4	2	3	2	4
Que.	21	22	23	24	25	26	27	28	29	30										
Ans.	4	3	4	3	4	4	2	3	3	2										