

Chapter 13

Nuclei

(Assertion and Reason Questions)

Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

- (a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (c) If the Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.

Q.1. Assertion: Density of all the nuclei is same.

Reason: Radius of nucleus is directly proportional to the cube root of mass number.

Q.2. Assertion: Neutrons penetrate matter more readily as compared to protons.

Reason: Neutrons are slightly more massive than protons.

Q.3. Assertion: The mass number of a nucleus is always less than its atomic number.

Reason: Mass number of a nucleus may be equal to its atomic number.

Q.4. Assertion: The binding energy per nucleon, for nuclei with atomic mass number $A > 100$, decrease with A .

Reason: The forces are weak for heavier nuclei.

Q.5. Assertion: Radioactivity of 108 undecayed radioactive nuclei of half life of 50

days is equal to that of 1.2×10^8 number of undecayed nuclei of some other material with half life of 60 days.

Reason: Radioactivity is proportional to half-life.

Q.6. Assertion: The ionising power of β -particle is less compared to β -particles but their penetrating power is more.

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

Q.7. Assertion: Radioactive nuclei emit β^{-1} particles.

Reason: Electrons exist inside the nucleus.

Q.8. Assertion: ${}_Z X^A$ undergoes 2α , 2β -particles and 2γ -rays, the daughter product is ${}_{Z-2} Y^{A-8}$.

Reason: In α -decay the mass number decreases by 4 and atomic number decreases by 2. In β -decay the mass number remains unchanged, but atomic number increases by 1.

Q.9. Assertion: The heavier nuclei tend to have larger N/Z ratio because neutron does not exert electric force.

Reason: Coulomb forces have longer range compared to the nuclear force.

Q.10. Assertion: A free neutron decays to a proton but a free proton does not decay to a neutron. This is because neutron is an uncharged particle and proton is a charged particle.

Reason: Neutron has larger rest mass than the proton.

Q.11. Assertion: Cobalt-60 is useful in cancer therapy.

Reason: Cobalt -60 is source of γ -radiations capable of killing cancerous cells.

Q.12. Assertion: It is not possible to use ${}^{35}\text{Cl}$ as the fuel for fusion energy.

Reason: The binding energy of ${}^{35}\text{Cl}$ is too small.

Q.13. Assertion: Energy is released when heavy nuclei undergo fission or light nuclei undergo fusion.

Reason: For heavy nuclei, binding energy per nucleon increases with increasing Z while for light nuclei it decreases with increasing Z .

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ANSWER KEY

Q.1 : (a)

Q.2 : (b) Both statements are separately correct.

Q.3 : (d) In case of hydrogen atom mass number and atomic number are equal.

Q.4 : (c) Nuclear force is nearly same for all nucleus.

Q.5 : (c)

Q.6 : (b) β -particles, being emitted with very high speed compared to α -particles, pass for very little time near the atoms of the medium. So the probability of the atoms being ionised is comparatively less. But due to this reason, their loss of energy is very slow and they can penetrate the medium through a sufficient depth.

Q.7 : (c) Electrons are not inside nucleus.

Q.8 : (a)

Q.9 : (a)

Q.10 : (d)

Q.11 : (d)

Q.12 : (c)

Q.13 : (d) We know that energy is released when heavy nuclei undergo fission or light nuclei undergo fusion. Therefore statement (1) is correct.

The second statement is false because for heavy nuclei the binding energy per nucleon decreases with increasing Z and for light nuclei, B.E./nucleon increases with increasing Z .