

ATOMS AND NUCLEOUS

1. The atomic number of silicon is 14. Its ground state electronic configuration is
 - a) $1s^2 2s^2 2p^6 3s^2 3p^4$
 - b) $1s^2 2s^2 2p^6 3s^2 3p^3$
 - c) $1s^2 2s^2 2p^6 3s^2 3p^2$
 - d) $1s^2 2s^2 2p^6 3s^2 3p^1$
2. What is the valence electron in alkali metal?
 - a) f-electron
 - b) p-electron
 - c) s-electron
 - d) d-electron
3. Of the following pairs of species which one will have the same electronic configuration for both members?
 - a) Li^+ and Na^+
 - b) He and Ne^+
 - c) H and Li
 - d) C and N^+
4. Which of the following did Bohr use to explain his theory?
 - a) Conservation of linear momentum
 - b) The quantization of angular momentum
 - c) Conservation of quantum frequency
 - d) Conservation of mass
5. According to Bohr's principle, what is the relation between the principal quantum number and the radius of the orbit?
 - a) r proportional to $1/n$
 - b) r proportional to $1/n^2$
 - c) r proportional to n
 - d) r proportional to n^2
6. The kinetic energy of the α -particle incident on the gold foil is doubled. The distance of closest approach will also be doubled.
 - a) True
 - b) False

7. Based on the Bohr model, what is the minimum energy required to remove an electron from the ground state of Be atom? (Given: $Z = 4$)

- a) 1.63 eV
- b) 15.87 eV
- c) 30.9 eV
- d) 217.6 eV

8. If an α -particle collides head-on with a nucleus, what is its impact parameter?

- a) Zero
- b) Infinite
- c) 10^{-10} m
- d) 10^{10} m

9. In which of the following system, will the radius of the first orbit ($n=1$) be minimum?

- a) Doubly ionized lithium
- b) Singly ionized helium
- c) Deuterium atom
- d) Hydrogen atom

10. An α -particle of energy 10 MeV is scattered through 180° by a fixed uranium nucleus. Calculate the order of distance of the closest approach?

- a) 10^{-20} cm
- b) 10^{-12} cm
- c) 10^{-11} cm
- d) 10^{12} cm

11. Radioactive material decays by simultaneous emission of two particles with respective half-lives 1620 and 810 years. The time, in years, after which one-fourth of the material remains?

- a) 1080
- b) 2430
- c) 3240
- d) 4860

12. Which of the following substances cannot be emitted by radioactive substances during their decay?

- a) Protons
- b) Neutrinos
- c) Helium nuclei
- d) Electrons

13. The electron emitted in β - radiation originates from where?

- a) Inner orbits of atoms

- b) Free electrons existing in nuclei
- c) The decay of a neutron in nuclei
- d) Photon escaping from the nucleus

14. Find the probability that the nucleus of ${}_{87}\text{Ra}^{221}$ undergoes decay after three half-lives if it's a radioactive substance that has a half-life of 6 days.

- a) $1/6$
- b) $5/6$
- c) $7/8$
- d) $1/2$

15. A 300-day old radioactive substance shows an activity of 5000 dps, 150 days later its activity becomes 2500 dps. What was its initial activity?

- a) 25000 dps
- b) 20000 dps
- c) 32000 dps
- d) 5000 dps

16. Emission of β -rays in radioactive decay results in the change of either mass or charge.

- a) True
- b) False

17. Which will be the unknown nucleus formed when ${}^{22}\text{Ne}_{10}$ decays into two α -particles and an unknown nucleus?

- a) Fluorine
- b) Carbon
- c) Neon
- d) Oxygen

18. What is the half-time of a radioactive sample (in minutes), if its mean life is 200 s?

- a) 0.69 min
- b) 2 min
- c) 2.57 min
- d) 2.31 min

19. What will happen in a time of 7 hours, if a radioactive substance has an average life of 7 hours?

- a) Half of the active nuclei decay
- b) Less half of the active nuclei decay
- c) More than half of the active nuclei decay
- d) All active nuclei decay

20. A freshly prepared radioactive source of half-time 2h emits radiation of intensity which is 64 times the permissible safe level. Minimum time after which it would be possible to work safely with this source is which of the following?

- a) 6 h
- b) 12 h
- c) 24 h
- d) 20 h

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**ANSWERS-1.(C) 2.(C) 3.(D) 4.(B) 5.(D) 6.(B) 7.(D) 8.(A) 9.(A) 10.(B) 11.(A) 12.(A)
13.(C) 14.(C) 15.(B) 16.(B) 17.(B) 18.(D) 19.(C) 20.(B)**