**IIT – JEE 2017** **TW TEST – (MAIN - 1)** **MARKS: 69**
**TIME: 1 ½ HR** **TOPIC: ATOMIC STRUCTURE** **DATE:30/5/15**

This section contains **23 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out which **ONLY ONE** is correct. **(+3, - 1)**

1. Which of the following electronic transitions in the line spectrum of $He^+$ will have the same wavelength as that of the first line in the Lyman series of hydrogen atom?
(a) $4 \leftarrow 2$ (b) $2 \leftarrow 1$ (c) $3 \leftarrow 1$ (d) $4 \leftarrow 1$

2. In Bohr theory of atom, the energy difference between two successive energy levels
(a) Increases with increases in the value of n
(b) Decreases with increases in the value of n
(c) Remains constant with increases in the value of n
(d) Initially increases followed by a decreases with increases in the value of n

3. For a 'd' subshell which of the following quantum numbers is definitely required?
(a) $n = 3$ (b) $\ell = 2$ (c) $m = 2$ (d) $s = 1/2$

4. The angular momentum of an electron in f orbital is
(a) $\sqrt{12}\left(h/2\pi\right)$ (b) $\sqrt{6}\left(h/2\pi\right)$ (c) $\sqrt{2}\left(h/2\pi\right)$ (d) $\sqrt{20}\left(h/2\pi\right)$

5. Rutherford's alpha particle scattering experiment eventually led to the conclusion that
(a) Most of space of Atom is vacant
(b) electrons occupy space around the nucleus
(c) neutrons are buried deep in the nucleus
(d) the point of impact with matter can be precisely determined

6. An energy of 24.6 is required to remove one of the electrons from a neutral helium atom. The energy required to remove both the electrons from a neutral helium atom is
(a) 38.2 eV (b) 49.2 eV (c) 51.8 eV (d) 79.0 eV

7. The transition from the state $n = 4$ to $n = 3$ in a hydrogen like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition
(a) $2 \rightarrow 1$ (b) $3 \rightarrow 2$ (c) $4 \rightarrow 2$ (d) $5 \rightarrow 4$

8. Which of the following sets of quantum numbers is not allowed?
(a) $n = 3, \ell = 1, m = +2$ (b) $n = 3, \ell = 1, m = +1$
(c) $n = 3, \ell = 0, m = 0$ (d) $n = 3, \ell = 2, m = \pm 2$

9. The maximum number of electrons that can be accommodated in a quantum shell is equal to
(a) n (b) $n^2$ (c) $2n^2$ (d) $n\left(n+1\right)$

10. The number of allowed values of magnetic quantum numbers for a given value of azimuthal quantum number $\ell$ is

(a) $\ell+1$ (b) $\ell+2$ (c) $2\ell+1$ (d) $2\ell+2$

11. For silver metal, threshold wavelength for the emission of photoelectron is $5000\,A^0$. The kinetic energy of electrons when silver is irradiated with a wavelength of $3000\,A^0$ nm is

(a) $1.65\,eV$ (b) $2\,eV$ (c) $2.7\,eV$ (d) $3.7\,eV$

12. The ratio of the $e/m$ values of a proton and an $\alpha-$particle is

(a) 2 : 1 (b) 1 : 1 (c) 1 : 2 (d) 1 : 4

13. The ratio of $E_2-E_1$ to $E_4-E_3$ for the hydrogen atom is approximately equal to

(a) 10 (b) 15 (c) 17 (d) 12

14. The wavelength of the third line of the Balmer series for a hydrogen atom is

(a) $\frac{21}{100R}$ (b) $\frac{100}{21R}$ (c) $\frac{21R}{100}$ (d) $\frac{100R}{21}$

15. When the electron of a hydrogen atom jumps from the $n=4$ to the $n=1$ state, the number of spectral lines emitted is

(a) 15 (b) 6 (c) 3 (d) 4

16. The correct set of quantum number for the unpaired electron of a chlorine atom is

(a) $2,0,0,+\frac{1}{2}$ (b) $2,1,-1,+\frac{1}{2}$ (c) $3,1,-1,\pm\frac{1}{2}$ (d) $3,0,0,\pm\frac{1}{2}$

17. Which of the following sets of quantum numbers represents the highest energy of an atom?

(a) $n=4,\ell=0,m=0,s=+\frac{1}{2}$ (b) $n=3,\ell=0,m=0,s=+\frac{1}{2}$

(c) $n=3,\ell=1,m=1,s=+\frac{1}{2}$ (d) $n=3,\ell=2,m=1,s=+\frac{1}{2}$

18. The number of unpaired electrons in $Mn^{4+}\,(Z=25)$ is

(a) four (b) two (c) five (d) three

19. The ratio of the energy of the electron in ground state of hydrogen to the electron in first excited state of $Be^{3+}$ is:

(a) 1 : 4 (b) 1 : 8 (c) 1 : 16 (d) 16 : 1

20. If the speed of electron in the Bohr's first orbit of hydrogen atom is x, the speed of the electron in the third Bohr's orbit is:

(a) $x/9$ (b) $x/3$ (c) $3x$ (d) $9x$

21. Which is correct paramagnetic order:

(a) Mn > Cr > Zn (b) Fe > Zn > Co (c) Cr > Fe > Zn (d) Zn > Mn > Fe

22. The work functions for metals A, B and C are respectively $1.92\,eV, 2.0\,eV$ and $5.0\,eV$. According to Einstein equation, the metal which will emt photo electrons for a radiation of wavelength $4100\,\overset{0}{A}$ is/are

(a) A only (b) A and B only (c) A B and C (d) None of these

23. The difference between $n^{th}$ and $(n+1)^{th}$ Bohr's radius of H atom is equal to its $(n-1)^{th}$ Bohr's radius. The value of n is:

(a) 1 (b) 2 (c) 3 (d) 4

## (ANSWER KEY)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | **[a]** | **2.** | **[b]** | **3.** | **[b]** | **4.** | **[a]** | **5.** | **[a]** | **6.** | **[d]** | **7.** | **[d]** |
| **8.** | **[a]** | **9.** | **[c]** | **10.** | **[c]** | **11.** | **[a]** | **12.** | **[a]** | **13.** | **[b]** | **14.** | **[b]** |
| **15.** | **[b]** | **16.** | **[c]** | **17.** | **[d]** | **18.** | **[d]** | **19.** | **[a]** | **20.** | **[c]** | **21.** | **[c]** |
| **22.** | **[b]** | **23.** | **[d]** | | | | | | | | | | |