BOHR ATOMIC MODEL

1. The ratio between kinetic energy and the total energy of the electrons of hydrogen atom according to Bohr's model is :

(A) 2 : 1 (B) 1 : 1 (C) 1 : – 1 (D) 1 : 2

2. The kinetic energy of electron in n = 2 of Li^{2+} ion is:

(A) 61.2 eV (B) – 61.2 eV (C) 15.3 eV (D) 30.6 eV

3. The radii of two of the first four Bohr's orbits of the hydrogen atom are in the ratio 1 : 4. The energy difference between them may be :

(A) Either 12.09 eV or 3.4 eV (B) Either 2.55 eV or 10.2 eV

(C) Either 13.6 eV or 3.4 eV (D) Either 3.4 eV or 0.85 eV

4. The ratio of of $(E_2 - E_t)$ to $(E_4 - E_3)$ for He^+ ion is approximately equal to (where E_n is the energy of nth orbit):

(A) 10 (B) 15 (C) 17 (D) 12

5. If the binding energy of 2nd excited state of hydrogen like sample is 24 eV approximately, then the ionization energy of the sample is approximately:

(A) 54.4 eV (B) 24 eV (C) 122.4 eV (D) 216 eV

6. Tne ionization energy of H atom is 21.79×10^{-19} J. Then the value of binding energy of second excited state of Li^{2+} ion:

(A) $3^2 \times 21.7 \times 10^{-19}$ J (B) 21.79×10^{-19} J (C) $\frac{1}{3} \times 21.79 \times 10^{-19}$ J (D) $\frac{1}{3^2} \times 21.79 \times 10^{-19}$

7. The binding energy of e^- in ground state of hydrogen atom is 13.6 eV. The energies required to eject out an electron from three lowest states of He^+ atom will be (in eV):

(A) 13.6,10.2,3.4 (B) 13.6,3.4,1.5 (C) 13.6, 27.2, 40.8 (D) 54.4,13.6, 6

8. The species which has its fifth ionization potential equal to 340 eV is :

(A) B^+ (B) C^+ (C) B (D) C

9. The radii of two Bohr's orbits of hydrogen atom are in the ratio of 4 : 9. Which of the following value of energy difference is not possible between the two orbits? [IE. = 13.6 eV]

(A) 1.9 eV (B) 0.472 eV (C) 0.66 eV (D) 0.21 eV

10. A hydrogen like species with atomic number Z is present in a higher excited state(n). This electron can make transition to the first excited level by successively emitting two photons of energy 2.64 eV and 48.36 eV. This electron can also make transition to third excited state by emitting three photons of energy 2.64 eV, 2.66. eV and 4.9 eV. Identify the hydrogen like species involved.

(A) He^+ (B) Li^{2+} (C) Be^{+3} (D) B^{+4}

11. The energy of hydrogen atom in its ground state is -13.6 eV. The energy of the level corresponding to n = 5 is:

(A) –0.54 eV (B) –5.40 eV (C) –0.85 eV (D) –2.72 eV

12. If first ionization potential of an atom is 16V, then the first excitation potential will be :

(A) 10.2 V (B) 12 V (C) 14 V (D) 16 V

13. The ionisation enthalpy of hydrogen atom is 1.312×10^6 J mol^{-1}. The energy required to excite the electron in the atom from n = 1 to n = 2is :

(A) 8.51×10^5 $Jmol^{-1}$ (B) 6.56×10^5 $Jmol^{-1}$

(C) 7.56×10^5 $Jmol^{-1}$ (D) 9.84×10^5 $Jmol^{-1}$

14. In a single isolated atom of hydrogen, electrons make transition from 4^{th} excited state to ground state producing maximum possible number of wavelengths. If the 2^{nd} lowest energy photon is used to further excite an already excited sample of Li^{2+} ion, then transition will be :

(A) $12 \rightarrow 15$ (B) $9 \rightarrow 12$ (C) $6 \rightarrow 9$ (D) $3 \rightarrow 6$

15. In a mixture of sample of H-atoms and He^+ ions, electrons in all the H-atoms and He^+ ions are present in $n = 4^{th}$ state. Then, find maximum number of different spectral lines obtained when all the electrons make transition from n = 4 upto ground state :

(A) 12 (B) 6 (C) 11 (D) 16

16. If the binding energy of 2nd excited state of a hypothetical H-like atom is 12 eV, then the CORRECT option is/are :

(A) I excitation potential = 81 V (B) II Excitation energy = 96 eV

(C) Ionisation potential = 192 V (D) Binding energy of 2^{nd} state = 27 eV

17. If electron is present in n_1 orbit of hydrogen atom and n_2 orbit of He^+ ions then which of the following relation is correct for the same value of potential energy of electron in both the chemcial specie

(A) $4n_2^2 = n_1^2$ (B) $n_1 = 2n_2$ (C) $2n_1 = n_2$ (D) $n_2 = 4n_1$

18. Select the correct expression(s) according to Bohr model -

(A) $TE = \dfrac{-2\pi^2k^2z^2e^4m}{n^2h^2}$ (B) $PE = \dfrac{-4\pi^2k^2z^2e^4m}{n^2h^2}$

(C) $v = \dfrac{2\pi kze^2}{nh}$ (D) $\dfrac{hc}{\lambda} = 13.6z^2\left(\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}\right)$

SPECTRUM

19. Wavelength of radiation emitted when an electron jumps from a state A to C is 3000A and it is 6000A when the electron jumps from state B to C. Wavelength of the radiation emitted when an electron jumps from state A to B will be :

(A) 2000Å (B) 3000Å (C) 4000Å (D) 6000Å

20. Difference in wavelength of two extreme lines of Lyman series in emission spectrum of He+ would be:

(A) $\dfrac{1}{12R_H}$ (B) $\dfrac{12}{R_H}$ (C) $\dfrac{1}{4R_H}$ (D) $\dfrac{1}{3R_H}$

21. A collection of H-atoms in 9th excited state returns to ground state. Calculate ratio of total number of spectral lines emitted without emitting any line in Brackett series to number of Brackett series lines.

(A) $\dfrac{39}{6}$ (B) $\dfrac{45}{6}$ (C) $\dfrac{45}{39}$ (D) 6

22. Which transition emits photon of maximum frequency:

(A) 2nd spectral line of Balmer series (B) 2nd spectral line of Paschen series

(C) 5th spectral line of Humphery series (D) Ist spectral line of Lymen series

Home Work : NCERT EXERCISE 2.13, 14, 15, 18, 19, 20

Answers

RACE # 27

1. (C) **2.** (D) **3.** (B) **4.** (B) **5.** (D) **6.** (B) **7.** (D) **8.** (C) **9.** (C) **10.** (C)
11. (A) **12.** (B) **13.** (D) **14.** (B) **15.** (C) **16.** (ABD) **17.** (C) **18.** (ABCD)
19. (BD) **20.** (A) **21.** (A) **22.** (D)