Chapter 02

Atomic Structure

NEET RANKER'S STUFF

Q.1 Radius of H-atom in its ground state is 5.3×10^{-11} m. After collision with an electron it is found to have a radius of 21.2×10^{-11}m. What is the principal quantum no. 'n' of the final state of the atom:-

(1) n = 2 (2) n = 3

(3) n = 4 (4) n = 16

Q.2 What should be the wavelength and energy respectively of the emitted light when the electron of hydrogen atom undergoes transition from first excited state to ground state?

(1) 1215 Å and 21.8×10^{-12} erg

(2) 6.560 Å and 16.35×10^{-12} erg

(3) 1215 Å and 16.35×10^{-12} erg

(4) 6560 Å and 21.8×10^{-12} erg

Q.3 What should be the ratio of energies of the electrons of the first orbits of Na^{+1} and H?

(1) 11:1 (2) 121 : 1

(3) 1 : 121 (4) 1 : 11

Q.4 What should be the frequency (in cycles per second) of the emitted radiation when an electron undergoes transition from M energy level to K energy level, if the value of R is 10^5 cm^{-1}.

(1) $3/2 \times 10^{15}$ (2) $8/3 \times 10^{15}$

(3) $8/5 \times 10^{15}$ (4) $9/4 \times 10^{15}$

Q.5 The ionization energy of the ground state hydrogen atom is 2.18×10^{-18} J. The energy of an electron in second orbit of He^+ will be

(1) -1.09×10^{-18} J (2) -4.36×10^{-18} J

(3) -2.18×10^{-18} J (4) -2.18×10^{-18} J

Q.6 If kinetic energy of a proton is increased nine times the wavelength of the de-Broglie wave associated with it would become

(1) 3 times (2) 9 times

(3) 1/3 times (4) 1/9 times

Q.7 An ion Mn^{a+} has the magnetic moment equal to 4.9 B.M. The value of 'a' is :

(1) 3 (2) 4 (3) 2 (4) 5

Q.8 For an electron in a hydrogen atom, the wave function, ψ is proportional to $\exp^{-r/a_0}$, where a_0 is the Bohr's radius. What is the ratio of the probability of finding the electron at the nucleus to the probability of finding it at a_0 .

(1) e (2) e^2 (3) $1/e^2$ (4) zero

Q.9 The maximum probability of finding electron in the d_{xy} orbital is :

(1) along the x-axis

(2) along the y-axis

(3) at an angle of 45º from the x & y-axis

(4) at an angle of 90º from the x & y-axis

Q.10 Maximum value (n + l + m) for unpaired electrons in second excited state of chlorine $_{17}Cl$ is:

(1) 28 (2) 25

(3) 20 (4) none of these

Q.11 The distance between 3rd and 2nd Bohr orbits of hydrogen atom is

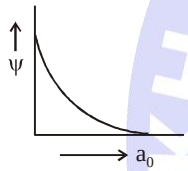
(1) 0.529×10^{-8} cm (2) 2.645×10^{-8} cm

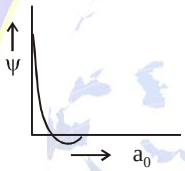
(3) 2.116×10^{-8} cm (4) 1.058×10^{-8} cm

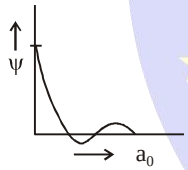
Q.12 The ratio of $(E_2 - E_1)$ to $(E_4 - E_3)$ for the hydrogen atom is approximately equal to:

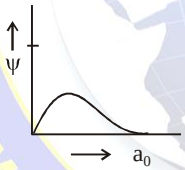
(1) 10 (2) 15 (3) 17 (4) 12

Q.13 Which of the following graphs correspond to one node?

(1) 

(2) 

(3) 

(4) 

Q.14 The number of waves made by a Bohr electron in an orbit of maximum magnetic quantum number 3 is:

(1) 3 (2) 4 (3) 2 (4) 1

Q.15 A compound of vanadium has a magnetic moment of 1.73 BM. The electronic configuration of vanadium ion in the compound is:

(1) $[Ar]3d^2$ (2) $[Ar]3d^14s^0$

(3) $[Ar]3d^3$ (4) $3d^04s^1$

Q.16 The wave number of the limiting line in Lyman series of hydrogen is 109678 cm^{-1}. The wave number of the limiting line in Balmer series of He^+ would be:

(1) 54839 cm^{-1} (2) 219356 cm^{-1}

(3) 109678 cm^{-1} (4) 438712 cm^{-1}

Q.17 The ratio of specific charge of an electron to that of a proton is

(1) 1 : 1 (2) 1837 : 1

(3) 1 : 1837 (4) 2 : 1

Q.18 The electrons, identified by quantum numbers n and l, (i) n = 4, l = 1 (ii) n= 4, l = 0 (iii) n = 3, l = 2 (iv)n = 3, l = 1 can be placed in order of increasing energy, from the lowest to highest, as

(1) (iv) < (ii) < (iii) < (i)

(2) (ii) < (iv) < (i) < (iii)

(3) (i) < (iii) < (ii) < (iv)

(4) (iii) < (i) < (iv) < (ii)

Q.19 Uncertainty in the position of an electron (mass = 9.1×10^{-31} kg) moving with a velocity 300 ms^{-1}, accurate upto 0.001%, will be:

(h = 6.63×10^{-34}Js)

(1) 19.2×10^{-2} m (2) 5.76×10^{-2} m

(3) 1.92×10^{-2} m (4) 3.84×10^{-2} m

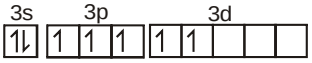
Q.20 The ionization enthalpy of hydrogen atom is 1.312×10^6 J mol^{-1}. The energy required to excite the electron in the atom from n = 1 to n = 2 is

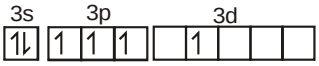
(1) 8.51×10^5 J mol^{-1} (2) 6.56×10^5 J mol^{-1}

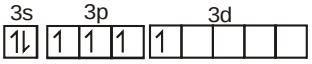
(3) 7.56×10^5 J mol^{-1} (4) 9.84×10^5 J mol^{-1}

Q.21 Which of the following has maximum energy?

(1) 

(2) 

(3) 

(4) 

Q.22 The frequency of radiation emitted when the electron falls from n = 4 to n = 1 in a hydrogen atom will be (Given ionization energy of H = 2.18 × 10^{-18} J $atom^{-1}$)

(1) 1.03 × 10^{15} s^{-1} (2) 3.08 × 10^{15} s^{-1}

(3) 2.00 × 10^{15} s^{-1} (4) 1.54 × 10^{15} s^{-1}

Q.23 What is the maximum number of electrons which can be accommodated in an atom in which the highest principal quantum number value is 4?

(1) 10 (2) 18 (3) 36 (4) 54

Q.24 The wavelength of radiation emitted when an electron in a hydrogen atom makes a transition from an energy level with n = 3 to a level with n = 2 is :

[Given that $E_n = \frac{-1312}{n^2}$ $kJmol^{-1}$]

(1) 6.56 × 10^{-7} m (2) 65.6 nm

(3) 65.6 × 10^{-7} m (4) any of the above

Q.25 The energy required to escape the electron from ground state of H is 13.6 eV then the same for I^{st} excited state of H atom :

(1) 3.4

(2) 13.6

(3) 27.2

(4) can't say anything

Q.26 A gas absorbs a photon of 355 nm and emits at two wavelengths. If one of the emissions is at 680 nm, the other is at :

(1) 743 nm (2) 518 nm

(3) 1035 nm (4) 325 nm

Q.27 The frequency of light emitted for the transition n = 4 to n = 2 of He^+ is equal to the transition in H atom corresponding to which of the following :

(1) n = 3 to n = 1

(2) n = 2 to n = 1

(3) n = 3 to n = 2

(4) n = 4 to n = 3

Q.28 Energy of an electron is given by

$E = -2.178 \times 10^{-18} J \left(\frac{Z^2}{n^2}\right)$. Wavelength of light required to excite an electron in an hydrogen atom from level n = 1 to n = 2 will be :

(h = 6.62 × 10^{-34} Js and c = 3.0 × 10^8 ms^{-1})

(1) 1.214 × 10^{-7} m (2) 2.816 × 10^{-7} m

(3) 6.500 × 10^{-7} m (4) 8.500 × 10^{-7} m

Q.29 Supposing the I.P. of hydrogen atom is 960 eV. Find out the value of principal quantum number having the energy equal to – 60 eV :

(1) n = 2 (2) n = 3 (3) n = 4 (4) n = 5

Q.30 If the ionisation potential of an atom is 20V, its first excitation potential will be :

(1) 5 V (2) 10 V (3) 15 V (4) 20 V

Q.31 Match the following

A.	Energy of ground of He^+	i.	+6.04 eV
B.	Potential energy of I orbit of H-atom	ii.	–27.2 eV
C.	Kinetic energy of II excited state of He^+	iii.	54.4 eV

D.	Ionization potential of He^+	iv.	–54.4 eV

(1) A – i ; B – ii ; C – iii ; D – iv

(2) A – iv ; B – iii ; C –ii ; D – i

(3) A – iv ; B – ii ; C – i ; D – iii

(4) A – ii ; B – iii ; C – i ; D – iv

ASSERTION & REASON TYPE QUESTIONS

In each sub-question below an assertion A and reason R is given. Choose the correct answers from the codes A, B, C and D given for each question.

(A) If both A and R are correct and R is correct explanation of A.

(B) If both A and R are correct and R is not correct explanation of A.

(C) If A is correct but R is wrong.

(D) If A is wrong but R is correct.

Q.32 **Assertion :** K and Cs are used in photoelectric cells.

Reason: K and Cs emit electrons on exposure to light.

(1) A (2) B (3) C (4) D

Q.33 **Assertion :** Radiant energy of quantum is given by E= hν.

Reason: Quantum in the energy equation signifies the principal quantum number.

(1) A (2) B (3) C (4) D

Q.34 **Assertion :** Energy of the orbitals increases as *1s < 2s = 2p <3s = 3d = 3d < 4 s= 4p = 4d = 4f <..*

Reason: Energy of the electron depends completely on the principal quantum numbers.

(1) A (2) B (3) C (4) D

Q.35 **Assertion :** It is impossible to determine the exact position and exact momentum of an electron simultaneously.

Reason: The path of an electron in an atom is clearly defined.

(1) A (2) B (3) C (4) D

Q.36 **Assertion:** Emitted radiation will fall in visible range when an electron jump n= 4 to n =2 in H-atom.

Reason: Balmer series radiations belong to visible range for hydrogen atom only.

(1) A (2) B (3) C (4) D

Q.37 **Assertion:** The kinetic energy of photo-electrons increases with increases in frequency of incident light where $v > v_0$.

Reason: Whenever intensity of light is increased the number of photo-electrons ejected always increases.

(1) A (2) B (3) C (4) D

Q.38 **Assertion :** Cu^{+2} is a coloured ion.

Reason: Every ion with unpaired electron is coloured .

(1) A (2) B (3) C (4) D

Q.39 **Assertion :** For n= 3 , L may be 0,1 and 2 and m may be 0; 0 $\pm$ 1; and $\pm$ 2

Reason : For each value of n, there are 0 to (n – 1) possible values of L ; and for each value of l , there are 0 to $\pm$ values of m.

(1) A (2) B (3) C (4) D

ANSWER KEY

NEET RANKER'S STUFF

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	3	2	2	3	3	1	4	3	4	2	2	2	2	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	2	1	3	4	2	2	3	1	1	4	2	1	3	3
Que.	31	32	33	34	35	36	37	38	39						
Ans.	3	1	3	3	3	1	3	3	1						