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| **Karan Arora**  **R.L. Institute M: 9416974837**  **Class : XI**  **Chapter : 2**  **“STRUCTURE OF ATOM”** |

**Assignment – 1**

1. Calculate the number of protons, neutrons and electrons in 35Br80.
2. Find out the atomic number , mass number , number of protons , electrons and neutrons present in the element with the notation 92U238.
3. The nucler radius is of the order of 10 – 13 cm while atomic radius is of the order 10 – 8 cm. Assuming the nucleus and the atom to be spherical, what fraction of the atomic volume is occupied by the nucleus?
4. Complete the following table :

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Particle | Mass No. | Atomic No. | Protons | Neutrons | Electrons |
| Nitrogen atom | …… | …… | …… | 7 | 7 |
| Calcium ion | …... | 20 | …… | 20 | ……. |
| Oxygen atom | 16 | 8 | …… | …… | ……. |
| Bromide ion | …… | …… | …… | 45 | 36 |

1. The number of electrons, protons and neutrons in a species are equal to 18 , 16 and 16respectively. Assign the proper symbol to the species.
2. Calculate the percentage of higher isotope of neon which has atomic mass 20.2 and the isotopes have the mass number 20 and 22.
3. Neutrons can be found in all atomic nuclei except in one case. What is this atomic nucleus and what does it consists of ?
4. How many nucleons are present in an atom of Nobelium, 102No254? How many electrons are present in the atom? How many nucleons may be considered as neutrons?
5. Find the number of protons, electrons and neutrons in (a) (b)
6. (a) Calculate number of electrons which will together weigh one gram. **[ N.C.E.R.T.]**

(b) Calculate the mass and charge of one mole of electrons.

1. (i) Calculate the total number of electrons present in one mole of methane. **[ N.C.E.R.T.]**

(ii) Find : (a) the total number and (b) the total mass of neutrons in 7 mg of C14 (Assume mass of neutrons = 1.675 x 10 – 27 kg.)

(iii) Find : (a) the total number and (b) the total mass of protons in 34 mg of NH3 at STP (Assume mass of protons = 1.6726 x 10 – 27 kg.)

Will the answer changed if the temperature and pressure are changed ?

1. How many neutrons and protons are there in following nuclei? **[ N.C.E.R.T.]**

, , , ,

STRUCTURE OF ATOM Page No. 1

1. Write the complete symbol for the atom with the given atomic number (Z) and atomic mass (A) :

(i) Z = 17 , A = 35 (ii) Z = 92 , A = 233 (iii) Z = 4 , A = 9 **[ N.C.E.R.T.]**

**Answers**

3. 10 – 15

4.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Particle | Mass No. | Atomic No. | Protons | Neutrons | Electrons |
| Nitrogen atom | **14** | **7** | **7** | 7 | 7 |
| Calcium atom | **40** | 20 | **20** | 20 | **18** |
| Oxygen atom | 16 | 8 | **8** | **8** | **8** |
| Bromide atom | **80** | **35** | **35** | 45 | 36 |

5. 6. 10 % 7. H 10. (i) 1.098 x 1027 electrons (ii) 5.486 x 10 – 7 kg , 9.65 x 104 C

11. (i) 6.022 x 1024 (ii) 2.4088 x 1021 , 4.0347 x 10 – 6 kg (iii) 1.2044 x 1022 , 2.0145 x 10 – 5 kg

13. (i) 17Cl35 (ii) 92U233 (iii) 4Be9

STRUCTURE OF ATOM Page No. 2

**Karan Arora M: 9416974837**

**Assignment – 2**

1. Calculate (a) wave number (b) frequency of yellow radiations having wavelength of 5800 Å.
2. The wavelength range of the visible spectrum extends from violet (400 nm) to red (750 nm). Express these wavelengths in frequencies (Hz).
3. Calculate the frequency of infrared radiations having wavelength 3 x 106 nm.
4. Calculate the range of frequencies of visible light from 3800 – 7600 Å.
5. How long would it take a radio wave of frequency, 6 x 103 sec – 1 to travel from Mars to the earth, a distance of 8 x 107 km?
6. Calculate the wave number of radiations having a frequency of 4 x 1014 Hz.
7. A particular radio station broadcasts at a frequency of 1120 KHz (Kilohertz). Another radio station broadcasts at a frequency of 98.7 MHz (megahertz). What are the wavelengths of the radiation form each station?

**Answers**

1. (a) 1.72 x 106 m – 1  (b) 5.172 x 1014 s – 1  2. 4 x 1014 Hz to 7.5 x 1014 Hz 3. 1011 sec – 1

4. 3.95 x 1014 to 7.89 x 1014 sec – 1  5. 4 min 26 sec 6. 1.33 x 104 cm – 1

7. 267.85 m , 3.0395 m

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**Assignment – 3**

1. Calculate the frequency and energy of a photon of radiation having wavelength 6000 Å.
2. Calculate the energy of a mole of photons of radiations whose frequency is 5 x 1014 Hz?
3. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.
4. Calculate the kinetic energy of the electron ejected when yellow light of frequency 5.2 x 1014 sec – 1 falls on the surface of potassium metal. Threshold frequency of potassium is 5 x 1014 sec – 1 .
5. Which has a higher energy: a photon of red light with a wavelength of 7500 Å or a photon of green light with a wavelength of 5250 Å?
6. In the ultraviolet region of the atomic spectrum of hydrogen, a line is obtained at 1026 Å. Calculate the energy of photon of this wavelength (h = 6.626 x 10 – 34 J-sec).
7. In the infrared region of the atomic spectrum of hydrogen, a line is obtained at 3802 cm – 1 . Calculate the energy of this photon (h = 6.626 x 10 – 34 J-sec).
8. light of a wavelength 4000 Å falls on the surface of cesium. Calculate the energy of the photoelectron emitted. The critical wavelength for photoelectric effect in cesium is 6600 Å.
9. What is the ratio between the energies of two radiations, one with a wavelength of 6000 Å and the other with 2000 Å.
10. The threshold energy for photoelectric emission of electrons from a metal is 3.056 x 10 – 15 joule. If light of 4000 Å wavelength is used, will the electrons be ejected or not? (h = 6.63 x 10 – 34 J-sec)
11. Calculate the wavelength of a photon in Angstrom units having energy of one electron volt.

**Answers**

1. 5 x 1014 s – 1  , 3.3125 x 10 – 19 J 2. 199.51 KJ/mol 3. 2.012 x 1020 s – 1  4. 1.325 x 10 – 20 J

5. Green 6. 1.937 x 10 – 18 J 7. 7.56 x 10 – 20 J 8. 1.95 x 10 – 19 J

9. 1/3 10. No 11. 12.40 x 103 Å

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**Assignment – 4**

1. (a) What are the frequency and wavelength of a photon emitted during a transition from n = 5 state to n = 2 state in the hydrogen atom?

(b) In which region of the electromagnetic spectrum will radiation lie?

1. The wavelength of the first line in the Balmer series is 656 nm. Calculate the wavelength of the second line and the limiting line in Balmer series.
2. Calculate the wavelength of the spectral line obtained in the spectrum of Li2+ ion when the transition takes place between two levels whose sum is 4 and the difference is 2.
3. Calculate the frequency and the wavelength of the radiation in nanometers emitted when an electron in the hydrogen atom jumps from third orbit to the ground state. In which region of the electromagnetic spectrum will this line lie? (Rydberg constant = 109, 677 cm – 1 )
4. Calculate the wavelength from the Balmer formula when n = 3.
5. Calculate the wavelength of the spectral line in Lyman series corresponding to n2 = 3.
6. Calculate the wavelength of the radiation emitted when an electron in a hydrogen atom undergoes a transition from 4th energy level to the 2nd energy level. In which part of the electromagnetic spectrum does this line lie?

**Answers**

1. (a) 434 nm , 6.9 x 1014 s – 1  (b) Visible region 2. 485.9 nm , 364.4 nm 3. 1.14 x 10 – 6 cm

4. 103 nm , 2.91 x 1015 Hz , ultraviolet region 5. 656 nm 6. 102.6 nm

7. 4863 Å , Visible region

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**Assignment – 5**

1. Calculate the energy associated with the first orbit of He+. What is the radius of this orbit?
2. Calculate the velocity of electron in the first Bohr orbit of hydrogen atom. Given that Bohr radius = 0.529 Å, Planck’s constant, h = 6.626 x 10 – 34 J-sec, mass of electron = 9.11 x 10 – 31 kg and 1 J = 1 kg m2/s2.
3. Calculate (i) First excitation energy of the electron in the hydrogen atom .

(ii) Ionization energy of the hydrogen atom .

1. The Ionisation energy of He+ is 8.72 x 10 – 18 J/atom. Calculate the energy of the first stationary state of Li2+.
2. The Ionisation energy of hydrogen in excited state is + 0.85 eV. What will be the energy of the photon emitted when it returns to the ground state?
3. To which orbit the electron in the hydrogen atom will jump on absorbing 12.1 eV of energy?
4. If the energy difference between two electronic states is 214.68 KJ/mol. Calculate the frequency of light emitted when an electron drops from the higher to the lower state. Planck’s constant, h = 39.79 x 10 – 14 KJ sec/mol.
5. In hydrogen atom, an electron jumps form 3rd orbit to the 2nd orbit. Calculate the wavelength of the radiation emitted. (h = 6.63 x 10 – 34 J-sec).
6. Calculate the wave number for the longest wavelength transition in the Balmer series of atomic hydrogen.
7. Applying Bohr’s model when electron in H atom comes form n = 4 to n = 2, calculate the wavelength of the line, write the range of radiation. (RH = 2.18 x 10 – 18 J , h = 6.63 x 10 – 34 J)

**Answers**

1. – 8.72 x 10 – 18 J , 0.02645 nm 2. 2.189 x 106 m/s 3. (i) 9.84 x 105 J/mol (ii) 1.312 x 106 J/mol

4. – 19.62 x 10 – 18 J/atom 5. 12.75 eV 6. 3rd orbit 7. 5.395 x 1014 sec – 1

8. 6564 Å 9. 1.523 x 106 m – 1  10. 4866 Å , visible region

STRUCTURE OF ATOM Page No. 6

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**Assignment – 6**

1. What will be the wavelength of a ball of mass 0.1 kg moving with a velocity of 10 m/s?
2. The mass of an electron is 9.1 x 10 – 31 kg. If its K.E. is 3 x 10 – 25 J. calculate its wavelength.
3. .
4. The kinetic energy of a sub-atomic particle is 5.85 x 10 – 25 J. calculate the frequency of the particle wave. (Planck’s constant, h = 6.626 x 10 – 34 Kg m2 s – 1 )
5. Calculate the de Broglie wavelength of an electron that has been accelerated from rest through a potential difference of 1 KV.
6. Calculate the momentum of a particle which has a de Broglie wavelength of 1 Å or 0.1 nm.

(h = 6.6 x 10 – 34 Kg m2 s – 1)

1. Calculate the wavelength of an electron moving at 3 x 1010 cm/sec (mass of the electron = 9.11 x 10 – 31 kg , h = 6.6 x 10 – 34 Kg m2 s – 1 )
2. The kinetic energy of an electron is 5 x 10 – 5 eV. Calculate the wavelength of the wave associated with the electrons. The mass of the electron may be taken as 10 – 30 kg.
3. A proton is moving with kinetic energy 5 x 10 – 27 J. What is the wavelength of the de Broglie wave associated with it?
4. What will be the wavelength of oxygen molecule in Pico meters moving with a velocity of 660 m/sec
5. A tennis ball of mass 6 x 10 – 2 kg is moving with a speed of 62 m/s. Calculate the wavelength associated with this moving tennis ball. Will the movement of this ball exhibit a wave character? Explain.
6. Calculate de Broglie wavelength of an electron moving with 1 % of the speed of light.
7. Calculate the wavelength of an electron that has been accelerated in a particle accelerator through a potential difference of 100 million volts.

[ 1eV = 1.6 x 10 – 19 J , me = 9.1 x 10 – 31 kg , h = 6.6 x 10 – 34 J s , c = 3 x 108 m/s. ]

1. Calculate the kinetic energy of an - particle which has a wavelength of 12 pm.
2. The energy of an - particle is 6.8 x 10 – 18 J. What will be the wavelength associated with it?

**Answers**

1. 6.626 x 10 – 34 m 2. 896.7 nm 3. 10 – 7 m 4. 1.77 x 10 9 s – 1  5. 3.87 x 10 – 11 m

6. 6.6 x 10 – 24 Kg m2 s – 1 7. 2.41 x 10 – 12 m 8. 1.66 x 10 – 7 m 9. 1.62 x 10 – 7 m

10. 18.8 pm 11. 1.8 x 10 – 34 m, No because the wavelength is too small to be observed.

12. 2.4 Å 13. 12.2 x 10 – 14 m 14. 2.29 x 10 – 19 J 15. 2.2 x 10 – 12 m

STRUCTURE OF ATOM Page No. 7

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**Assignment – 7**

1. A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1 Å. What is the uncertainty involved in the measurement of its velocity?
2. Calculate the uncertainty in the velocity of a wagon of mass 3000 kg whose position is known to an accuracy of 10 pm (Planck’s constant, h = 6.63 x 10 – 34 J s)
3. Calculate the uncertainty in the position of an electron if the uncertainty in its velocity is 5.7 x 105 m/sec (h = 6.6 x 10 – 34 Kg m2 s – 1 , mass of the electron is 9.1 x 10 – 31 kg )
4. A golf ball has a mass of 40 g and a speed of 45 m/sec. If speed can be measured within accuracy of 2 %, calculate the uncertainty in position.
5. If an electron is moving with a velocity 600 m/s which is accurate upto 0.005 %, then calculate the uncertainty in its position.
6. Calculate the product of uncertainty in position and velocity for an electron of mass 9.1 x 10 – 31 kg according to Heisenberg uncertainty principle.
7. Calculate the uncertainty in velocity (v) of a cricket ball (mass = 0.15 kg) if the uncertainty in its position (x) is of the order of 1 Å.
8. Calculate the minimum uncertainty in velocity of a particle of mass 1.1 x 10 – 27 kg if uncertainty in its position is 3 x 10 – 10 cm
9. The uncertainty in position and velocity of a particle are : 10 – 10 m and 5.27 x 10 – 24 m/sec respectively. Calculate the mass of the particle
10. The mass of an electron is 9.11 x 10 – 31 kg. Calculate the uncertainty in its velocity if the uncertainty in its position is of the order of 10 pm.
11. An electron has a speed of 500 m/s with an uncertainty of 0.02 %. What is the uncertainty in locating its position?
12. A proton is accelerated to a velocity of 3 x 107 m/s. If the velocity can be measured with a precision of 0.5 % , calculate the uncertainty in position of proton (mass of proton = 1.66 x 10 – 27 kg )
13. Calculate the uncertainty in the position of a dust particle with mass equal to 1 mg if the uncertainty in its velocity is 5.5 x 10 – 20 m/s.
14. The uncertainty in the momentum of a particle is 2.2 x 10 – 4 g cm/sec. With what accuracy can its position be determined?
15. What is the minimum uncertainty in the position of a bullet of mass 5 g that is known to have a speed somewhere between 550,00000 and 550,00001 m/s?

**Answers**

1. 5.79 x 106 m/s 2. 1.76 x 10 – 27 m/s 3. 10 – 10 m 4. 1.46 x 10 – 33 m

5. 1.93 x 10 – 3 m 6. 5.77 x 10 – 5 m2/sec 7. 3.5 x 10 – 24 m/s 8. 1.59 x 104 m/s

9. 0.1 kg 10. 5.76 x 106 m/s 11. 5.77 x 10 – 4 m 12. 2.11 x 10 – 13 m

13. 9.55 x 10 – 10 m 14. 2.4 x 10 – 24 cm 15. 1.05 x 10 – 32 m

STRUCTURE OF ATOM Page No. 8

**Karan Arora M: 9416974837**

**Assignment – 8**

1. An electron is in a 4f orbital. What possible values for the quantum numbers n , l , m and s can it have?
2. Using s , p , d , and f notations, describe the orbitals with the following quantum numbers :

(a) n = 2 , l = 1 (b) n = 4 , l = 0 (c) n = 5 , l = 3 (d) n = 3 , l = 2

1. Which of the following sets of quantum numbers are not permitted ?

|  |  |
| --- | --- |
| a) n = 2 , l = 2 , m = 1 , s = + 1/2 | b) n = 2 , l = 1 , m = 1 , s = 1/2 |
| c) n = 2 , l = 0 , m = 0 , s = 0 | d) n = 2 , l = 1 , m = 2 , s = + 1/2 |

1. Write down the quantum numbers n , l and m for the following orbitals :

(a) (b) (c) (f)

1. Which of the following orbitals are not possible ? 1p , 2s , 3f and 4d
2. If n = 3, what are the values of quantum numbers l and m?
3. How many orbitals are present in the subshells with (a) n = 3 , l = 2 (b) n = 4 , l = 2 (c) n = 5 , l = 2 ?
4. What are the values of n , l and m for 2p orbitals?
5. Write the correct orbital notations for each of the following sets of quantum numbers :

(a) n = 1 , l = 0 , m = 0 (b) n = 2 , l = 1 , m = 1 (c) n = 3 , l = 2 , m = + 1

1. What designation is given to an orbital having

(a) n = 2 , l = 1 (b) n = 3 , l = 0 (c) n = 5 , l = 3 (d) n = 4 , l = 2

1. Which of the following orbitals are not possible? 7s , 2d , 3f and 1p
2. Which of the following sets of quantum numbers are not possible ?

|  |  |
| --- | --- |
| a) n = 3 , l = 2 , m = 0 , s = 1/2 | b) n = 3 , l = 2 , m = 2 , s = 1/2 |
| c) n = 3 , l = 3 , m = 3 , s = + 1/2 | d) n = 3 , l = 1 , m = 0 , s = + 1/2 |

1. Give the values of the quantum numbers for the electrons with the highest energy in sodium atom.
2. Find the number of unpaired electrons present in phosphorus (At. No = 15) , chromium (At. No = 24) and copper (At. No = 29) after writing their orbital electronic configurations.
3. Write the electronic configurations of the elements with the following atomic numbers :

3 , 8 , 14 , 17 , 21 , 38 , 57 Also mention the groups of the periodic table to which they belong.

1. What atoms are indicated by the following electronic configurations ?

(a) 1s2 2s2 2p1 (b) [Ar] 4s2 3d1

1. A neutral atom of element has 2K, 8L and 5 M electrons. Find out the following :

(a) Atomic number of the element (b) Total number of s electrons (c) Total number of p electrons

(d) Number of protons in the nucleus (e) Valency of the element

1. Give the electronic configuration of the following ions :

(a) Cu2+ (b) Cr3+ (c) Fe2+ and Fe3+  (d) H –  (e) S2 –

1. Give the electronic configurations of : (a) Scandium (At. No = 21) (b) Chromium (At. No = 24).
2. Write the electronic configurations and the names of the elements having the atomic numbers 5 , 9 , 10 , 19 and 20.
3. Give the electronic configurations of the elements : 19K , 25Mn , 20Ca.
4. Write the electronic configurations of the elements : Chlorine and Phosphorus
5. Give the electronic configurations of the ions : H – 1  , Na+ , N – 1  , N2+

STRUCTURE OF ATOM Page No. 9

1. Write down the electronic configuration of an element with atomic number 14. Which group in the periodic table does this element belongs to ?
2. Name the elements that corresponds to each of the given electronic configurations. Write down their atomic number also : (i) 1s2 2s2 2p2  (ii) 1s2 2s2 2p6 3s2 3p1  (iii) 1s2 2s2 2p6 3s2 3p6
3. Correct the following electronic configurations of the elements in the ground state :

(i) 1s2 2s1 2 2 2 3s2 3 (ii) 1s2 2s2 2p6 3s2 3p6 3d5 (iii) 1s2 2s2 2p6 3s2 3p6 3d4 4s2

1. The atomic mass of an elements is double its atomic number. If there are four electrons in the 2p orbital, then draw the model of the atom showing the arrangement of protons, neutrons and electrons. Give its valency and name the element.
2. Write the electronic configurations of : 9F19 , 16S32 and 18Ar38 and then point out the element with :

(a) Maximum nuclear charge (b) Minimum number of protons (c) Highest mass number

(d) Maximum number of unpaired electrons.

1. What are the atomic numbers of elements whose outermost electrons are represent by :

(a) 3s1 (b) 2p3 (c) 3d6

1. What atoms are indicated by the following configurations ?

(a) [He] 2s1 (b) [Ne] 3s2 3p3 (c) [Ar] 4s2 3d1

1. Which of the following configurations represent the element in the ground and which in the excited state? Name the element in each case :

(i) 1s2 2s1 2p1 (ii) 1s2 2s2 2p1  (iii) 1s2 2s1 2 2 2 (iv) 1s2 2s2 2p6 3s2 3 3 33d1

1. A p-subshell which consists of px ,py and pz orbitals contains only one electrons. In which one of these three orbitals should the electors be located? justify your answer.
2. Which of the following quantum numbers for orbitals in hydrogen atom has a greater energy for electrons? (i) n = 3 , l = 2 and m = +1 (ii) n = 3 , l = 2 and m = 1

**Answers**

1. n = 4, l = 3, m = 3 to +3, s = +1/2 or 1/2 2. 2p , 4s , 5f , 3d 3. a , c & d are not permitted

4. (i) 3 , 2 , +2 (ii) 4 , 2 , 0 (iii) 3 , 2 , 2 (iv) 4 , 2 , +1 (v) 2 , 1 , 0 (vi) 3 , 1 , +1

5. 1p and 3f are not possible 6. l = 0, 1, 2 m = - 2 to +2 7. 5 orbitals in each case

8. n = 2 , l = 1 , m = -1 to +1 9. 1s , 2py , 3dxz 10. 2p , 3s , 5f , 4d 11. 2d , 3f , 1p

12. c 13. n = 3, l = 0, m = 0 , s = +1/2 or 1/2 14. 3 , 6 , 1

15. 38 = 1s2 2s2 2p6 3s2 3p6 3d10 4s2 4p6 5s2 , group = 2

57 = 1s2 2s2 2p6 3s2 3p6 3d10 4s2 4p6 4d10 5s2 5p6 5d1 6s2 , group = 3

16. Boron (B) , Scandium (Sc) 17. 15 , 6 , 9 , 15 , 3 24. group = 14 25. 6C , 13Al , 18Ar

26. (i) 1s2 2s2 2 2 23s2 (ii) 1s2 2s2 2p6 3s2 3p6 4s2 3d3 (iii) 1s2 2s2 2p6 3s2 3p6 3d5 4s1

27. 1s2 2s2 2 2 2 , two , oxygen 28. (a) 18 in 18Ar38 (b) 10 = 9F19 (c) 18Ar38 (d) 2 in 16S32

29. (a) 11 (b) 7 (c) 26 30. (a) 3Li (b) 15P (c) 21Sc

31. (i) Be (ii) B (iii) C (iv) S , all are in excited state except (ii)

32. In any one because they are degenerate 33. Same energy but different orientations.

STRUCTURE OF ATOM Page No. 10

**Karan Arora M: 9416974837**

**COMPETITION FOCUS – 1**

1. Nitrogen has the electronic configuration 1s2 2s2 2 2 2 and not 1s2 2s2 2 2 2 which is determined by :

|  |  |
| --- | --- |
| a) Pauli exclusion principle | b) Aufbau principle |
| c) Hund’s rule | d) Uncertainty principle |

1. Which of the following has largest de-Broglie wavelength, provided all have equal velocity?

|  |  |
| --- | --- |
| a) Carbon dioxide molecule | b) Electron |
| c) Ammonia molecule | d) proton |

1. The orbital diagram in which the Aufbau principle is violated is :

|  |  |
| --- | --- |
| a) | b) |
| c) | d) |

1. Which of the following relates to photons both as wave motion and as a stream of particles :

|  |  |  |  |
| --- | --- | --- | --- |
| a) interference | b) E = mc2 | c) diffraction | d) E = h |

1. The orbital diagram in which both the Pauli’s exclusion principle and Hund’s rule are violated is :

|  |  |
| --- | --- |
| a) | b) |
| c) | d) |

1. The number of nodal planes ‘5d’ orbital has, is:

|  |  |  |  |
| --- | --- | --- | --- |
| a) zero | b) one | c) two | d) three |

1. For a d electron, the orbital angular momentum is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) | b) | c) | d) 2 |

1. The position of both, an electron and a helium atom, is known within 1 nm. Further, the momentum of the electron is known within 5 x 10 – 26 kg m s – 1. The minimum uncertainty in the measurement of momentum of helium atom is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 50 kg m s – 1 | b) 5 x 10 – 26 kg m s – 1 | c) 80kg m s – 1 | d) 80 x 10 – 26 kg m s – 1 |

1. The number of nodal planes in a px orbital is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) one | b) two | c) three | d) zero |

1. Among the following groupings which represents the collection of isoelectronic species?

|  |  |  |  |
| --- | --- | --- | --- |
| a) NO+ , ,, CO | b) N2 , , CO , NO | c) CO , NO+ , CN – , | d) NO , CN – , N­2 , |

1. Principal, Azimuthal and magnetic quantum numbers are respectively related to :

|  |  |
| --- | --- |
| a) size , orientation and shape | b) size , shape and orientation |
| c) shape , size and orientation | d) None of these |

1. For which of the following species, Bohr’s theory is not applicable?

|  |  |  |  |
| --- | --- | --- | --- |
| a) Be3+ | b) Li2+ | c) He2+ | d) H |

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

|  |  |  |  |
| --- | --- | --- | --- |
| a) 10 | b) 18 | c) 36 | d) 54 |

STRUCTURE OF ATOM Page No. 11

1. The following quantum number are possible for how many orbitals? n = 3 , l = 2 , m = + 2

|  |  |  |  |
| --- | --- | --- | --- |
| a) 1 | b) 2 | c) 3 | d) 4 |

1. Which of the following element outermost orbital’s last electron has magnetic quantum number m = 0?

|  |  |  |  |
| --- | --- | --- | --- |
| a) Na | b) O | c) Cl | d) N |

1. In hydrogen atom, energy of the first excited state is – 3.4 ev. Then find out the K.E. of the same orbit of H - atom

|  |  |  |  |
| --- | --- | --- | --- |
| a) + 3.4 ev | b) + 6.8 ev | c) – 13.6 ev | d) + 13.6 ev |

1. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which of the following inter-orbit jumps of the electron for Bohr orbits in an atom of hydrogen?

|  |  |  |  |
| --- | --- | --- | --- |
| a) 5 2 | b) 4 1 | c) 2 5 | d) 3 2 |

1. The value of Plank’s constant is 6.63 x 10 – 34 J s. The velocity of light is 3 x 108 m/s. Which value is closest to the wavelength in nanometers of a quantum of light with frequency of 8 x 1015 sec – 1 ?

|  |  |  |  |
| --- | --- | --- | --- |
| a) 2 x 10 – 25 | b) 5 x 10 – 18 | c) 4 x 10 1 | d) 3 X 10 7 |

1. A species having only one electron has ionization energy of 11810 KJ/mol. The number of protons in its nucleus will be :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 1 | b) 2 | c) 3 | d) 4 |

1. The electronic configuration. 1s2 2s2 2p6 3s2 3p6 3d9, represents a

|  |  |  |  |
| --- | --- | --- | --- |
| a) Metal atom | b) Non-metal atom | c) non-metallic atom | d) metallic cation |

1. The line spectrum of He+ ion will resemble that of

|  |  |  |  |
| --- | --- | --- | --- |
| a) Hydrogen atom | b) Li+ ion | c) Helium atom | d) Lithium atom |

1. Which of the following orbitals will have zero probability of finding the electrons in the yz plane ?

|  |  |  |  |
| --- | --- | --- | --- |
| a) px | b) py | c) pz | d) dyz |

1. If n = 3 , l = 0 m = 0 then atomic number is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 12 , 13 | b) 13 , 14 | c) 10 , 11 | d) 11 , 12 |

1. The number of radial nodes in 3s and 2p respectively are :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 2 and 0 | b) 1 and 2 | c) 0 and 2 | d) 2 and 1 |

1. Which of the following transitions will have minimum wavelength :

|  |  |  |  |
| --- | --- | --- | --- |
| a) n4 n1 | b) n2 n1 | c) n4 n2 | d) n3 n1 |

**Answers**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. c | 1. b | 1. b | 1. d | 1. a | 1. c | 1. a | 1. b |
| 1. a | 1. c | 1. b | 1. c | 1. c | 1. a | 1. a | 1. a |
| 1. a | 1. c | 1. c | 1. d | 1. a | 1. a | 1. d | 1. a |
| 1. a |  |  |  |  |  |  |  |

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