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**LEVEL – 1**

1. Deuterium nucleus contains :

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| a) 1 p + 1 n | b) 2 p + 0 n | c) 1 p + 1 e – | d) 2 p + 2 n |

1. Which one of the following pairs constitutes isotones?

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| a) 6C13 and 6C14 | b) 6C13 and 7N14 | c) 7N14 and 9F19 | d) 7N14 and 7N15 |

1. 1 mole of photons, each of frequency 250 s – 1 would have approximately a total energy of :

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| --- | --- | --- | --- |
| a) 1 erg | b) 1 Joule | c) 1 eV | d) 1 MeV |

1. The energies E1 and E2 of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths i.e. and will be :

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| --- | --- | --- | --- |
| a) = ½ | b) = | c) = 2 | d) = 4 |

1. In photoelectric effect, the kinetic energy of the photoelectrons increases linearly with the :

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| a) wavelength of incident light | b) frequency of incident light |
| c) velocity of incident light | d) Atomic mass of the element |

1. When the frequency of incident radiation on a metallic plate is doubled, K.E. of the photoelectrons will be :

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| a) doubled | b) halved |
| c) more than doubled | d) increases but less than doubled |

1. The series of lines present in the visible region of the hydrogen spectrum is :

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| a) Lyman | b) Balmer | c) Paschen | d) Brackett |

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

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

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

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

1. The wavelength of the electron emitted, when in a hydrogen atom, electron falls from infinity to stationary state 1, would be (Rydberg constant = 1.097 x 107 m – 1 )

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| --- | --- | --- | --- |
| a) 91 nm | b) 192 nm | c) 406 nm | d) 9.1 x 10 – 8 nm |

1. Planck’s constant has the units of :

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| a) work | b) energy | c) angular momentum | d) linear momentum |

1. According to Bohr’s theory, the angular momentum of an electron in 5th orbit is :

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| a) 10 h/ | b) 2.5 h/ | c) 25 h/ | d) 1 h/ |

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1. Energy of an electron is given by E = – 2.178 x 10 – 18 J (). Wavelength of light required to excite an electron in a hydrogen atom from level 1 to level 2 will be : (h= 6.626 x 10 – 34 Js, speed of light = 3 x 108 m/s).

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| a) 8.500 x 10 – 7 m | b) 1.214 x 10 – 7 m | c) 2.816 x 10 – 7 m | d) 6.500 x 10 – 7 m |

1. The one electron species having ionization energy of 54.4 eV is :

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| --- | --- | --- | --- |
| a) H | b) He+ | c) B4+ | d) Li2+ |

1. Calculate the energy in joule corresponding to light of wavelength 45 nm (h= 6.63 x 10 – 34 Js, speed of light = 3 x 108 m/s).

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| --- | --- | --- | --- |
| a) 6.67 x 10 15 | b) 6.67 x 10 11 | c) 4.42 x 10 – 15 | d) 4.42 x 10 – 18 |

1. The radius of the first Bohr orbit of hydrogen atom is 0.59 . The radius of the third orbit of He+ will be :

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| --- | --- | --- | --- |
| a) 8.46 | b) 0.705 | c) 1.59 | d) 2.655 |

1. In the Sommerfeld’s modification of Bohr’s theory, the trajectory of an electron in a hydrogen atom is :
2. A perfect ellipse
3. A closed ellipse like curve, narrower at the perihelion position and flatter at the aphelion position.
4. A closed loop on the spherical surface
5. A rosette.
6. When the electron of a hydrogen atom jumps from n = 4 to n = 1 state, the number of spectral lines emitted is :

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| a) 15 | b) 9 | c) 6 | d) 3 |

1. How fast is an electron moving if it has a wavelength equal to the distance it travels in one second?

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

1. The de-Broglie wavelength associated with a ball of mass 1 kg having kinetic energy 0.5 J is :

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| a) 6.626 x 10 – 34 m | b) 13.20 x 10 – 34 m | c) 10.38 x 10 – 21 m | d) 6.626 x 10 – 33 |

1. The de-Broglie wavelength of a ball of mass 10 g moving with a velocity of 10 m/s is (h= 6.626 x 10 – 34 Js)

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| --- | --- | --- | --- |
| a) 6.626 x 10 – 33 m | b) 6.626 x 10 – 29 m | c) 6.626 x 10 – 31 m | d) 6.626 x 10 – 36 m |

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. The minimum uncertainty in the measurement of momentum of helium atom is :

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

1. Given : The mass of electron is 9.11 x 10 – 31 kg, Planck constant is 6.626 x 10 – 34 J, the uncertainty involved in the measurement of velocity within a distance of 0.1 is :

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| --- | --- | --- | --- |
| a) 5.79 x 108 m/s | b) 5.79 x 105 m/s | c) 5.79 x 106 m/s | d) 5.79 x 107 m/s |

1. The total number of atomic orbitals in fourth energy level of an atom is :

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| --- | --- | --- | --- |
| a) 4 | b) 8 | c) 16 | d) 32 |

1. For principle quantum number n = 4, the total number of orbitals having l = 3 is :

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| a) 3 | b) 7 | c) 5 | d) 9 |

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1. What is the maximum number of electrons that can be associated with the following set of quantum numbers? n = 3 , l = 1 and m = – 1

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| a) 10 | b) 6 | c) 4 | d) 2 |

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

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| --- | --- | --- | --- |
| a) 0 | b) 1 | c) 2 | d) 3 |

1. The number of 2p electrons having spin quantum number s = – ½ are :

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| --- | --- | --- | --- |
| a) 6 | b) 0 | c) 2 | d) 3 |

1. The angular momentum of an electron is zero. In which orbital may it be present?

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| a) 2s | b) 2p | c) 3d | d) 4f |

1. Which of the following has zero electron density in xy plane?

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| a) | b) | c) pz | d) dxy |

1. The species Ar , K+ and Ca2+ contain the same number of electrons. In which order do their radii increase?

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| a) Ca2+ < K+ < Ar | b) K+ < Ar < Ca2+ | c) Ar < K+ < Ca2+ | d) Ca2+ < Ar < K+ |

1. The ratio of charge and mass would be greatest for :

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| --- | --- | --- | --- |
| a) proton | b) electron | c) neutron | d) -particles |

1. (32Ge76 , 34Se76) and (14Si30 , 16S32) are examples of :

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| --- | --- |
| a) Isotopes and Isobars | b) Isobars and Isotones |
| c) Isotones and Isotopes | d) Isobars and Isotopes |

1. The nucleus of an atom can be assumed to be spherical. The radius of the nucleus of mass number ‘A’ is given by 1.25 x 10 – 13 X A1/3 cm. Radius of atom is one . If the mass number is 64, then the fraction of the atomic volume that is occupied by the nucleus is :

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| --- | --- | --- | --- |
| a) 1 x 10 – 3 | b) 5 x 10 – 5 | c) 2.5 x 10 – 2 | d) 1.25 x 10 – 13 |

1. The sodium vapour street lamp emits radiation of wave length 589 nm. The frequency of this radiation would be :

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| --- | --- | --- | --- |
| a) 5.1 x 10 14 Hz | b) 42 x 10 14 Hz | c) 3 x 10 17 Hz | d) 5 x 10 9 Hz |

1. The wave number of first line of Balmer series of hydrogen is 15200 cm – 1. The wave number of first Balmer line of li2+ ion is :

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| --- | --- | --- | --- |
| a) 15200 cm – 1 | b) 60800 cm – 1 | c) 76000 cm – 1 | d) 136800 cm – 1 |

1. Assuming Rydberg constant (RH) to be 109670 cm – 1 , the longest wavelength line in the Lyman series of the hydrogen spectrum is :

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| --- | --- | --- | --- |
| a) 1215.8 | b) 1025.8 | c) 972.6 | d) 949.8 |

1. Which of the following is the energy of a possible excited state of hydrogen?

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

1. The velocity with which an electron should travel so that its momentum is equal to that of a photon of wavelength 560 nm is :

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| a) 1100 m/s | b) 1200 m/s | c) 1300 m/s | d) 400 m/s |

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1. Uncertainty in the position of an electron (mass = 9.1 x 10 – 31 kg) moving with a velocity 300 m/s, accurate upto 0.001 %, will be :

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| a) 1.92 x 10 – 2 m | b) 3.84 x 10 – 2 m | c) 19.2 x 10 – 2 m | d) 5.76 x 10 – 2 m |

1. Which shell would be the first to have a g-subshell?

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| --- | --- | --- | --- |
| a) 4th | b) 5th | c) 6th | d) 7th |

1. The maximum number of electrons that can be accommodated in the subshell with azimuthal quantum number l = 4 is :

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| --- | --- | --- | --- |
| a) 10 | b) 8 | c) 16 | d) 18 |

1. The number of planar and spherical nodes in 4f-orbital are respectively:

|  |  |  |  |
| --- | --- | --- | --- |
| a) 4 and 3 | b) 0 and 3 | c) 2 and 1 | d) 3 and 0 |

1. The total number of electrons present in all the p-orbitals of bromine is :

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| --- | --- | --- | --- |
| a) 5 | b) 15 | c) 17 | d) 35 |

1. How many electrons in a given atom can have the following set of quantum numbers?

n = 3 , l = 2 , m = +2 , s = – 1/2

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| a) 1 | b) 18 | c) 14 | d) not possible |

**Answers**

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

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