Shiksha Classes Bhandara

Subject : Chemistry **Topic : Atomic structure** **M.M. : 100**

Marking Scheme:

(i) Each question is allotted 4 (four) marks for each correct response.

(ii) ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

Q.1 The atomic number of an element is equal to the –
(A) number of neutrons
(B) electrical charge of the nucleus
(C) weight of the nucleus
(D) atomic weight divided by two

Q.2 Wave nature of electrons was demonstrated by –
(A) Schrodinger (B) de-Broglie
(C) Davission and Germer (D) Heisenberg

Q.3 What is the wave number for 4th line in Balmer series of hydrogen spectrum ? (R = 109677 cm^{-1})
(A) 24630 cm^{-1} (B) 24360 cm^{-1}
(C) 24730 cm^{-1} (D) 24372 cm^{-1}

Q.4 $_{19}K^{40}$ and $_{20}Ca^{40}$ are known as –
(A) isotopes (B) isobars
(C) isotones (D) isodiaphers

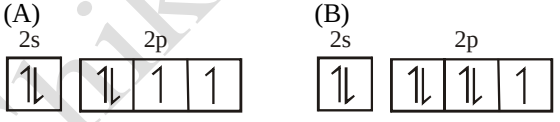
Q.5 What is the wavelength (in metre) of a particle of mass 6.62×10^{-29}g moving with a velocity of 10^3 m/s –
(A) 6.62×10^{-4} (B) 6.62×10^{-3}
(C) 10^{-5} (D) 10^5

Q.6 What are the values of n_1 and n_2 respectively for H_β line in the Lyman series of hydrogen atomic spectrum ?
(A) 3 and 5 (B) 2 and 3
(C) 1 and 3 (D) 2 and 4

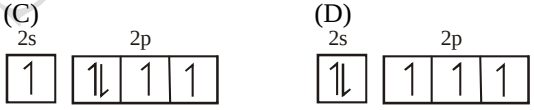
Q.7 Electronic configuration of hydride ion is –
(A) $1s^0$ (B) $1s^1$
(C) $1s^2$ (D) $1s^1\ 2s^1$

Q.8 Which one of the following has unit positive charge and 1u mass –
(A) Electron (B) Neutron
(C) Proton (D) None of these

Q.9 Which is not in accordance to Aufbau principle ?
(A) (B)



(C) (D)



Q.10 What is the electronic configuration of Mn^{2+} ?
(A) [Ne] $3d^5\ 4s^0$ (B) [Ar] $3d^5\ 4s^2$
(C) [Ar] $3d^5\ 4s^0$ (D) [Ne] $3d^5\ 4s^2$

Q.11 The radius of hydrogen atom is 0.53Å. The radius of $_3Li^{2+}$ is of –
(A) 1.27 Å (B) 0.17 Å
(C) 0.57 Å (D) 0.99 Å

Q.12 If the energy of a photon is given as : 3.03×10^{-19} J, then wavelength λ of the photon is –
(A) 6.56nm (B) 65.6nm
(C) 656nm (D) 0.656nm

Q.13 In hydrogen atom, energy of first excited state is – 3.4eV. Find out KE of the same orbit of Hydrogen atom –
(A) + 3.4 eV (B) + 6.8 eV
(C) – 13.6 eV (D) + 13..6 eV

Q.14 The value of Planck's constant is 6.63×10^{-34} Js. The velocity of light is 3.0×10^8 m/s. Which value is closest to the wavelength in nanometers of a quantum of light with frequency of $8 \times 10^{15}\ s^{-1}$?
(A) 3×10^7 (B) 2×10^{-25}
(C) 5×10^{-18} (D) 4×10^1

Q.15 An electron collides with a hydrogen atom in its ground state and excited it to a state of n = 3. How much energy was given to the hydrogen atom in this inelastic collision –
(A) 12.08 eV (B) 6.12 eV
(C) 15.14 eV (D) 18.21 eV

Q.16 Given : The mass of electron is 9.11×10^{-31} kg , Planck constant is 6.626×10^{-34} Js, the uncertainty involved in the measurement of velocity within a distance of 0.1Å is –
(A) 5.79×10^7 m/s (B) 5.79×10^8 m/s
(C) 5.79×10^5 m/s (D) 5.79×10^6 m/s

Q.17 The orientation of an atomic orbital is governed by –
(A) Spin quantum number
(B) Magnetic quantum number
(C) Principal quantum number
(D) Azimuthal quantum number

For Q.18-Q.20

Werner Heisenberg considered the limits of how precisely we can measure the properties of an electron or other microscopic particle. He determined that there is a fundamental limit to how closely we can measure both position and momentum. The more accurately we measure the momentum of a particle, the less accurately we can determine its position. The converse is also true. This is summed up in what we now call the Heisenberg uncertainty principle.

The equation is $\Delta x.\Delta (mv) \geq \frac{h}{4\pi}$

The uncertainty in the position or in the momentum of a macroscopic object like a baseball is too small to observe. However, the mass of microscopic object such as an electron is small enough for the uncertainty to be relatively large and significant.

Q.18 If the uncertainties in position and momentum are equal, the uncertainty in the velocity is –
(A) $\sqrt{\frac{h}{\pi}}$ (B) $\sqrt{\frac{h}{2\pi}}$

(C) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$ (D) None of these

Q.19 If the uncertainty in velocity and position is same, then the uncertainty in momentum will be –

(A) $\sqrt{\frac{hm}{4\pi}}$ (B) $m\sqrt{\frac{h}{4\pi}}$

(C) $\sqrt{\frac{h}{4\pi m}}$ (D) $\frac{1}{m}\sqrt{\frac{h}{4\pi}}$

Q.20 What would be the minimum uncertainty in de-Broglie wavelength of a moving electron accelerated by potential difference of 6 volt and whose uncertainty in position is $\frac{7}{22}$ nm ?

(A) 6.25 Å (B) 6Å

(C) 0.625 Å (D) 0.3125 Å

For Q.21-Q.25 :

The answer to each question is a NUMERICAL VALUE.

Q.21 The atomic number of an element M is 26. How many electrons are present in the M-shell of the element in its M^{3+} state ?

Q.22 The total number of electrons present in all the p-orbitals of bromine is –

Q.23 The total number of orbitals in the fifth energy level is –

Q.24 The atomic number of an element is 17. The number of orbitals containing electron pairs in its valence shell is –

Q.25 The following quantum numbers are possible for how many orbital(s) n = 3, ℓ = 2, m = + 2 ?