



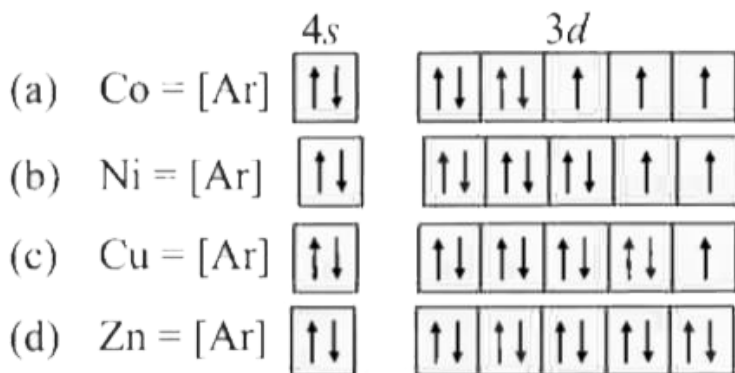
CHEMISTRY

BOOKS - MTG WBJEE CHEMISTRY (HINGLISH)

ATOMIC STRUCTURE

**Wb Jee Workout Category 1 Single Option
Correct Type 1 Mark**

1. Which of the following is not correct for electronic distribution in the ground state?



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2. Which one of the following sets of quantum numbers represents an impossible arrangement ?

$$\text{A. } \begin{cases} n & l & m_l & m_s \\ 3 & 2 & -2 & 1/2 \end{cases}$$

$$\text{B. } \begin{cases} n & l & m_l & m_s \\ 4 & 0 & 0 & 1/2 \end{cases}$$

$$\text{C. } \begin{cases} n & l & m_l & m_s \\ 3 & 2 & -3 & 1/2 \end{cases}$$

$$\text{D. } \begin{cases} n & l & m_l & m_s \\ 5 & 3 & 0 & -1/2 \end{cases}$$

Answer:



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3. In a set of degenerate orbitals, the electrons distribute themselves to retain like spins as far as possible. The statement is attributed to

A. Pauli exclusion principle

B. Aufbau principle

C. Hund's rule of maximum multiplicity

D. Slater's rule.

Answer:



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4. When the value of the azimuthal quantum number is 3, the magnetic quantum number can have values

A. +1, -1

B. +1, 0, -1

C. +2, +1, 0, -1, -2

D. +3, +2, +1, 0, -1, -2, -3.

Answer:



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5. A transition metal X has a configuration $[\text{Ar}] 3d^4$ in its +3 oxidation state. Its atomic number is

A. 25

B. 26

C. 22

D. 19

Answer:



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6. The orbital angular momentum of an electron in 2s orbital is

A. $+\frac{1}{2} \cdot \frac{h}{2\pi}$

B. zero

C. $\frac{h}{2\pi}$

D. $\sqrt{2} \cdot \frac{h}{2\pi}$

Answer:



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7. In Balmer series of hydrogen atom spectrum which electronic transition causes third line ?

- A. Fifth Bohr orbit to second one
- B. Fifth Bohr orbit to first one
- C. Fourth Bohr orbit to second one
- D. Fourth Bohr orbit to first one

Answer:



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8. A photon of radiation of wavelength 4000 \AA has an energy E . The wavelength of photon of radiation having energy $0.5 E$ will be

A. 2000 Å

B. 8000 Å

C. 4000 Å

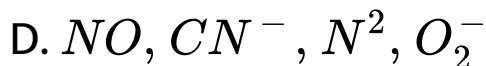
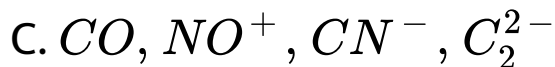
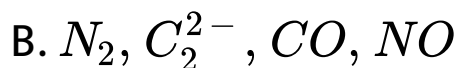
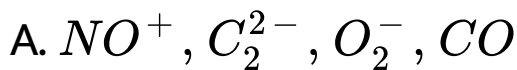
D. 6000 Å

Answer:



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



Answer:



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10. The number of d-electrons in Ni (at. no.= 28) is equal to that of the

A. p electrons in F^-

B. p electrons in Ar

C. d electrons in Ni^{2+}

D. total electrons in N.

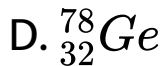
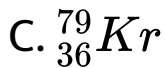
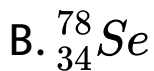
Answer:



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11. Which is the isotone ${}^{76}_{32}Ge$?

A. ${}^{77}_{32}Ge$



Answer:



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12. The first emission line in the H-atom spectrum in the Balmer series will have wave number

A. $\frac{5R}{36} \text{cm}^{-1}$

B. $\frac{3R}{4} \text{cm}^{-1}$

C. $\frac{7R}{144} \text{cm}^{-1}$

D. $\frac{9R}{400} \text{cm}^{-1}$

Answer:



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13. If the ionisation energy of hydrogen atom is 13.6 eV, the energy required to excite it from ground state to the next higher state is nearly

A. 3.4 eV

B. 10.2 eV

C. 12.1 eV

D. 1.5 eV

Answer:



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14. The one electron species having ionisation energy of 54.4 eV is

A. H

B. He^+

C. B^{4+}

D. Li^{2+}

Answer:



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15. If $n = 3$, $l = 0$, $m = 0$, then atomic number is

A. 12 or 13

B. 13 or 14

C. 10 or 11

D. 11 or 12

Answer:



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16. The correct set of quantum numbers (n , l and m respectively) for the unpaired electron of chlorine atom is

A. 2, 1, 0

B. 2, 1, 1

C. 3, 1, 1

D. 3, 2, 1

Answer:



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17. The number of 2p electrons having spin quantum number $s = -1/2$ are

A. 6

B. 0

C. 2

D. 3

Answer:



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18. The uncertainty in momentum of an electron is 1×10^{-5} kg mis. The uncertainty in its position will be ($h = 6.62 \times 10^{-34}$ kgm²/s)

A. $5.27 \times 10^{-30} \text{ m}$

B. $1.05 \times 10^{-26} \text{ m}$

C. $1.05 \times 10^{-28} \text{ m}$

D. $5.25 \times 10^{-28} \text{ m}$

Answer:



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19. Which of the following expression gives the de Broglie relationship ?

$$\text{A. } p = \frac{h}{mv}$$

$$\text{B. } \lambda = \frac{h}{mv}$$

$$\text{C. } \lambda = \frac{h}{mp}$$

$$\text{D. } \lambda m = \frac{v}{p}$$

Answer:



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20. For the Paschen series the values of n_1 and n_2 in the expression

$$\Delta E = R_H \cdot c \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

A. $n_1 = 1, n_2 = 2, 3, 4 \dots$

B. $n_1 = 2, n_2 = 3, 4, 5$

C. $n_1 = 3, n_2 = 4, 5, 6 \dots$

D. $n_1 = 4, n_2 = 5, 6, 7 \dots$

Answer:



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21. For principal quantum number $n = 4$, the total number of orbitals having $l = 3$ is

A. 3

B. 5

C. 7

D. 9

Answer:



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22. Consider the ground state of Cr atom ($Z = 24$). The number of electrons with the azimuthal quantum numbers $l = 1$ and 2 are respectively

A. 12 and 4

B. 12 and 5

C. 16 and 4

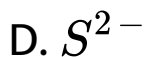
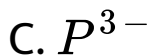
D. 16 and 5

Answer:



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23. A species has 16 protons, 18 electrons and 16 neutrons. Find the species and its charge.



Answer:



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24. The number of d-electrons retained in Fe^{2+} (At. no. of Fe= 26) ion is

A. 4

B. 5

C. 6

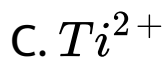
D. 3

Answer:



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25. Which of the following ions has the maximum magnetic moment?



Answer:



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26. The spectrum of He is expected to be similar to that of

A. H

B. Na

C. He^+

D. Li^+

Answer:



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27. The electronic transitions from $n = 2$ to $n = 1$ will produce shortest wavelength in (where $n = 1$ = principal quantum state)



Answer:



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28. The following quantum numbers are possible for how many orbitals?

$$n = 3, l = 2, m = +2.$$

A. 1

B. 2

C. 3

D. 4

Answer:



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29. Which of the following does mathematical expression for not represent the the Heisenberg uncertainty principle?

A. $\Delta x \cdot \Delta p \geq h / (4\pi)$

B. $\Delta x \cdot \Delta v \geq h / (4\pi m)$

C. $\Delta x \cdot \Delta mv \geq h / (4\pi)$

D. $\Delta x \cdot \Delta v \geq h / (4\pi)$

Answer:



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Wb Jee Workout Category 2 Single Option
Correct Type 2 Marks

1. The ratio of the difference in energy between the first and the second Bohr orbit to that between the second and the third Bohr orbit is

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{4}{9}$

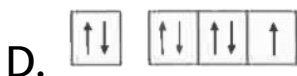
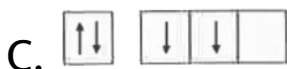
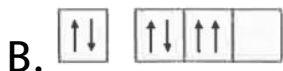
D. $\frac{27}{5}$

Answer:



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2. The orbital diagram in which both the Pauli's exclusion principle and Hund's rule are violated is



Answer:



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3. If electron, hydrogen, helium and neon nuclei are all moving with the velocity of light, then the wavelengths associated with these particles are in the order

A. electron \gt hydrogen \gt helium \gt neon

B. electron \gt helium \gt hydrogen \gt neon

C. electron \lt hydrogen \lt helium \lt neon

D. neon It hydrogen It helium It electron.

Answer:

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4. Which one of the following set of quantum numbers is not possible for 4p electron?

A. $n = 4, l = 1, m = -1, m_s = +\frac{1}{2}$

B. $n = 4, l = 1, m = 0, m_s = +\frac{1}{2}$

C. $n = 4, l = 1, m = 2, m_s = +\frac{1}{2}$

$$D. n = 4, l = 1, m = -1, m_s = -\frac{1}{2}$$

Answer:



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5. The nucleus of an atom can be assumed to be spherical. The radius of the nucleus of mass number A is given by $1.25 \times 10^{-13} \times A^{1/3}$ cm. Radius of atom is one A . If the mass number is 64, then the fraction of the atomic volume that is occupied by the nucleus is

A. 1.0×10^{-3}

B. 5.0×10^{-5}

C. 2.5×10^{-2}

D. 1.25×10^{-13}

Answer:



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6. Assuming Rydberg constant (R_H) to be 109670 cm^{-1} , the longest wavelength line in the Lyman series of the hydrogen spectrum is

A. 1215.8\AA

B. 1025.8\AA

C. 972.6\AA

D. 949.8\AA

Answer:



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7. Light of wavelength λ shines on a metal surface with intensity x and the metal emits y

electrons per second of average energy, z .

What will happen to y and z if x is doubled ?

- A. y will be doubled and z will become half
- B. y will remain same and z will be doubled
- C. both y and z will be doubled
- D. y will be doubled but z will remain same.

Answer:



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8. A particle A moving with a certain velocity has a de Broglie wavelength of 1 \AA . If particle B has mass 25% of that A and velocity 75% of that of A, the de Broglie wavelength of B will be approximately

A. 1 \AA

B. 5.3 \AA

C. 3 \AA

D. 0.2 \AA

Answer:



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9. If n and l are respectively the principal and azimuthal quantum numbers, then the expression for the calculation of the total no. of electrons in any energy level is

A.
$$\sum_{l=0}^{l=n} 2(2l + 1)$$

B.
$$\sum_{l=n-1}^{l=n+1} 2(2l + 1)$$

C.
$$\sum_{l=0}^{l=n+1} 2(2l + 1)$$

D.
$$\sum_{l=0}^{l=n-1} 2(2l + 1)$$

Answer:



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10. Which of the following element outermost orbit's last electron has magnetic quantum number $m = 0$?

A. Na

B. O

C. Cl

D. N

Answer:



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11. The value of Planck's constant is 6.63×10^{-34} Js. The velocity of light is $3.0 \times 10^8 \text{ms}^{-1}$. Which value is closest to the wavelength in nanometers of a quantum of light with frequency of $8 \times 10^{15} \text{s}^{-1}$?

A. 2×10^{-25}

B. 5×10^{-18}

C. 37.5

D. 26.7

Answer:



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

A. $5 \rightarrow 2$

B. $4 \rightarrow 1$

C. $2 \rightarrow 5$

D. $3 \rightarrow 2$

Answer:



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13. In the Bohr's orbit, what is the ratio of total kinetic energy and the total energy of the electron?

A. -1

B. -2

C. $+1$

D. $+2$

Answer: A



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14. The frequency of the radiation emitted when the electron falls from $n = 4$ to $n = 1$ in a hydrogen atom will be

(Given ionization energy of $H = 2.18 \times 10^{-18}$

J atom^{-1} and $h = 6.625 \times 10^{-34} \text{ Js}$)

A. $1.54 \times 10^{15} \text{ s}^{-1}$

B. $1.03 \times 10^{15} \text{ Js}^{-1}$

C. $3.08 \times 10^{15} \text{ s}^{-1}$

D. $2.0 \times 10^{15} \text{ s}^{-1}$

Answer:



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Wb Jee Workout Category 3 One Or More Than One Option Correct Type 2 Marks

1. Some of the following sets of quantum numbers are correct for a 4d electron. Which are the correct sets?

A. $4, 3, 2, +\frac{1}{2}$

B. $4, 2, 1, 0$

C. $4, 2, -2, +\frac{1}{2}$

D. $4, 2, 1, -\frac{1}{2}$

Answer:



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2. Which of the following statements are correct for an electron that has $n = 4$ and $m = -2$?

A. The electron may be in a p-orbital.

B. The electron is in the fourth principal electronic shell.

C. The electron may be in a d-orbital.

D. The electron must have the spin quantum number = $-1/2$.

Answer:



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3. Which of the following is/are not correct?

A. Isotones differ in the number of neutrons.

B. Isobars contain the same number of neutrons but differ in the number of protons.

C. No isotope of hydrogen is radioactive.

D. Density of nucleus is much greater than that of atom.

Answer:



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4. For which of the following species, the expression for the energy of electron in n th orbit

$\left(E_n = - \frac{13.6Z^2}{n^2} eV a \rightarrow m^{-1} \right)$ has the validity?



C. Deuterium

D. Tritium

Answer:



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5. Which of the following statement(s) is(are) correct?

A. The electronic configuration of Cr is



B. The magnetic quantum number may have a negative value.

C. In silver atom, 23 electrons have a spin of one type and 24 of the opposite type.

(Atomic number of Ag=47)

D. The total number of orbitals in a shell with principal quantum number n is $2n^2$.

Answer:

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6. Out of the following pairs of electrons, identify the pairs of electrons present in degenerate orbitals.

A. (i)

$$n = 3, I = 2, m_l = -2, m_s = -\frac{1}{2}$$

$$(ii) n = 3, l = 2, m_l = 1, m_s = -\frac{1}{2}$$

B. (i) $n = 3, I = 1, m_l = 1, m_s = +\frac{1}{2}$

$$(ii) n = 3, l = 2, m_l = 2, m_s = +\frac{1}{2}$$

C. (i) $n = 4, I = 1, m_l = 1, m_s = +\frac{1}{2}$

$$(ii) n = 3, l = 2, m_l = -2, m_s = +\frac{1}{2}$$

D. (i)

$$n = 3, I = 2, m_l = +2, m_s = -\frac{1}{2}$$

(ii)

$$n = 3, l = 2, m_l = +2, m_s = \pm \frac{1}{2}$$

Answer:



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7. The energy of an electron in the first Bohr orbit of H atom is -13.6 eV. The possible energy value(s) of the excited state(s) for electrons in Bohr orbits of hydrogen is (are)

A. $-3.4eV$

B. $-4.2eV$

C. $-6.8eV$

D. $-1.5eV$

Answer:



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8. Which of the following statements is/are correct?

A. The mass of neutron is slightly greater than that of proton.

B. e/m ratio of particle in anode rays depends upon the nature of the gas taken in the discharge tube.

C. In H-atom, the electron revolves at a fixed distance of 0.53 \AA .

D. Angular momentum of all s-electrons is same.

Answer:



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9. The sum of the number of neutrons and protons in the isotope of hydrogen is

A. 6

B. 2

C. 4

D. 3

Answer:



10. According to Bohr's theory,

A. when the atom gets the required energy from the outside, electrons jump from lower orbits to higher orbits and remain there

B. when the atom gets the required energy from outside, electrons jump from lower orbits to higher orbits and remain there

for very short intervals of time and return back to the lower orbit, radiating energy.

C. angular momentum of the electron is proportional to its quantum number

D. angular momentum of the electron is independent of its quantum number.

Answer:



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11. For a d-electron the orbital angular momentum is

A. h

B. $\sqrt{6} \frac{h}{2\pi}$

C. $\sqrt{2}h$

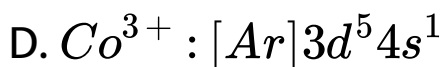
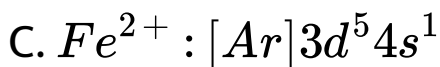
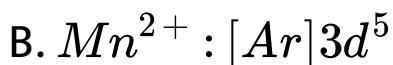
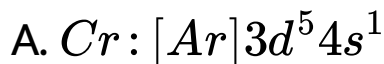
D. $\sqrt{6}h$

Answer:



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12. Which of the following configurations are correct in the first excited state?



Answer:



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Wb Jee Previous Years Questions Category 1

Single Option Correct Type 1 Mark

1. The emission spectrum of hydrogen discovered first and the region of the electromagnetic spectrum in which it belongs, respectively are

- A. Lyman, ultraviolet
- B. Lyman, visible
- C. Balmer, ultraviolet
- D. Balmer, visible.

Answer:



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2. As per de Broglie's formula a macroscopic particle of mass 100 g and moving at a velocity of 100 cm s^{-1} will have a wavelength of

A. $6.6 \times 10^{-29} \text{ cm}$

B. $6.6 \times 10^{-30} \text{ cm}$

C. $6.6 \times 10^{-31} \text{ cm}$

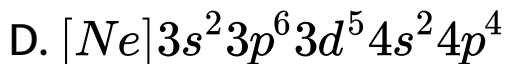
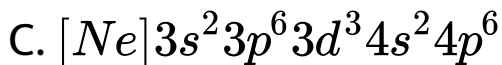
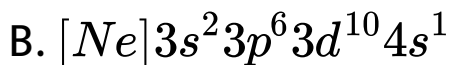
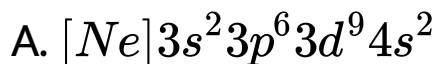
D. $6.6 \times 10^{-32} \text{ cm}$

Answer:



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3. The electronic configuration of Cu is



Answer:



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4. The energy required to break one mole of hydrogen hydrogen bonds in H_2 is 436 kJ. What is the longest wavelength of light required to break a single hydrogen-hydrogen bond?

A. 68.5 nm

B. 137 nm

C. 274 nm

D. 548 nm

Answer:



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5. Which one of the following corresponds to a photon of highest energy?

A. $\lambda = 300nm$

B.

C. $\nu = 3 \times 10^8 s^{-1}$

$$D. \bar{\nu} = 30\text{cm}^{-1}$$

Answer:



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6. If the given four electronic configurations (i)

$n = 4, l = 1$ (ii) $n = 4, l = 0$

(iii) $n = 3, l = 2$ (iv) $n = 3, l = 1$

are arranged in order of increasing energy,

then the order will be

A. (iv)lt (ii)lt (iii) lt (i)

B. (ii)lt (iv)lt (i) lt (iii)

C. (i) lt (iii) lt (ii) lt (iv)

D. (iii) lt (i) lt (iv) lt (ii)

Answer:



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7. Which of the following sets of quantum numbers represents the 19th electron of Cr (Z= 24)?

A. $\left(4, 1, -1, +\frac{1}{2}\right)$

B. $\left(4, 0, 0, +\frac{1}{2}\right)$

C. $\left(3, 2, 0, -\frac{1}{2}\right)$

D. $\left(3, 2, -2, +\frac{1}{2}\right)$

Answer:



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8. Which of the following electronic configuration is not possible?

A. $n = 3, l = 0, m = 0$

B. $n = 3, l = 1, m = -1$

C. $n = 2, l = 0, m = -1$

D. $n = 2, l = 1, m = 0$

Answer:



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9. The number of unpaired electrons in Ni (atomic number = 28) are

A. 0

B. 2

C. 4

D. 8

Answer:



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**Wb Jee Previous Years Questions Category 2
Single Option Correct Type 2 Marks**

1. The time taken for an electron to complete one revolution in Bohr orbit of hydrogen atom is

A. $\frac{4m^2\pi r^2}{n^2h^2}$

B. $\frac{n^2h^2}{4mr^2}$

C. $\frac{4\pi^2mr^2}{nh}$

D. $\frac{nh}{4\pi^2mr^2}$

Answer:



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