CHEMISTRY

JEE MAIN AND ADVANCED

STRUCTURE OF ATOM

Example

1. Why electrons are considered as the universal constituents of matter?

Watch Video Solution

2. Calculate the number of protons , electrons and neutrons in the following.

(a) Chloride ion $\left(Cl^{-}\right)$ with $Z=17, A=35$

(b) Aluminium ions $\left(Al^{3+}\right)$ with $Z=13, A=27$

Watch Video Solution

3. Calculate the frequency , wave number of the microwaves with 4×10^7 nm

Watch Video Solution

4. Calculate the wavelength , frequency and wave number of a light wave whose time period is $3 \times 10^{-10} s$.

Watch Video Solution

5. Two radiations one having red colour $\left(\lambda = 7.5 \times 10^{-5} cm\right)$ and other with orange colour $\left(\lambda = 6.2 \times 10^{-5} cm\right)$. Which will have higher energy ?

Watch Video Solution

6. Calculate the frequency and wavelength of photon with energy $3.98 \times 10^{-15} J$

Watch Video Solution

7. What is the work function (w_o) of the metal whose threshold frequency (v_0) is $5.2 \times 10^{14} s^{-1}$?

Watch Video Solution

8. A 100 watt bult emits monochromatic light of wavelength 400 nm. Calcualte the number of photons emitted per second by the bulb.

Watch Video Solution

9. Calcualte the maximum kinetic energy of photoelectrons emitted where as light of freqency $2 \times 10^{16} Hz$ is irradiated on a metal surface with threshold frequency (v_0) equal to$8.68 \times 10^{15} Hz$.

Watch Video Solution

10. Why line spectra is regarded as the fingerprints of atoms ?

Watch Video Solution

11. Calcualte the limiting wavelengths of Balmer Series.

Watch Video Solution

12. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4$ to $n = 2$ of He^+ spectrum ?

Watch Video Solution

13. How many spectrual lines are emitted by atomic Hydrogen, when an electron jumps from 5th energy level to ground state ?

Watch Video Solution

14. Calculate the radii of 2nd Bohr orbit of Li^{2+}

Watch Video Solution

15. Calculate the energy of an electron in the first Bohr orbit of He^{+}.

Watch Video Solution

16. Calculate the frequency of the spectral line corresponding to $n(1) = 2$ and $n_2 = 4$. To which spectral series does this line belong ?

Watch Video Solution

17. An electron in H -atoms jumps from some higher level to 3rd energy level.If three spectral lines are possible for the transition, find the initial

position of electron.

Watch Video Solution

18. An electron is moving in an orbit of circumference 14.92Å in He^+ .

Calculate

(a) Energy of electron in this orbit

(b) Ionisation Energy of He^+

(c) Separation energy

Watch Video Solution

19. Calculate the wavelength associated with cricket ball ofmass of 150 g travelling with a velocity of$25ms^{-1}$

Watch Video Solution

20. If the KE of electron is 2.5×10^{-24} J , then calculate its de-Broglie wavelength.

Watch Video Solution

21. Calculate the uncertainty in the velocity of anelectron when the uncertainty in its positionis $1.012 \times 10^{-12} m$

Watch Video Solution

22. Calculate the uncertainity in the position of a cricket ball of mass 150 g if the uncertainity in its velocity is$3.53 \times 10^{-24} ms^{-1}$

Watch Video Solution

23. What is the uncertainty in locating the position of an electron with speed $25 ms^{-1}$ having uncertainity of$0.1\ \%$?

Watch Video Solution

24. (i)The uncertainties in the potisition and velocity of particle are $3.14 \times 10^{-10} m$ and$5.27 \times 10^{-24} m / s$ respectively . Calculate mass of the particle.

(ii)Find the numberof waves made by a Bohr electron in one complete revolution in the 3rd Bohr orbit.

Watch Video Solution

25. Write down the values of azimuthal quantum number possiblefor electron present in $3rd$ shell.

Watch Video Solution

26. How many orbitals are present in p-subshell?

Watch Video Solution

27. Give the possible values of lm_l , m_s for electrons having$n = 2$

Watch Video Solution

28. From the following sets of quantum numbers , state which are possible ?

(i) $n = 0, l = 0, m_l = 1, m_s = +1/2$

(ii) $n = 2, l = 1, m_l = 0, m_s = -1/2$

(iii) $n = 2, l = 0, m_1 = 3, m_s = +1/2$

(iv) $n = 3, l = 1, m_l = 0, m_s = +1/2$

Watch Video Solution

29. name the element with electronic configuration $1s^2 2s^2 2p^6 3s^2$

Watch Video Solution

30. Arrange the following orbital in the increasing order of the energy

$3s, 4d, 2p, 4s, 3p$

Watch Video Solution

31. In which of the following orbitals , the sum of $(n+1)$ value is lowest ?

$4s, 3d, 4p$

Watch Video Solution

32. Whatis the electronic configuration of Argon ?

Watch Video Solution

33. Which of the following quantum number for orbitals in hydrogen atom has a greater energy of electrons ?

(i) $n = 3, l = 2$ and $m_l + 1$

(ii) $n = 3, l = 2$ and $m_l = -1$

Watch Video Solution

Illustration 1

1. Why electron cannot exist inside the nucleus according to Heisenberg's uncertainty principle?

Watch Video Solution

Illustration 2

1. Determine the following for the fouth shellof an atom

(a) The number of subshells

(b) The designation for each subshell

(c) The number of orbitals in each subshell

(d) The maximum number of electrons that can be contained in each subshell

(e) The maximum number of electrons that can be contained in the shell.

Watch Video Solution

Try Yourself

1. Why the cathode rays always are considered to be consiste of fundamental common particles called electrons?

Watch Video Solution

2. Why is charge on cathode ray particles ?

Watch Video Solution

3. Calculate the number of proton, neutrons and electrons in $._{19}^{39}K$.

Watch Video Solution

4. What is the symbol of the species with number of electrons equal to 36, protons eual to 35 and neutrons equal to 45 ?

Watch Video Solution

5. The wave length range of the visible spectrum extends from violet (400 nm)to red (750 nm). Express these wavelengthsin frequencies (Hz) $\left(1nm = 10^{-9}m\right)$.

Watch Video Solution

6. A FM radio station broadcasts at frequency of 103.1 MHz . What is the wavelengthof these radiowaves ?

Hint : $\lambda = \frac{c}{v}\ 1MHz = 10^6 Hz$

Watch Video Solution

7. The Vividh Bharti station of All India Radio , Delhi, broadcasts on a frequency of1,368 kHz. Calculate the wavelength of the electromagnetic spectrum it belongs to

Hint : $\lambda = \frac{c}{v}\ 1kHz = 10^3 Hz$

Watch Video Solution

8. The threshold frequency v_0 for a metal is $8 \times 10^{14} s^{-1}$. What is the kinetic energy of an electron emitted having frequency $v = 1.0 \times 10^{15} s^{-1}$

Watch Video Solution

9. A hot metal emits photons of light with energy $3.0 \times 10^{-19} J$. Calculate the frequency and wavelength of the photon?

Watch Video Solution

10. Calculate the energy of photon of light having frequency of $2.7 \times 10^{13} s^{-1}$

Watch Video Solution

11. Calculate energy of one mole of photons of radiation whose frequency is 5×10^{14} Hz.

Watch Video Solution

12. the threashold frequency v_0 for a metal is $7 \times 10^{14} s^{-1}$. Calculate the kinetic energy of an electron emitted when radiation of fequency $v = 1.0 \times 10^{15} s^{-1}$ hits the metal .

Watch Video Solution

13. Photoelectrons are removed with kinetic energy $1.864 \times 10^{-21} J$, when photons of light with energy $4.23 \times 10^{-19} J$ fall on the metal. What is the minimum energy required per mole to remove an electron potassium metal?

Hing : $hv_0 = hv - KE$

Energy required per mole $= hv_0 \times 6.022 \times 10^{23}$

Watch Video Solution

14. Calculate the threshold freqency of the metalfrom the photoelectronsare emitted with zero velocity when exposed to radiation of wavelength 6800 Å

Hint : $KE = \frac{1}{2}mv^2$

$hv = hv_0 + KE, KE = 0$

$v = \frac{c}{\lambda}$

Watch Video Solution

15. Calculate the energy associated with the first orbitof He^+.What is the radius of this orbit ?

Hint : $E_n = -2.18 \times 10^{-18}\left(\frac{Z^2}{n^2}\right) J/\text{atom}$

$He^+(Z=2)$

$r_n = \frac{52.9(n^2)}{Z}$ pm

Watch Video Solution

16. what are the frequency and wavelength of a photon emitted during a transition from n = 5 state to the n =2 state in the hydrogen atom?

Watch Video Solution

17. Calculate the ratio of the radius of 1^{st} orbit of H atom to thatof4^{th} orbit.

Hint : $r_n \propto (n)^2$

Watch Video Solution

18. Calculate thevelocity of the electron in the third orbit of hydrogen atom

Hint : $v = \frac{2.18 \times 10^6 z}{n} = m/s$

Watch Video Solution

19. what will be the wavelength of a ball of mass 0.1 kg moving with a velocity of $10ms^{-1}$?

Watch Video Solution

20. Calcualte the wavelength of matter wave associated with small ball of mass of 100g travelling at a velocity of $35ms^{-1}$

Watch Video Solution

21. A beam of helium atoms moves with a velocity of$2 \times 10^4 ms^{-1}$. Find the wavelength of paritcles constituting with the beam .

Hint : Mass of helium atom $= \frac{4}{6.022 \times 10^{23}} g$

Watch Video Solution

22. Calculate the frequency of paritcle wave, when the kinetic energy of a sub-atomic particle is$3.79 \times 10^{-27} J$.

Hint : $KE = \frac{1}{2} mv^2$

$\lambda = \frac{h}{mv}, \lambda = \frac{v}{v}$

$\therefore \frac{v}{v} = \frac{h}{mv}, v = \frac{mv^2}{h} = \frac{2 \times \frac{1}{2} mv^2}{h}$

Watch Video Solution

23. Calculate the uncertainty in the position of a dust particle with mass equal to $1mg$ if the uncertiainty in its velocity is $5.5 \times 10^{-20} ms^{-1}$

Watch Video Solution

24. A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1 Ã.... What is the uncertainty involved in the measurement of its velocity ?

Watch Video Solution

25. A golf ball has a mass of $40g$ and a speed of $45m/s$. If the speed can be measured within accuracy of 2%, calculate the uncertainty in the position.

Watch Video Solution

26. What is the uncertainty in velocity of an electron if the uncertainty in its position is $10^{-10}m$? Mass of the electron is $9.1 \times 10^{-31}kg$ and $h = 6.6 \times 10^{-34}m^2s^{-1}$?

Watch Video Solution

27. Calculate the uncertainty in the velocity of a wagon of mass 3000 kg, whose position is known to an accuracy of ± 10 pm.

Hint , Position known to accuracty mean ± 10 pm, i.e., $\Delta x = \pm 10$ pm.

Watch Video Solution

28. An electron has a speed$3 \times 10^3 ms^{-1}$ with uncertainty $0.07\,\%$. What is the uncertainty in locating its position ?

Hint : $\Delta v = 3 \times 10^2 \times 0.07\,\%$

Watch Video Solution

29. Usings,p,d,f notations, describe the orbital with the following quantum numbers.

(i) $n = 2, l = 1$

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

9iii) $n = 5, l = 3$

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

Watch Video Solution

30. What is the toal number of orbitals associated with the principal quantum number $n = 3$?

Hint : The total number of orbitals in a shell is given by formula $= n^2$?

Watch Video Solution

31. Which of the following orbitals are possible ?

$1 \pm, 2s, 3f, 3d$

Watch Video Solution

32. What are the possible values of m_s when m_l have values $+1, +2, +3$?

Watch Video Solution

33. f-orbitals cannot be present in which of the following shell ?

$n = 1, n = 2, n = 3, n = 4, n = 5$

Hint : $'l' = 0$ to $(n - 1)$, f-orbital 'l' =3

Watch Video Solution

34. An orbital has $l = 4$, what are the possible values of m_l ?

Hint : $m_l = -1, \ldots\ldots, 0 \ldots\ldots\ldots, +l$

Watch Video Solution

35. Write the electronic configuration of chlorine atom ?

Hint : Chlorine $(Z = 17)$

Watch Video Solution

36. How may valence electrons are present in sodium with atomic number 11 ?

Hint : $1s^2 2s^2 2p^6 3s^1$

Watch Video Solution

37. How many core electrons are presentin $._{19} K$?

Hint : $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

Watch Video Solution

38. Name the element with the following electronic configurations .

(a) $1s^2 2s^2 2p^6 3s^2 3p^1$

(b) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

(c) $1s^2 2s^1 2p^6 3s^2 3p^6 3d^5 4s^1$

Watch Video Solution

39. How many angular nodes are present in d_{xy} orbital ?

Hint : Angular nodes $-$ $'l'$

Watch Video Solution

40. How many number of nodes present in 3s-orital?

Hint : $(n-1) =$ Radial nodes in s-orbital

Watch Video Solution

Assignment Section A Objective Type Questions One Option Is Correct

1. Canal rays produced when hydrogen atoms are taken in the discharge tube constitutes

A. Electrons

B. Protons

C. Neutrons

D. Nucleus

Answer: 2

Watch Video Solution

2. Cathode rays move towards

A. Positively charged cathode

B. Positively charged anode

C. Negatively charged cathode

D. Negatively charged anode

Answer: 2

Watch Video Solution

3. The absolute charge on an electron is -

A. $-1.6 \times 10^{-19} C$

B. $9.1 \times 10^{-31} C$

C. $-1.6 \times 10^{-31} C$

D. $-9.1 \times 10^{-19} C$

Answer: 1

Watch Video Solution

4. The charge to mass ratio of electron was found out to be

A. $1.6022 \times 10^{-19} C kg^{-1}$

B. $1.925 \times 10^{12} C kg^{-1}$

C. $1.758 \times 10^{11} C kg^{-1}$

D. $1.869 \times 10^{13} C kg^{-1}$

Answer: 3

Watch Video Solution

5. The ratio of mass of an electron to that of the mass of hydrogen atom is

A. $1:3871$

B. $1:1837$

C. $1:1296$

D. $1:3781$

Answer: 2

Watch Video Solution

6. Which of the following is a correct statement ?

A. Anode rays arise from anode (so called)

B. Anode rays are also known as canal rays

C. The nature of anode rays depend upon the nature of gas in the discharge tube

D. All of these

Answer: 4

Watch Video Solution

7. How many times is an atom bigger than the nucleus ?

A. 100000

B. 5000

C. 10000

D. 200

Answer: 1

Watch Video Solution

8. What α-rays strikea thin gold foil then

A. Most of the $\alpha -$ rays do not pass through the gold foil

B. Most of the $\alpha -$ rays get deflected back

C. Most of the$\alpha -$ rays get deflected through small angles

D. Most of the $\alpha -$ rays pass through without any deviation.

Answer: 4

Watch Video Solution

9. Rutherford's $\alpha -$ scattering experiment was successful in discovering

A. Nucleus

B. Protons

C. Neutrons

D. Electrons

Answer: 1

Watch Video Solution

10. The general representation of the symbol of element 'X' is $(Z =$ Atomic number, A $=$ Mass number)

A. $._{X}^{A} Z$

B. $._{Z}^{A} X$

C. $(A+1)^{X}$ ˆ $(Z+1)$

D. $._{X} A^{Z}$

Answer: 2

Watch Video Solution

11. Isotopes have

A. Same number of protons

B. Same number of neutrons

C. Different number of electrons

D. Different atomic numbers

Answer: 1

Watch Video Solution

12. The number of neutrons in deuterium is

A. 0

B. 1

C. 2

D. 3

Answer: 2

Watch Video Solution

13. Which of the following species have maximum number of electrons ?

A. Mg

B. C

C. Na^+

D. F

Answer: 1

Watch Video Solution

14. The range of wavelength of the visible light is

A. 400 - 750 nm

B. 200- 400 nm

C. 400 - 750 Å

D. 200 - 400 Å

Answer: 1

Watch Video Solution

15. The correct seuence of frequency of the electromagnetic radiations in electromagnetic spectrum is

A. X-rays $>$ UV rays $>$ Microwaves $>$ Radio waves

B. Radio waves $>$ Microwaves $>$ UV rays $>$ X -rays

C. UV rays $>$ X -rays $>$ Radio waves $>$ Microwaves

D. Radiwaves $>$ Microwaves $>$ X -rays $>$ UV rays

Answer: 1

Watch Video Solution

16. The colour of light which has maximum frequency is

A. Blue

B. Red

C. Green

D. Violet

Answer: 4

Watch Video Solution

17. The kinetic energy of the photoelectrons depends upon the

A. Intensity of striking light

B. Number of photons striking

C. Frequency of striking light

D. Number of photoelectrons ejected

Answer: 3

Watch Video Solution

18. The value of n_1 for Pashecn series of hydrogen spectrum is($n_1 =$ orbit number in which electron falls)

A. 1

B. 2

C. 3

D. 4

Answer: 3

Watch Video Solution

19. Radius of Bohr's orbit of hydrogen atom is

A. 0.24Å

B. 0.48Å

C. 0.53Å

D. 1.06Å

Answer: 3

Watch Video Solution

20. Bohr theory is not applicable for

A. He^+

B. Li^{2+}

C. Br^+

D. H

Answer: 3

Watch Video Solution

21. Which among the following scientists was successful in accounting for the stability of atom ?

A. NeilsBohr

B. Rutherford

C. J.J. Thomson

D. Maxwell

Answer: 1

Watch Video Solution

22. How many spectral lines are seen for hydrogen atom when electron jump from $n_2 = 5$ to $n_1 = 1$ in visible region ?

A. 2

B. 3

C. 4

D. 5

Answer: 2

Watch Video Solution

23. What is the energy associated with 3^{rd} energy shell of hydrgoen atom ?

A. $-2.18 \times 10^{-18} J$

B. $-0.342 \times 10^{-19} J$

C. `-0. 726 xx 10^(-18) J

D. $-2.42 \times 10^{-19} J$

Answer: 4

Watch Video Solution

24. Find out the incorrect match

A. Electron - Dual nature

B. Rainbow - Discontinuous spectra

C. Atoms - Line spectra

D. Particle nature - Photoelectric effect

Answer: 2

Watch Video Solution

25. The de -Brogile wavelength associated with a matter particle is

A. Directly proportional to the momentum of the particle

B. Directly proportional to the velocity of the particle

C. Inversely proportional to the velocity of the particle

D. Inversely proportional to Planck's constant

Answer: 3

Watch Video Solution

26. de-Broglie wavelength applies only to

A. Light particles

B. Electrons

C. Photons

D. All the microscopic matter in motion

Answer: 4

Watch Video Solution

27. The wavelength associated with an electron moving with velocity $10^{10} ms^{-1}$ is

A. $6.62x10^{-10}m$

B. $7.27 \times 10^{-14}m$

C. $3.69 \times 10^{-12}m$

D. $4.92 \times 10^{-11}m$

Answer: 2

Watch Video Solution

28. The formula for Heisenberg's uncertainty principle is

A. $\lambda = \frac{h}{mv}$

B. $\Delta x \times \Delta p \geq \frac{h}{4\pi}$

C. $\Delta x \times \Delta p \geq \frac{h}{2\pi}$

D. $mvr = n\frac{h}{2\pi}$

Answer: 2

Watch Video Solution

29. Who first time ruled out the existence of definite paths of electrons ?

A. de-Broglie

B. Heisenberg

C. Neils Bohr

D. Einstein

Answer: 2

Watch Video Solution

30. Probability density is given by

A. Ψ

B. $|\Psi|^2$

C. de-Broglie wavelength

D. H

Answer: 2

Watch Video Solution

31. The possible values of magnetic quantum number for p-orbital are

A. 0

B. $-1, 0, +1$

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

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

Answer: B

Watch Video Solution

32. The notation of orbital with $n = 5$ and $l = 3$ is

A. 2p

B. 5s

C. 5f

D. 3d

Answer: 3

Watch Video Solution

33. The possible valuesof $m_l$in a givensubshell are given by the formula

A. n^{20}

B. $2n^2$

C. $2l+1$

D. $4l+1$

Answer: 3

Watch Video Solution

34. The shape of $\rho-$ orbital is

A. Dumb-bell

B. Double dumb -bell

C. Spherical

D. Conical

Answer: 1

Watch Video Solution

35. In multi-electron atom 4s-orbital is lower in energy than

A. 3d-orbital

B. 3p-oribital

C. 2s-orbital

D. 2p-orbital

Answer: 1

Watch Video Solution

36. The main energy shell in which the electron is present is given by

A. Principal quantum number

B. Azimuthal quantum number

C. Spin quantum number

D. Magnetic quantum number

Answer: 1

Watch Video Solution

37. Shape of an orbital is given by

A. Principal quantum number

B. Spin quantum number

C. Azimuthal quantum number

D. Magnetic quantum number

Answer: 3

Watch Video Solution

38. Orientation of orbitals is given by

A. Magnetic quantum number

B. Spin quantum number

C. Azimuthal quantum number

D. Principal quantum number

Answer: 1

Watch Video Solution

39. Which one of the following orbitals is spherical in shape ?

A. 4s

B. 3p-oribital

C. 3d

D. 4f

Answer: 1

Watch Video Solution

40. The number of valence electrons in Aluminium is

A. 1

B. 2

C. 3

D. 4

Answer: C

Watch Video Solution

41. For $n = 4$, which one of the following values of l is not possible ?

A. 1

B. 2

C. 3

D. 4

Answer: 4

Watch Video Solution

42. The number of electrons present in 3d of $Cu^{\oplus}$ is

A. 20

B. 10

C. 16

D. 24

Answer: 2

Watch Video Solution

43. The maximum number of electrons that can be accomoddated in $d_{x^2-y^2}$ orbital is

A. 10

B. 5

C. 2

D. 1

Answer: 3

Watch Video Solution

44. The number of unpaired electrons in magnesium atom is

A. 0

B. 1

C. 2

D. 3

Answer: 1

Watch Video Solution

45. The correct sequence of energy of orbitals of multielectron species is

A. $4p < 3d < 4s$

B. $4s < 4p < 3d$

C. $4s < 3d < 4p$

D. $3d < 4s < 4p$

Answer: C

Watch Video Solution

46. The maximum number of unpaired electrons can present in p_x orbital is

A. 0

B. 1

C. 2

D. 3

Answer: 2

Watch Video Solution

47. The number of electrons present in 'M' shell of silicon is

A. 2

B. 4

C. 6

D. 8

Answer: 2

Watch Video Solution

Assignment Section B Objective Type Questions One Option Is Correct

1. How many electrons with $l = 2$ are there in an atom having atomic number 54 ?

A. 3

B. 10

C. 14

D. 20

Answer: D

Watch Video Solution

2. The maximum number of electrons possible in subshell is equal to

A. $2l + 1$

B. $2n^2$

C. $2l^2$

D. $4l + 2$

Answer: 4

Watch Video Solution

3. The potential energy of an electron in hydrogen atom is $-3.02eV$, its kinteic energy will be

A. $1.51eV$

B. $15.10eV$

C. $13.6eV$

D. $1.36eV$

Answer: 1

Watch Video Solution

4. In the emission line spectra of hydrogen atom, how many lines can be accounted for all possible electronic transitions from 5^{th} energy level within the atom?

A. 4

B. 5

C. 10

D. 20

Answer: 3

Watch Video Solution

5. Which set of quantum numbers is not consistent with theory?

A. $n = 2, l = 1, m = 0, s = -\frac{1}{2}$

B. $n = 4, l = 3, m = 2, s = -\frac{1}{2}$

C. $n = 3, l = 2, m = 3, s = +\frac{1}{2}$

D. $n = 4, l = 3, m = 3, s = +\frac{1}{2}$

Answer: 3

Watch Video Solution

6. The total number of electrons in a 4d subshell are

A. 14

B. 7

C. 10

D. 32

Answer: 3

Watch Video Solution

7. The correct set of quantum numbers for the unpaired electron of chlorine atom is

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

B. $n = 2, l = 1, m = 1$

C. $n = 3, l = 1, m = 1$

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

Answer: 3

Watch Video Solution

8. The elctron identified by quantum numbers n and l

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

(iii) $n = 3, l = 0$ (iv) $n = 3, l = 1$

can be placed in order of increasing energy

A. $(iii) < (iv) < (i) < (ii)$

B. $(iii) < (iv) < (ii) < (i)$

C. $(i) < (iii) < (ii) < (iv)$

D. $(iii) < (i) < (iv) < (ii)$

Answer: 2

Watch Video Solution

9. Which of the following represent(s) the correct set of four quantum numbers of a 5d electron ?

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

B. $4, 2, 1, +\frac{1}{2}$

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

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

Answer: 2

Watch Video Solution

10. How many 3d electrons can have spin quantum number $-\frac{1}{2}$?

A. 5

B. 7

C. 8

D. 10

Answer: 1

Watch Video Solution

11. The total number of orbitals in a shell having principal quantum n is

A. 2n

B. n^2

C. $2n^2$

D. $n+1$

Answer: 2

Watch Video Solution

12. The momentum of a paricle which has a d-Broglie wavelength of 0.1 nm is $\left(h=6.6\times10^{-34}Js\right)$

A. $3.2\times10^{-24}kgms^{-1}$

B. $4.3\times10^{-22}kgms^{-1}$

C. $5.3\times10^{-22}kgms^{-1}$

D. $6.62\times10^{-24}kgms^{-1}$

Answer: 4

Watch Video Solution

13. Which of the following equation was suggested by de-Broglie?

A. $2\pi r = n\lambda$

B. $\lambda = \frac{p}{h}$

C. $\pi r^2 = n\lambda$

D. $2\pi r = \frac{nh}{\lambda}$

Answer: 1

Watch Video Solution

14. Which have the same number of s-electrons as the d-electrons in Fe^{2+} ?

A. Li

B. Ca

C. N

D. P

Answer: 4

Watch Video Solution

15. The radius of 5° Bohr orbit in hydrogen atom is

A. $5r_0$

B. $\frac{r_0}{5}$

C. $25r_0$

D. $\frac{r_0}{25}$

Answer: 3

Watch Video Solution

16. Which of the following ion has the maximum magnetic moment?

A. Mn^{3+}

B. Cu^{2+}

C. Fe^{3+}

D. V^{3+}

Answer: 3

Watch Video Solution

17. Radius of 2 nd shell of He^{+} is

(where a_0 is Bohr radius)

A. $3a_0$

B. a_0

C. $\frac{3}{2}a_0$

D. $2a_0$

Answer: 4

Watch Video Solution

18. With increasing principal quantum number , the energy difference between adjacent energy levels in atoms

A. Decreases

B. Increases

C. Remains constant

D. Decreases for low Z and increases for high Z

Answer: 1

Watch Video Solution

19. H_α line of Balmer series is 6500 Å . The wave length of H_γ is

A. 4815 Å

B. 4341Å

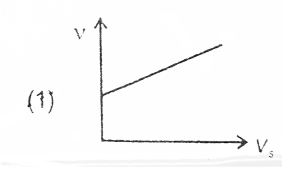
C. 7800Å

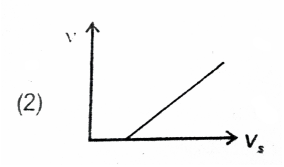
D. 3800Å

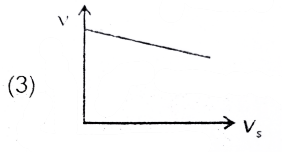
Answer: 2

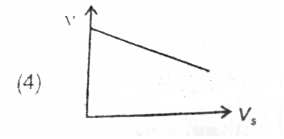
Watch Video Solution

20. Graph of incident freuency with stopping potential in photoelectric effect is

A. 

B. 

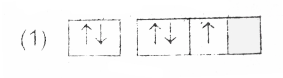
C. 

D. 

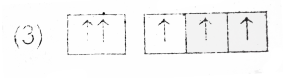
Answer: 1

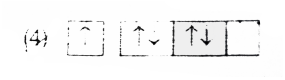
Watch Video Solution

21. The orbital diagram in which Hund's rule and Aufbau principle is violated is

A. 

B. 

C. 

D. 

Answer: 4

Watch Video Solution

22. The total spin resulting from d^9 configuration is

A. $\frac{9}{2}$

B. 2

C. $\frac{5}{2}$

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

Answer: 4

Watch Video Solution

23. How many nodal planes are present in $4d_{z^2}$?

A. 2

B. 1

C. Zero

D. 3

Answer: 3

Watch Video Solution

24. An electron is moving in 3^{rd} orbit of Li^{+2} and its separation energy is y.The separation energy of an electron moving in 2^{nd} orbit of He^{+} is

A. $\frac{4y}{9}$

B. $\frac{y}{9}$

C. $-\frac{y}{9}$

D. y

Answer: 4

Watch Video Solution

25. If radius of 2^{nd} orbit is x then di-Broglie wavelength in4^{th}orbit is given gy

A. $8\pi x$

B. $2\pi x$

C. $4\pi x$

D. $6\pi x$

Answer: 2

Watch Video Solution

26. Calculate the wavelength of light required to break the bond between two Cl atoms in Cl_2 molecules $\left((BE)_{Cl-Cl} = 243kJmol^{-1}\right)$

A. 8180 Å

B. 9860Å

C. 4930Å

D. 500nm

Answer: 3

Watch Video Solution

27. An electron is moving in 3rd orbit of Hydrogen atom . The frequency of moving electron is

A. $2.19 \times 10^{14} rps$

B. 7.3×10^{14} rps

C. 2.44×10^{14} rps

D. 7.3×10^{10} rps

Answer: 3

Watch Video Solution

28. The wavelength of a spectral life for an electronic transition inversely proportional to:

A. Number of electrons undergoing transition

B. The nuclear charge of the atom

C. Velocity of an electron undergoing transition

D. The difference in the energy level involved in the transition.

Answer: 4

Watch Video Solution

29. In the Rutherford scattering experiment the number of αparticles scattered at anangle $\theta = 60^\circ$ is 12 per min. The number of α particles per minute when scatterd at an angle of90° are

A. 160

B. 10

C. 6

D. 3

Answer: 4

Watch Video Solution

30. The number of quanta of radiation of frequncy $4.98 \times 10^{14} s^{-1}$ required to melt 100 g of ice are (latent heat of melting of ice is 33 joule per g)

A. 10^{20}

B. 10^{22}

C. 10^{14}

D. 6.023×10^{21}

Answer: 2

Watch Video Solution

31. Photoelectric emmision is observed from a surface when lights of frequency $n_1$and n_2 incident.If the ratio of maximum kinetic energy in two cases is $K:1$ then (Assume $n_1 > n_2$) threshod frequency is

A. $(K-1) \times (Kn_2 - n_1)$

B. $\frac{Kn_1 - n_2}{1-K}$

C. $\frac{K-1}{Kn_1-n_2}$

D. $\frac{Kn_2-n_1}{K-1}$

Answer: 4

Watch Video Solution

32. The velocity of electron moving in 3rd orbit of He^+ is v. The velocity of electron moving in 2nd orbit of Li^{+2} is

A. $\frac{9}{4}V$

B. $\frac{4}{9}V$

C. v

D. None of these

Answer: 1

Watch Video Solution

33. Which electronic configuration is not allowed for a neutral atom or an ion in ground state ?

A. $1s^2 2s^2 2p^6 3s^1$

B. $1s^2 2s^2 2p^6 3d^5$

C. $1s^2 2s^2 2p^6$

D. $1s^2 2s^2 2p^6 3s^2$

Answer: 2

Watch Video Solution

34. If $E_1, E_2 \text{and} E_3$ represent respectively the kinetic energies of an electron , an alpha particle and a proton each having same de Broglie wavelength then :

A. $E_1 > E_3 > E_2$

B. $E_2 > E_3 > E_1$

C. $E_1 > E_2 > E_3$

D. $E_1 = E_2 = E_3$

Answer: 1

Watch Video Solution

35. Choose the correct statement

A. Ionisation energy of H is equal to ${}_{.1}H^2$

B. Ionisation energy of ${}_{.1}H^1$ is greater than ${}_{.1}H^2$

C. Ionisation energy of ${}_{.1}H^2$ is greater than ${}_{.1}H^1$

D. IE of ${}_{.1}H^1$ may be greater than or less than ${}_{.1}H^2$

Answer: 3

Watch Video Solution

36. Consider ψ (wave function) of $2s$ atomic orbital of H-atom is-

$$\psi_{2s} = \frac{1}{4\sqrt{2\pi a_0^{3/2}}}\left[2 - \frac{r}{a_0}\right]e^{\cdot}\frac{r}{2a_0}$$

Find distance of radial node from nucleous in terms of a_0

A. a_0

B. $2a_0$

C. $\frac{a_0}{2}$

D. $\frac{a_0}{3}$

Answer: 2

Watch Video Solution

37. In which of the following, maximum wavelength is emitted ?

A. 4 to 1 in H

B. 5 to 1in H^+

C. 6 to 1 in Li^{+2}

D. 6 to 1 in Be^{+3}

Answer: 1

Watch Video Solution

38. For a microscopic object Δx is zero than Δv will be (According to Heisenberg's principle)

A. Zero

B. Inifinite

C. 10^{-23}

D. 10^{8}

Answer: 2

Watch Video Solution

Assignment Section C Objective Type Questions More Than One Options Are Correct

1. In a certain electronic transition in Hydrogen atom from an initial state to a final state, the difference of orbit radius is 8 times the first Bohr radius. Which transition does not satisfy the given condition?

A. $7 \rightarrow 1$

B. $6 \rightarrow 1$

C. $5 \rightarrow 1$

D. $3 \rightarrow 1$

Answer: A::B::C

Watch Video Solution

2. The work function for Ag metal is $7.5 \times 10^{-19} J$. As metal is being exposed to the light of frequency 1220 Å . Which is / are correct statements?

A. Threshold frequency of metal is $\frac{1}{135} \times 10^{15} s^{-1}$

B. Threshold frequency of metal is $8.33 \times 10^{15} s^{-1}$

C. Stopping potential is 5.46 volt

D. If light of wavelength 3600 $\mathring{A}$ is used then photo -electric effect take place

Answer: 1,3

Watch Video Solution

3. Which statement is / are correct about hydrogen spectrum?

A. Energy of 2nd orbit is different for ${}_{.1}H^1$, ${}_{.1}H^2$ and ${}_{.1}H^3$

B. Visible spectrum can be obtained in Lyman series and Balmer series

C. Infrared spectrum can be obtained in Paschen, brackett and Pfund series.

D. Total number of emission lines obtained in Balmer series is $n-2$, where n is principal quantum number an $n>2$

Answer: 1,3,4

Watch Video Solution

4. In Hydrogen atom, electron is present in 6^{th} energy level , which is / are correct about the Hydrogen spectrum?

A. Total 15 emission lines are observed in spectrum

B. 4 emission lines belong to Lyman series and 5 emission lines belong to Balmer series.

C. 2 emission lines belong to Brackett series and 3 emission lines belong to Paschen series

D. One emission line belong to Humphry series

Answer: 1,3

Watch Video Solution

5. An electron is moving in 3^{rd} orbit of Hydrogen series and radius of first orbit is x then

A. de-Broglie wavelength is $6\pi x$

B. de-Broglie wavelength is$2\pi x$

C. Velocity of electron is $\frac{h}{6\pi xm}$

D. Velocity of electron is $\frac{h}{2\pi xm}$

Answer: 1,3

Watch Video Solution

6. Velocity of an electron in the Iind stationary orbit of hydrogen atom is

A. Equal to velocity of light

B. Equal to $\frac{1}{137}$ times velocity oflight

C. Equal to velocity of an electron in sixth stationary orbit of Li^{+2}

D. Equal to $\frac{1}{274}$ times of the velocity of light

Answer: 3,4

Watch Video Solution

7. How many degenerate orbitals are presentin a subshell if electron associated with that subshell possesses orbital angular momentum $= 2\sqrt{3}h$?

A. No degenerate orbitals

B. Seven degenerates orbitals

C. Three degenerate orbitals

D. No of degenerate orbitals are same as in subshell which possesses $\mu_L = 3.46$ B.M.

Answer: 2,4

Watch Video Solution

8. Which of the following species have same magnetic moment?

A. Cr^{+3}

B. Fe^{+3}

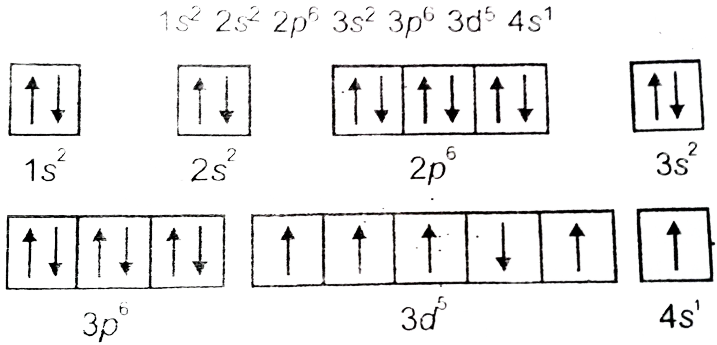
C. Co^{+2}

D. Ni^{+2}

Answer: A::C

Watch Video Solution

9. Electronic configuration of anatom



Choose the correct statement regarding this E.C.

A. It represents the ground state ofCr

B. It violates Aufbau principle

C. It violates Hungs rule of maximum multiplicity

D. If it not a stable E.C.

Answer: 2,3,4

Watch Video Solution

10. Choose the correct statements

A. The nature of cathode ras does not depend on the nature of gas taken in discharge tube

B. Anode rays cause sputtering when incident on metal

C. Cathode rays produce X rays when they are abruptly stopped by metallic obstacle and nature of X rays produced depends only on metal and not on cathode rays

D. The degree of deflection in same magnetic field vary in case o anode rays produced from different gases taken in discharge tube

Answer: C

View Text Solution

11. Which is / are incorrect observations related to photoelectric effect ?

A. When intensity of light is increased then kinetic energy of photo electron increases

B. If frequency of incident light isless than threshold frequency photoelectron is ejected from the metal surface, if we increase the intensity light

C. Photoelectric current is proportionalto the frequency of incident light

D. When frequency of light is increased , velocity of photoelectron increased

Answer: 1,2,3

Watch Video Solution

12. Which of the following suggested de-Broglie wavelength(s) is / are possible for electron in a Bohr orbit of Hydrogen atom ?

A. 19.92Å

B. 9.96Å

C. 4.98Å

D. 3.32Å

Answer: 1,2,4

Watch Video Solution

13. Energy of level 1,2,3 of a certain atom corresponds to increasing value of energy $E_1 < E_2 < E_3$. If λ_1, λ_2 and λ_3 are the wavelength of radiation corresponding to transition $3 \to 2, 2 \to 1$ and $3 \to 1$ respectively. Which ofte following statement is / are correct ?

A. $\frac{1}{\lambda_3} = \frac{1}{\lambda_1} + \frac{1}{\lambda_2}$

B. $\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

C. $\frac{1}{\lambda_2} = \frac{1}{\lambda_1} + \frac{1}{\lambda_3}$

D. $\lambda_2 = \frac{\lambda_1 \lambda_3}{\lambda_1 + \lambda_2}$

Answer: 1,2

Watch Video Solution

14. Choose the following regarding Bohr model

A. It introduce the concept of quantisation of energy

B. Radius of shellis given by $r = \frac{0.529n^2}{z}\text{Å}$

C. K.E. of electron is given by $\frac{2\pi^2 Me^4 z^2 k^2}{n^2 h^2}$

D. Two isotopes have same ionisation energy

Answer: 1,2

Watch Video Solution

15. $\left|\Psi^2\right|$ can have

A. Any value from zero to 1

B. Any value from -1 to $+1$

C. A positive non-zero value

D. A non -zero value

Answer: 1

Watch Video Solution

Assignment Section D Linked Comprehension Type Questions

1. The energy of n^{th} orbit is given by

$$E_n = \frac{-Rhc}{n^2}$$

When electron jumpsfrom one orbit to another orbit then wavelength associated with the radiation is given by

$$\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

When electron of 1.0 gm atom of Hydrogen undergoes transition giving the spectral line of lowest energy is visible region of its atomic spectra, the wavelength of radiation is

A. 6489Å

B. 3640Å

C. 5000Å

D. 4312Å

Answer: A

Watch Video Solution

2. The energy of n^{th} orbit is given by

$$E_n = \frac{-Rhc}{n^2}$$

When electron jumpsfrom one orbit to another orbit then wavelength associated with the radiation is given by

$$\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

The series that belongs to visible region is

A. Lyman Series

B. Balmer Series

C. Pfund Series

D. Humphrey Series

Answer: 2

Watch Video Solution

3. The energy of n^{th} orbit is given by

$$E_n = \frac{-Rhc}{n^2}$$

When electron jumps from one orbit to another orbit then wavelength associated with the radiation is given by

$$\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

The ratio of wavelength H_α of Lyman Series and H_α of Pfund Series is

A. $54.7:1$

B. $0.0183:1$

C. $61.4:1$

D. $0.0163:1$

Answer: 4

Watch Video Solution

4. In photoelectric effect light of certain frequency ($>$ threshold frequency) is incident on a metal surfave whereby , an e^- (with certain K.E.) moves towards the collector plate and a flow of current is initiated . In order to stop the current flow, an opposite potential , on the two metal plates, is applied

The work function of a metal is 4eV. If light of frequency $2.3 \times 10^{15} Hz$ is incident on metal surface, then

A. No photoelectron will be ejected

B. 2 photoelectron of zero kinetic energy are ejected

C. 1 photoelectron of zero kinetic energy is ejected

D. 1 photoelectron is ejected , which required the stopping potential of 5.52 volt

Answer: 4

Watch Video Solution

5. In photoelectric effect light of certain frequency ($>$ threshold frequency) is incident on a metal surfave whereby , an e^- (with certain K.E.) moves towards the collector plate and a flow of current is initiated . In order to stop the current flow, an opposite potential , on the two metal plates, is applied

The work function of metal is 6eV . If light of frequency 1×10^{15}Hz is incident on the metal , intensity of light is increased 4 times, then

A. No photoelectron will be ejected

B. 8 photoelectrons of zero kinetic energy shall be ejected

C. 2 photoelectrons of 2 eV kinetic energy are ejected

D. Only one photoelectron is ejected

Answer: 1

Watch Video Solution

6. In photoelectric effect light of certain frequency ($>$ threshold frequency) is incident on a metal surfave whereby , an e^- (with certain K.E.) moves towards the collector plate and a flow of current is initiated . In order to stop the current flow, an opposite potential , on the two metal plates, is applied

A light of frequency $2.5 \times 10^{15} Hz$ is incident on a metal surface having work function 4 eV. The velocity of photoelectron is (in cm s^{-1})

A. 1.5×10^6

B. 1.5×10^8

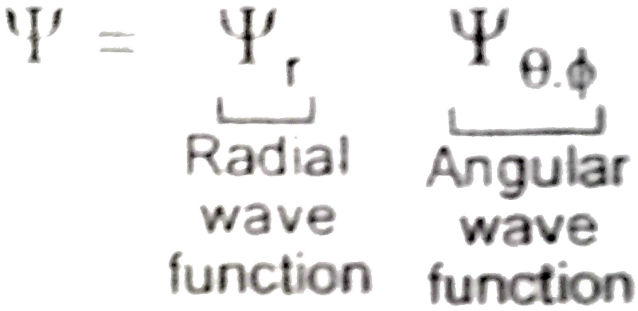
C. 2×10^8

D. 2.5×10^4

Answer: 2

Watch Video Solution

7. Orbitals are the pictorial representationofΨ or Ψ^2



Ψ^2 tell about the probability of finding electron.

Which of the following orbital is non directional ?

A. s

B. $2p_x$

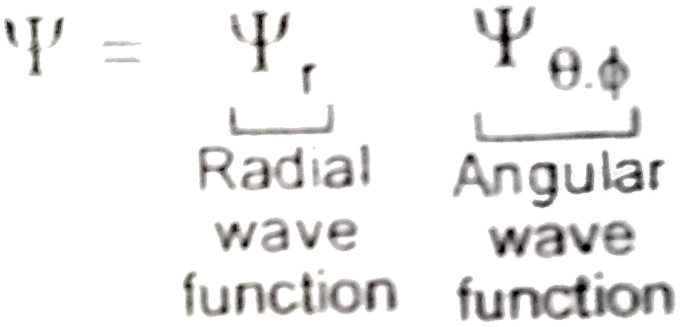
C. $4d_{x^2-y^2}$

D. d_{z^2}

Answer: A

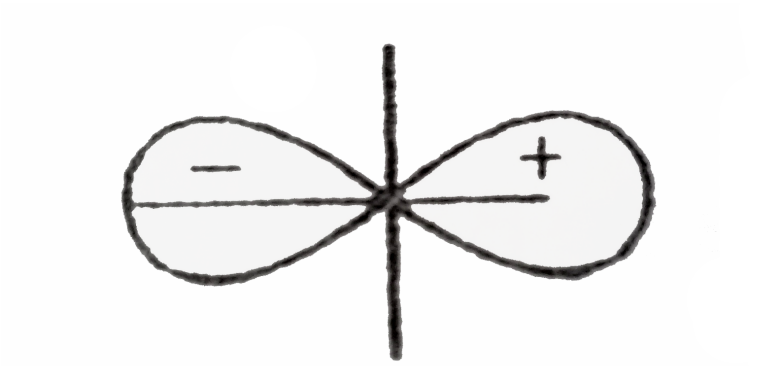
Watch Video Solution

8. Orbitals are the pictorial representationofΨ or Ψ^2



Ψ^2 tell about the probability of finding electron.

A $2p_x$ orbital is shown by given diagram



Correct regarding diagram is

A. Sign represent charge only

B. Sign represent sign of wave function only

C. Both (1) & (2)

D. Sign represent sign of Ψ^2

Answer: 2

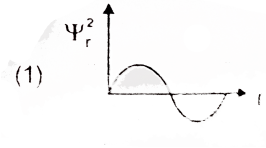
Watch Video Solution

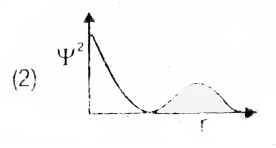
9. Orbitals are the pictorial representationofΨ or Ψ^2

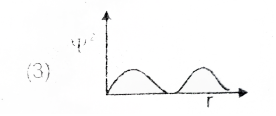
$$\Psi = \underbrace{\Psi_r}_{\text{Radial wave function}} \quad \underbrace{\Psi_{\theta,\phi}}_{\text{Angular wave function}}$$

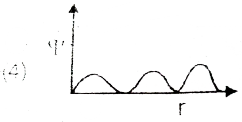
Ψ^2 tell about the probability of finding electron.

Which of the following graph is correct for 3p ?

A. (1) 

B. 

C. 

D. 

Answer: 3

Watch Video Solution

Assignment Section E Assertion Reason Type Questions

1. STATEMENT-1: Electronic configuration of Cr^{+3} (containing 21 electrons) is same as that of Sc i.e.,isoelectronic species have the same configuration

and

STATEMENT-2 : Orbitals of an atom are filled in order increasing energy.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: D

Watch Video Solution

2. STATEMENT-1 : The orbital angular momentum of an e^- in 4f atomic orbital is $\sqrt{12}\frac{h}{2\pi}$

and

STATEMENT-2 : The orbital angualar momentum of an electron is given by $\sqrt{l(l+1)}\frac{h}{2\pi}$ and for f-subshell,$l=3$

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 1

Watch Video Solution

3. STATEMENT-1 : The maximum number of electrons in subshell p is 6.

and

STATEMENT -2 : The maximum number of electrons in a subshell isgiven by $(4l + 2)$, where lis the azimuthal quantum number and for p-subshell $l = 1$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 1

Watch Video Solution

4. STATEMENT-1 : The energy of an electron depends only upon principal quantum number in case of hydrogen and hydrogen like ions.

and

STATEMENT -2 : The energy of an electron depends on principal quantum number as well as azimuthal quantum number for other atoms.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 2

Watch Video Solution

5. STATEMENT-1 : The de-Broglie wavelength of an electron decreases as kinetic energy decreases.

and

STATEMENT- 2 : The de-Broglie wavelength $\lambda = \frac{h}{\sqrt{2mKE}}$

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 4

Watch Video Solution

6. STATEMENT-1 : The 19^{th} electron in potassium atom enters into 4s-orbital than in 3d-orbital.

and

STATEMENT-2 : $(n+1l)$ rule is followed for determining the orbital of lowest energy state.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 1

Watch Video Solution

7. STATEMENT-1 : A spectral lne will not be seen for a $2p_x - 2p_y$ transition.

and

STATEMENT-2 : Only Balmer lines are observed in the visible region.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 2

Watch Video Solution

8. STATEMENT -1 : Orbital angular momentum is given by $\sqrt{l(l+1)}\frac{h}{2\pi}$ and

STATEMENT-2 : I (Quantum number) decides the shape of orbital

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 2

Watch Video Solution

9. STATEMENT-1 : Among 5p and 6s, 6s orbital have high energy

and

STATEMENT-2 : $(n+l)$ for5p and 6s is same.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 2

Watch Video Solution

10. STATEMENT-1 : Principal Quantum number of outermost electron in Fe is 4.

and

STATEMENT-2 : Last electron is filled in 3d.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 isTrue, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 isTrue

Answer: 2

Watch Video Solution

Assignment Section F Matrix Match Type Questions

1. Match the following :

	Column-I		Column-
(A)	Velocity	(p)	Increase
(B)	Potential Energy	(q)	Increase
(C)	$E_n - E_{n-1}(E =$ Total energy for H atom $(n \neq 1))$	(r)	Decrease
(D)	Separation energy (For H atom)	(s)	No chan

Watch Video Solution

2. Match the following :

	Column-I (Orbitals)		Column-II (Nature and No. of Nodes)
(A)	$3d_{z^2}$	(p)	One sperhical node
(B)	$4d_{xy}$	(q)	Two nodal planes
(C)	$2s$	(r)	Node in yz plane
(D)	$3p_x$	(s)	Two angular nodes

Watch Video Solution

3. Match the following :

	Column-I		Column-II
(A)	$3s^1$	(p)	$n = 3$
(B)	$3p^1$	(q)	$l = 0$
(C)	$4s^1$	(r)	$l = 1$
(D)	$4d^1$	(s)	$m = 0$
		(t)	$m = \pm 1$

Watch Video Solution

4. Match the following :

	Column-I		Column-II
(A)	$3d_{xy}$	(p)	$\Psi = 0[zx\text{plan}]$
(B)	$2p_y$	(q)	$\Psi = 0[yz\text{plane}]$
(C)	$2s$	(r)	$\Psi = \max[\text{yz plane}]$
(D)	$2s$	(s)	$\Psi = \max[\text{zx plane}]$
		(t)	$\Psi\text{versus r graph has wo maximas}$

A. A(q,r), B(s,t), C(q,s) ,D(q,p)

B. A(s,t), B(r,a,s) ,C(p,r,s),D(q,t)

C. A(r,t) , B(p,t) C(r,s,q) D(p,r,s)

D. A(p,q),B(q,s),C(r,s,t),D(r,s)

Answer: A(p,q),B(q,s),C(r,s,t),D(r,s)

View Text Solution

Assignment Section G Integer Answer Type Questions

1. An electron in Hydrogen atom (ground state) jumps to higher energy level x, such that the potential energy of electron becomes half of itstotal energy at ground state. What is the value of x ?

Watch Video Solution

2. What is no.of radial nodes of4f orbital?

Watch Video Solution

3. An electron jumps to higher excited state of a orbital which is non directional and have 4 radial node then shell with which electron belong?

Watch Video Solution

4. Magnetic momentum of an ion M^{+3} is $\sqrt{35}$ BM. Then, number of electron in d orbital of M element will be _____

Watch Video Solution

Assignment Section H Multiple True False Type Questions

1. STATEMENT -1 : The graph of Ψ^2 and r for 4d orbital has two maximas

STATEMENT-2 : $3d_{z^2}$ has no nodal plane.

STATEMENT-3 , 4s is closer to nucleus than 3d

A. T T T

B. T T F

C. F T F

D. T F T

Answer: B

Watch Video Solution

2. STATEMENT-1: de-Broglie wavelength is not appreciable for molecule / atom moving in gaseous state.

STATEMENT -2 : Law of uncertainty is not applicable to molecule / atom of a gas

STATEMENT-3 : Value of spin quantum number is the directional cosine of magnetic moment dueto rotation of electron

A. T T F

B. F T T

C. T F T

D. F F T

Answer: D

Watch Video Solution

3. STATEMENT -1 : Work function of a metal depends on ionisation energy.

STATEMENT-2 : One photon can eject one electron

STATEMENT -3 : K.E. of ejected depends on intensity of light

A. T F F

B. T T F

C. T F T

D. T T T

Answer: B

Watch Video Solution

4. STATEMENT-1 : Spin quantum number is derived from Schrodinger equation.

STATEMENT -2 : Magnetic quantum number tells about orbital angular

momentum along z axis.

STATEMENT-3 : Spin of electron have no relation with energy

A. F T T

B. T T T

C. F T F

D. F F T

Answer: A

Watch Video Solution

5. STATEMENT-1 : $\Delta x : \Delta p = \frac{h}{4\pi}$ is not applicable for macroscope particles.

STATEMENT-2 : p,orbital is an example of gerade.

STATEMENT-3 : Due to production of matter waves, energy of the moving system decreases

A. T T T

B. T T F

C. T F T

D. T F F

Answer: C

Watch Video Solution

Assignment Section I Subjective Type Questions

1. An ion which carries $+3$ charge posseses magneticof 4.9 B.M.andits last electron possesses orbital angular momentum of $\sqrt{6h}$. Write the E.C. of that ion and identify that element if highest n in the E.C. of that ion is 3.

Watch Video Solution

2. Electron exicted from lower orbit to higher orbit and returns back to ground state from excited state with a life time1 nanosecond by emitting

a photon of wave length 600nm. Calculate uncertainity in the energy of the excited state. Also calculate the percentage uncertainity, if the energy is measured from ground state.

Watch Video Solution

3. The minium energy required to remove the electron from metal surface is $7.50 \times 10^{-19} J$. What will be the stopping potential required when this metal surface is exposed to U.V. light of $\lambda = 375 Å$?

Watch Video Solution

4. 2g of Hydrogen atoms are excited to radiation. The study of spectra indicated $25\,\%$ of atoms are in III^{rd} energy level and $20\,\%$ atoms in II^{nd} energy level and rest in ground state. Calculate the total energy evolved when atoms return to ground state.

Watch Video Solution

5. Two hydrogen atoms undergo head on collision and end up with zero kinetic energy. Each particle then emits a photon of wavelength 1028 $\mathring{A}$. Which transition leads to this wavelength ? Calculate the velocity of hydrogen atom before collision $\left(m_H = 1.67 \times 10^{-27} kg\right)$

Watch Video Solution

6. A tube emits light of wavelength 5296 $\mathring{A}$. The bulb is rated as 200 watt and $20\,\%$ of the enrgy is converted into light . If the whole light emitted is allowed to fall on a metal surface having work function $3.00 \times 10^{-19} J$ calculate the no. of electrons ejected in 10s.

Watch Video Solution

7. Calculate the uncertainty in position of the electron if de-Broglie wavelength associated with electron is$7.2\mathring{A}(0.01\,\% -$ error is involved in measurement ofvelocity) . (Mass of electron $= 9.1 \times 10^{-31} kg\big)$

Watch Video Solution

Assignment Section J Aakash Challengers Questions

1. How many maximum spectral lines are possible if electron is present in 4^{th} shell and only two atom are present in sample ?

A. 6

B. 4

C. 3

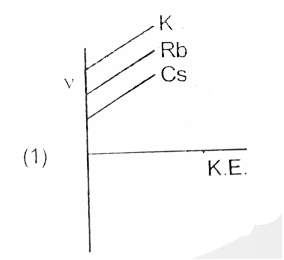
D. 2

Answer: B

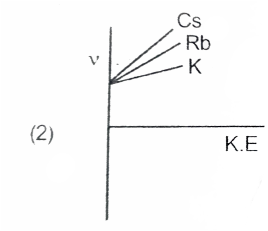
Watch Video Solution

2. The correct graph regarding v vs KE. (Incident)

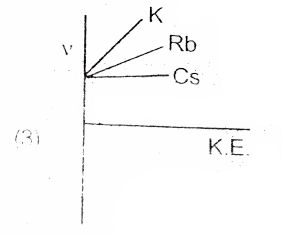
A.



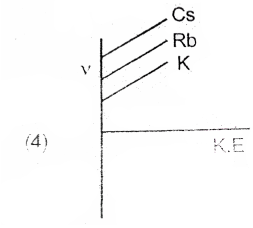
B.



C.



D.



Answer: 1

Watch Video Solution

3. Maximum electron in 1^{st} shell having $m_l = 2$ will be

A. 2

B. 0

C. 12

D. 24

Answer: 2

Watch Video Solution

4. What about degeneracy of 2p orbitals in a magnetic field?

A. No degenerate orbitals

B. Three degenerate orbital

C. Two degenerate orbital

D. Cannot say anything about degeneracy

Answer: 2

Watch Video Solution

5. In electric field which have maximum angle of deflection? (Assume all have same velocity)

A. α rays

B. H^+ rays

C. D^+ rays

D. All have equal

Answer: 2

Watch Video Solution

6. Choose the pair in which after filling of electron , energy sequence is reversed

A. $2p > 2s$

B. $3d > 4s$

C. $4p < 5s$

D. $5p < 6s$

Answer: 2

Watch Video Solution

7. The orbital having zero probability of finding electron on the surface of nucleus is

A. s

B. p_x

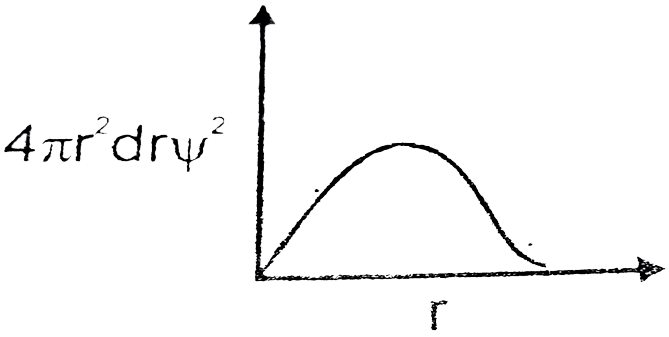
C. $d_{x^2-y^2}$

D. Both (2)& (3)

Answer: 4

Watch Video Solution

8. Given graph may belong with



A. 1s

B. 2p

C. 3d

D. All of these

Answer: 4

Watch Video Solution

9. If above graph is correct for 1s then

A. Ψ is zero when $r \neq 0$

B. Ψ is maximum when $r \neq 0$

C. maxima is at surface

D. Ψ have negative sign

Answer: 3

View Text Solution

10. An electron in hydrogen jumps to a shell in which four fold degeneracy is present , then correct about that shell is

A. 3

B. 4

C. 2

D. This type of transition is not possible

Answer: 3

Watch Video Solution

11. Largest wavelength is associated with which one of the following . If all these travel with same velocity

A. CO_2

B. He

C. H_2

D. NO_2

Answer: 3

Watch Video Solution

12. Which of the following have highest ionisation energy ?

A. ${}_{.1}H^1$

B. ${}_{.1}H^2$

C. ${}_{.1}H^3$

D. All of these have equal I.E.

Answer: 3

Watch Video Solution