CHEMISTRY

AAKASH INSTITUTE ENGLISH

STRUCTURE OF ATOM

Illustration

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

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2. Determine the following for the fouth shell of an atom .

(a) The number of subshells

(b) The number of orbitals in each subshell

(c) The maximum number of electrons that can be contatined in each subshell

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Example

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

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2. Calculate the number of electrons , protons and neutrons in (I) phosphorus atom (ii) phosphate ion mass number $= P = 31, O = 16$

Atomic numbers : $P = 15, o = 8$

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3. calculate the wavelength frequency and wavenumber of a light wave whose period is $2.0 \times 10^{-10} s$.

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

(a) Chloride ion (Cl^-) with $Z = 17, A = 35$

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

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

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6. calculate the wavelength frequency and wavenumber of a light wave whose period is $2.0 \times 10^{-10} s$.

7. 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 ?

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

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

10. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.

11. Calculate the maximum kinetic energy of photoelectrons emitted when a light of frequency 2×10^{16} Hz is irradiated on a metal surface with threshold frequency (v_0) equal to 8.68×10^{15} Hz.

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

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

14. Calculate the energy of an electron in the first Bohr orbit of He^+.

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

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

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

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

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

20. What is the uncertainty in locating the position of an electron with speed $25ms^{-1}$ having uncertainity of0.1% ?

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

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

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

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24. Uncertainity in position of a particles of 15 gram in space is 10^{-5}m. Hence uncertainity in velocity (m//sec) is $\left(h = 6.6 \times 10^{-34} J\sec\right)$

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

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

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

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

$4s, 3d, 4p$

28. Whatis the electronic configuration of Argon ?

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29. 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 $m_l = -1$

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Try Yourself

1. Calculate the volume of 80% H_2SO_4 by weight $\left(density = 1.80 gmL^{-1}\right)$ required to prepare 1 L of 0.2M H_2SO_4 .

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2. Complete the value given below

S.No.	Symbol	Mass No.	Atomic No.	Protons	Neutrons	Electrons
1	Fe	56	26	—	—	
2	Zn^{2+}	64	30	—	—	
3	Cl^-	35	—	—	18	18
4	Ar	—	—	18	22	—

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

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

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5. the wavelength range of the visible spectrum extends from violet (400 nm) to red (750 nm). Express these wavelengths in frequencies (Hz) . (1nm =$10^{-9}m$)

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

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

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7. the vividh bharati station of All india Radio, Delhi , broadcasts on a frequency of 1,368 kHz (kilo hertz). Calculate the wavelength of the electromagnetic radiation emitted by transmitter . Which part of the electromagnetic spectrum does it belong to

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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 $v = 1.0 \times 10^{15} s^{-1}$

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

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

11. calculate energy of one mole of photons of radiation whose frequency is $5 \times 10^{14} hz$

12. 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 $= hv_0 \times 6.022 \times 10^{23}$

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

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

$$hv = hv_0 + KE, \quad KE = 0$$

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

14. calculate the energy associated with the first orbit of He^+ . What is the radius of this orbit?

15. 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?

16. Calculate the ratio of the radius of 1st orbit of H atom to that of 4th orbit.

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

17. What is the velocity of electron present in first Bohr orbit of hydrogen atom?

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

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

20. 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 $= \dfrac{4}{6.022 \times 10^{23}} g$

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

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

`lambda = (h)/(mv) ,

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

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23. A micorscope using suitable photons is employed an electron in an atom within a distance of $0.1\overset{\circ}{A}$. What is the uncetrancity involved in the measurment of its velcity ?

24. A golf ball has a mass of 40 g , and a speed of 45m/s. if the speed can be measured with in accuracy of 2 % . Calculate the uncertainty in the position .

25. Calculate the uncertainty in the velocity of an electron if the uncertainty in its position is of the order of $1\overset{\circ}{A}$

26. 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.

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27. An electron has a speed $3 \times 10^2 ms^{-1}$ with uncertainty 0.07 % what is the uncertainty in locating its position ?

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28. 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)$n = 3, l = 2$

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29. what is the total number of orbitals associated with the principal quartum number n= 3?

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30. Which of the following orbitals are possible ?

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

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

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32. 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

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

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

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34. Write the electronic configuration of chlorine atom ?

Hint : Chlorine $(Z = 17)$

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

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

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36. Name the element with the following electrons configuartions

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

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

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

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Exercise

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

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

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

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

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

Answer: C

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2. 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: B

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

   A. 1, 00, 000

   B. 5, 000

   C. 10, 000

   D. 200

Answer: A

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4. In Rutherford's experiment, generally the thin foil of heavy atoms, like gold, platinum etc. have been used to be bombarded by the α-particles. If the thin foil of light atoms like aluminium etc. is used, what difference would be observed from the above results?

   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 α $-$ rays get definected through small angles

D. Most of the α $-$ rays through without any deviation

Answer: D

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5. 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. $_{A+1} X^{Z+1}$

D. $_X A^z$

Answer: B

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6. Isotopes have

    A. same number of protons

    B. Same number of neutrons

    C. Different number of electrons

    D. Different atomic numbers

Answer: A

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7. The number of neutrons in deuterium is

    A. 0

    B. 1

    C. 2

    D. 3

Answer: B

8. Nucleus was discovered by

    A. Rutheford

    B. chadwick

    C. Bohr

    D. Iron

Answer: A

9. Metal of which foil was used in Rutherted experiment ?

    A. Silver

B. Gold

C. platinum

D. Iron

Answer: B

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10. Wave number is

A. λ

B. $\dfrac{1}{\lambda}$

C. $\dfrac{c}{\lambda}$

D. $\lambda \times v$

Answer: B

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11. 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. Radio waves $>$ Microwaves $>$ x - rays $>$ UV rays

Answer: A

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12. The kinetic energy of the photoelectrons depends upon the

A. (a) Intensity of striking light

B. (b) Number of photons striking

C. (c) Frequcncy of striking light

D. (d) Number of photonselectrons ejected

Answer: C

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13. 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: C

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

A. 0.24Å

B. 0.48Å

C. 0.53Å

D. 1.06Å

Answer: C

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15. Bohr's theory is applicable to:

A. He^+

B. Li^{2+}

C. Be^+

D. H

Answer: C

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16. 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: B

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17. What is the energy associated with 3rd energy shell of hydrgoen atom ?

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

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

C. -0.726×10^{-18}J

D. $-2.42 \times 10^{-18} J$

Answer: D

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18. Find out the incorrect match .

A. `electron - dual nature

B. Rainbow- Discontinuous spectra

C. Atom - Line spectra

D. Particle nature - photoelectric effect

Answer: B

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19. According to Bohr theory, which of the following transition in hydrogen atom will give rise to the least energetic proton?

    A. n=6 to n=5

    B. n=5 to n=3

    C. n=6 to n=1

    D. n=5 to n=4

Answer: A

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20. Which of the following ion is not isoelectronic with O^{2-} ?

    A. Mg^+

    B. Na^+

    C. N^{3-}

    D. F^-

Answer: A

21. 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 momentum of the particle

    D. Inversely proportional of planck's constant

Answer: C

22. Calculate the wavelength associated with an electron moving with a velocity of 10^{10} cm per sec.

A. $6.62 \times 10^{-10} m$

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

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

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

Answer: B

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23. Probability density is given by

A. (a) Ψ

B. (b) $|\Psi|^2$

C. (c) De broglie wavelength

D. (d) $\widehat{H}$

Answer: B

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24. 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

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

A. $2p$

B. $5s$

C. $5f$

D. $3d$

Answer: C

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

A. $3d -$ orbital

B. 3p- orbital

C. 2s - orbital

D. 2p - orbital

Answer: A

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27. Shape of an orbital is given by

A. Principal quantum number

B. spin quantum number

C. Azimuthal quntum number

D. Magnetic quantum number

Answer: C

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28. Orientation of orbitals is given by

A. Magnetic quantum number

B. spin quantum number

C. Azimuthal quantum number

D. Principal quantum number

Answer: A

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

A. 1

B. 2

C. 3

D. 4

Answer: D

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30. If the uncertainties in position and momentum are equal, the uncertainty in the velocity is :

A. $\sqrt{\dfrac{h}{\pi}}$

B. $\dfrac{1}{2m}\sqrt{\dfrac{h}{\pi}}$

C. $\sqrt{\dfrac{h}{2\pi}}$

D. $\dfrac{1}{m}\sqrt{\dfrac{h}{\pi}}$

Answer: B

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

A. (a) 4s

B. (b) 3p

C. (c) 3d

D. (d) 4f

Answer: A

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

A. 20

B. 10

C. 16

D. 24

Answer: B

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

A. (a) 10

B. (b) 5

C. (c) 2

D. (d) 1

Answer: C

34. The number of unpaired electrons in magnesium atom is

A. 0

B. 1

C. 2

D. 3

Answer: A

35. 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

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

A. 0

B. 1

C. 2

D. 3

Answer: B

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

A. (a) 2

B. (b) 4

C. (c) 6

D. (d) 8

Answer: B

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38. The ion that is isoelectronic with CO is

A. CN^-

B. N_2^+

C. O_2^-

D. N_2^-

Answer: A

39. Which of the following electron configurations is correct for iron, (atomic number26)?

A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$

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

D. $1s^2 2^2 2p^6 3s^2 3p^6 4s^2 3d^6$
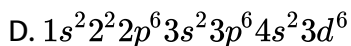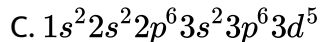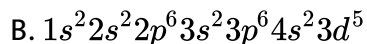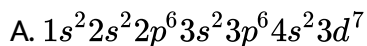
Answer: D

40. Which of the following has maximum of unpaired d- electrons ?

A. N^{3+}
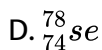
B. Fe^{2+}

C. Zn^+

D. Cu^+
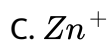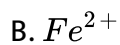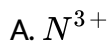
Answer: B

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Assignment Section A Objective Type Questions

1. An isotone of $._{32}^{76}Ge$ is:

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

B. $_{33}^{77}As$

C. $_{34}^{77}Se$

D. $_{74}^{78}se$

Answer: B

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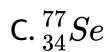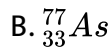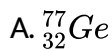
2. The ratio of specific charge of an electron to that of a protons is

   A. $1:1$

   B. $1837:1$

   C. $1:1837$

   D. $2:1$

Answer: B

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3. Atomic number and mass number of an element M are 25 and 52 respectively. The number of electrons, protons and neutrons in M^{+2} ion are respectively.

A. 25,25 and 27

B. 25, 27 and 25

C. 27, 25 and 27

D. 23, 25 and 27

Answer: D

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4. If R_1 is the radius of the first of hydrogen atom then the radii of second , third and fourth orbitals in term of r_1 are

A. $2.5\dfrac{h}{\pi}$

B. $6\dfrac{h}{\pi}$

C. $3\dfrac{h}{\pi}$

D. $\dfrac{2.5h}{2\pi}$

Answer: C

5. If R_1 is the radius of the first of hydrogen atom then the radii of second , third and fourth orbitals in term of r_1 are

A. (a) r_1^2, r_1^3, r_1^4

B. (b) $4r_1, 9r_1, 16r_1$

C. (c) $8r_1, 27r_1, 64r_1$

D. (d) $2r_1, 6r_1, 8r_1$

Answer: B

6. Electronic energy is negative because:

A. Electron has negatuve charge

B. Energy is zero near the nucleus and decreases as the distance from

nucleus increases

C. Energy is zero at infinite distance from the nucleus and decreases

as the electron comes towards nucleus

D. These are interelectronic repulsions

Answer: C

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7. According to Bohr's theory energy is ...when an electron moves from a

lower to a higher orbit.

A. Energy is released

B. Energy is absorbed

C. No change in energy

D. It radiations energy

Answer: B

8. if The energy difference between the ground state and excited state of an atom is $4.4 \times 10^{-19} J.$ the wavelength of photon required to produce this transition is

A. (a) $4.5 \times 10^{-7} m$

B. (b) $4.5 \times 10^{-7} nm$

C. (c) $4.5 \times 10^{-7} \text{Å}$

D. (d) $4.5 \times 10^{-7} cm$

Answer: A

9. The number of photons of light of wavelength 7000 A equivalent to 1 J are

A. (a) 3.52×10^{18}

B. (b) 3.52×10^{16}

C. (c) $50, 000$

D. (d) $10, 0000$

Answer: B

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10. The Threshold energy is given as E_0 and radiation of energy E falls on metal then $K.E$ is given as

A. (a) $\dfrac{E - E_0}{2}$

B. (b) $E - E_0$

C. (c) $E_0 - E$

D. (d) $\dfrac{E}{E_0}$

Answer: B

11. Frequency of a wave is 6×10^{15} Hz. The wave is

A. $10^5 \, cm^{-1}$

B. $2 \times 10^7 m^{-1}$

C. $2 \times 10^7 cm^{-1}$

D. $2 \times 10^5 m^{-1}$

Answer: B

12. If the threshold wavelength (λ_0) for ejection of electron from metal is 330 nm, then work function for the photoelectric emission is:

A. $6 \times 10^{-10} J$

B. $1.2 \times 10^{-18} J$

C. $3 \times 10^{-19} J$

D. $6 \times 10^{-19} J$

Answer: D

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13. The ionization energy of the electron in the lowest orbit of hydrogen atom is 13.6 eV. The energies required in eV to remove an electron from three lowest energy orbits of hydrogen atom respectively are

A. $13.66.8, 8.4$

B. $13.6, 10.2, 3.4$

C. 13.6, 27.2, 40.8

D. 13.6, 3.4, 1.51

Answer: D

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14. A certain metal when irradiated by light $(v = 3.2 \times 10^{16} Hz)$ emits photoelectrons with twice of K.E. as did photoelectrons when the same metal is irradiated by light $(v = 2.0 \times 10^{16} Hz)$. The v_0 of the metal is

A. $1.2 \times 10^{14} Hz$

B. $8 \times 10^{15} Hz$

C. $1.2 \times 10^{16} Hz$

D. $4 \times 10^{12} Hz$

Answer: B

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15. $E_n = -313.6/n^2$ kcal/mol. If the value of $E = -34.84$ kcal/mol, to which value does 'n' correspond?

A. 4

B. 3

C. 2

D. 1

Answer: B

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16. Which transition of Li^{2+} is associated with same energy change as $n = 6$ to $n = 4$ transtion in He^+ ?

A. n=3 to n=1

B. n=8 to n=6

C. n=9 to n=6

D. n=2 to n=1

Answer: C

17. Zeeman effect refers to the

A. splitting of the spectral lines in a magnetic field

B. Splitting up of the spectral lines in an electrostatic field

C. Emission of electrons from metals when light falls on it

D. Random scattering of α - particles by gold foil

Answer: A

18. Number of spectral lines in Balmer series when an electron retrurn from 7th orbit to 1st orbit of hydrogen atom are

A. 5

B. 6

C. 21

D. 15

Answer: A

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19. If kinetic energy of a proton is increased nine times, the wavelength of the de - Broglie wave associated with it would become :-

A. 3 times

B. 9 times

C. $\dfrac{1}{3}$ times

D. $\dfrac{1}{9}$ times

Answer: C

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20. The number of waves in the third orbit of $H-$ atom is

A. 1

B. 2

C. 4

D. 3

Answer: D

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21. What will be the wavelength of an electron moving with 1/10th of velocity of light?

    A. 242.4pm

    B. 24.2pm

    C. 2.42pm

    D. 0.2424pm

Answer: B

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22. The de Broglie wavelength associated with a ball of mass 200 g and moving at a speed of 5 metres/hour, is of the order of ($h = 6.625 \times 10^{-34}$ J s) is

    A. 10^{-10}m

    B. $10^{-20}m$

C. 10^{-3}m

D. 10^{-40}m

Answer: C

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23. Calculate the momentum of a particle which has de Broglie wavelength of 0.1 nm.

A. $3.2 \times 10^{-24} kgms^{-1}$

B. $4.3 \times 10^{-22} kgms^{-1}$

C. $5.3 \times 10^{-22} kgms^{-1}$

D. $6.62 \times 10^{-24} kgms^{-1}$

Answer: D

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24. The uncertainty in velocity of an electron present in the nucleous of diameter 10^{-15} m hypothetically should be approximately

A. 10^{-11}m/s

B. 10^8 m/s

C. 10^{11} m/s

D. $10Å/s$

Answer: C

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25. The set of quantum numbers not applicable to an electron: (n, l, m, s)

A. $1, 1, 1, +\dfrac{1}{2}$

B. $1, 0, 0, +\dfrac{1}{2}$

C. $1, 0, 0, -\dfrac{1}{2}$

D. $2, 0, 0, +\dfrac{1}{2}$

Answer: A

26. The principal and azimuthal quantum number of electrons in 4f orbitals are

A. 4,2

B. 4,4

C. 4,3

D. 3,4

Answer: C

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

A. 5

B. 7

C. 8

D. 10

Answer: A

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28. The correct orders of increasing energy of atomic orbitals is

A. $5p > 4f < 6s < 5d$

B. $5p < 6s < 4f < 5d$

C. $4f < 5p < 5d < 6s$

D. $5p < 5d < 4f < 6s$

Answer: B

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29. Which shell would be the first to have g sub-shell ?

A. L

B. M

C. N

D. O

Answer: D

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30. For which of the following sets of quantum numbers, an electrons will have the highest energy ?

A. $3, 2, 1, \dfrac{1}{2}$

B. $4, 2, -1, \dfrac{1}{2}$

C. $4, 1, 0, -\dfrac{1}{2}$

D. $5, 0, 0, \dfrac{1}{2}$

Answer: B

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31. Arrange the following orbitals of H-atom in the increasing order of their energy.

$3p_x$, $2s$, $4d_{xy}$, $3s$, $4p_z$, $3p_y$, $4s$

A. 3slt 3p lt 4slt 3dlt4p

B. 3slt3plt3dlt4slt4p

C. 3s=3p=3dlt4s=4p

D. 3s=3p=3dlt4s lt4p

Answer: C

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32. Which of the following set of quantum number is possible ?

A. n=4 , l=2, m=-2 ,s=-2

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

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

D. $n = 4, l = 0, m = 0, s = 0$

Answer: C

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33. The maximum number of electrons in an atom which can have n=4 is

A. 4

B. 8

C. 16

D. 32

Answer: D

34. An orbital is described with the help of a wave function. Since many wave functions are possible for an electron, there are many atomic orbitals. When atom is placed in a magnetic field the possible number of orientations for an orbital of azimuthal quantum number 3 is

A. Three

B. One

C. Five

D. Seven

Answer: D

35. Assuming the velocity to be same , the wavelength of the waves associated with which of the following particles would be maximum ?

    A. An electron

    B. A proton

    C. An$\alpha -$ particle

    D. A deutron

Answer: A

36. For a 'p' electron the orbial angular momentum is

    A. $\sqrt{6}\hbar$

    B. $\sqrt{2}\hbar$

    C. $\hbar$

    D. $2\hbar$

Answer: B

37. Which electronic level would allow the hydrogen atom to absorb a photon but not to emit a photon?

A. 3s

B. 2p

C. 2s

D. 1s

Answer: D

38. Which of the following transition will emit maximum energy in hydrogen atom ?

A. $4f \rightarrow 2s$

B. $4d \rightarrow 2p$

C. $4p \rightarrow 2s$

D. all have same enegy

Answer: D

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39. In an atom which has 2K, 8L , 18 M and 2N electrons in the ground state . The total number of electrons having magnetic quantum number m=0 is
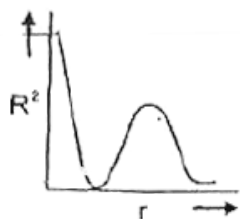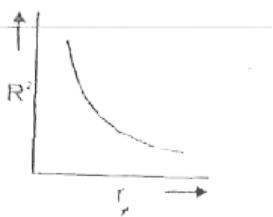
A. 6

B. 10

C. 7

D. 14

Answer: D

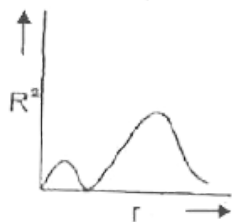**40.** The prodensity curve for 2s electrons appears like
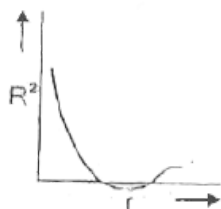

A.

B.

C.

D.

Answer: A

---

41. Any p-orbital can accommodate upto :

A. Four electrons

B. Six electrons

C. Two electrons

D. Eight electrons

Answer: C

---

42. If the uncertainty in the position of an electron is zero the uncertainty

in its momentum be

A. zero

B. Greater than $\dfrac{h}{4\pi}$

C. Less than $\dfrac{h}{4\pi}$

D. infinite

Answer: D

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43. The number of radial nodes in 4s and 3p orbitals are respectively

A. 2,0

B. 3,1

C. 2,2

D. 3,2

Answer: B

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44. Which of the following orbital is with the four lobes present on the axis ?

    A. d_{z^2}

    B. d_{xy}

    C. d_{yz}

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

Answer: D

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45. Which of the following statements concerning the four quantum numbers is false?

    A. n gives the size of an orbital

    B. l gives the shape of an orbital
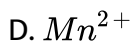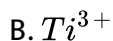
C. m gives the energy of the electron in orbital

D. s gives the direction of spin of electron in the orbital

Answer: C

46. Which of the following has maximum number of unpaired electrons ?

A. Mg^{2+}

B. Ti^{3+}

C. Fe^{2+}

D. Mn^{2+}

Answer: D

47. The two electrons in sub-shell of K-shell will differ in:

A. same principal quantum number

B. same azimuthal quntaum number

C. Same magnetic quantum number

D. same spin quantum number

Answer: D

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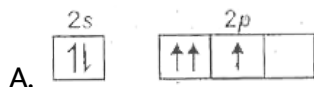**48.** Which of the following electronic configuration is not possible ?

A. $2p^3$

B. $2d^6$

C. $4s^1$

D. $5f^8$

Answer: B

---

49. The orbital diagram in which both the pauli's exclusion principal and Hund's rule are violated is :

A.
```
 2s        2p
[1↓]    [↑↑|↑|  ]
```

B.
```
[1↓]    [1↓|1↓|  ]
```

C.
```
[1↓]    [↓|↓|↓]
```

D.
```
[1↓]    [1↓|1↓|↑]
```

Answer: A

---

50. Which of the following electronic configuration is incorrect ?

A. $1s^2, 2s^2, 2p_x^2, 2p_y^2, 2p_z^2, 3s^2, 3p_x^1$

B. $1s^2, 2s^1, 2p_x^1, 2p_y^1, 2p_z^1$

C. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5, 4s^2$

D. $1s^2, 2s^2, 2p^6, 3s^2, 3p_x^1, 3p_y^1, 3p_z^1$

Answer: B

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Assignment Section B Objective Type Questions

1. What will be the value of the longest wavelength line in Balmer's spectrum for H atom?

A. 546 nm

B. 656 nm

C. 566 nm

D. 556nm

Answer: B

---

2. The uncertainty in momentum of an electron is 1×10^{-5} kg m/s. The uncertainty in its position will be (Given, $h = 6.62 \times 10^{-34} kgm^2/s$)

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

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

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

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

Answer: A

---

3. In hydrogen atom, energy of first excited state is -3.4 eC. Then, KE of same orbit of hydrogen atom is

A. $+3.4eV$

B. $+6.8eV$

C. $-13.6ev$

D. $+13.6$eV

Answer: A

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4. Maximum number of electrons in a subshell with $l = 3$ and $n = 4$ is

A. 10

B. 12

C. 14

D. 16

Answer: C

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5. The total number of subshells in fouth energy level of an atom is

A. 4

B. 8

C. 16

D. 32

Answer: A

6. For which of the following sets of quantum numbers, an electrons will

have the highest energy ?

A.
n	l	m	s
3	2	1	$+1/2$

B.
n	l	m	s
4	2	-1	$+1/2$

C.
n	l	m	s
4	1	0	$-1/2$

$$\text{D.} \quad \begin{array}{cccc} n & l & m & s \\ 5 & 0 & 0 & -1/2 \end{array}$$

Answer: B

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7. A transition element X has a configuration $[Ar]3d^4$ in its $+3$ oxidation state. Its atomic number is
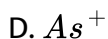
A. 22

B. 19

C. 25

D. 26

Answer: C

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8. Among the following which one is not paramagnetic ? [Atomic numbers , $Be = 4, Ne = 10$,As =33 ,Cl=17]`

A. Ne^{2+}

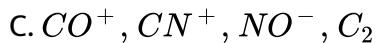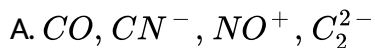B. Be^{+}

C. Cl^{-}

D. As^{+}

Answer: C

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9. Isoelectronic species are

A. $CO, CN^{-}, NO^{+}, C_2^{2-}$

B. CO^{-}, CN, NO, C_2^{-}

C. $CO^{+}, CN^{+}, NO^{-}, C_2$

D. CO, CN, NO, C_2

Answer: A

10. Consider the following sets of quantum number

	n	l	m	s
(i)	3	0	0	+1/2
(ii)	2	2	1	+1/2
(iii)	4	3	-2	-1/2
(iv)	1	0	-1	-1/2
(v)	3	2	3	+1/2

Which of the following sets of quantum number is not possible ?

A. (i),(ii),(iii) and (iv)

B. (ii) ,(iv) and (v)

C. (i) and (iii)

D. (ii),(iii) and (iv)

Answer: B

11. Two particles A and B are in motion. If the wavelength associated with particle A is $5 \times 10^{-8} m$, calculate the wavelength associated with particle B if its momentum is half of A.

    A. $5 \times 10^{-8} m$

    B. $10^{-5} cm$

    C. $10^{-7} cm$

    D. $5 \times 10^{-8} cm$

Answer: B

12. A p-orbital can accommodate upto :

A. 2 electrons with parallel spin

B. 6 electrons

C. 2 electrons with opposite spin

D. 14 electrons

Answer: C

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13. Total number of spectral in UV region during transition from 5th excited state to 1^{St} excited state

A. 10

B. 3

C. 4

D. zero

Answer: D

14. For principal quantum number n=5 the total number of orbital having

l=3 is

A. 7

B. 14

C. 9

D. 18

Answer: A

15. The first emission line in the atomic spectrum of hydrogen in the

Balmer series appears at`

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

B. $\dfrac{3R}{4}\,cm^{-1}$

C. $\dfrac{7R}{144}\,cm^{-1}$

D. $\dfrac{9R}{400}\,cm^{-1}$

Answer: A

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16. The four quantum number of the valence electron of potassium are.

A. $4,\ 0,\ 1,\ \dfrac{1}{2}$

B. $4,\ 1,\ 0,\ \dfrac{1}{2}$

C. $4,\ 0,\ 0,\ \dfrac{1}{2}$

D. $4,\ 1,\ 1,\ \dfrac{1}{2}$

Answer: C

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17. In a hydrogen atom , If the energy of electron in the ground state is -x

eV ., then that in the 2nd excited state of He^+ is

A. $-xeV$

B. $-\dfrac{4}{9}xeV$

C. $+2xeV$

D. $-\dfrac{9}{4}xeV$

Answer: B

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18. In the ground state, an element has 13 electrons in its M shell. The

element is

A. Manganese

B. Cobalt

C. Nickel

D. Iron

Answer: A

---

19. The wavelength of radiation emitted when in He^+ electron falls infinity to stationary state would be $\left(R = 1.098 \times 10^7 m^{-1}\right)$

A. $2.2 \times 10^{-8} m$

B. $2.2 \times 10^{-9} m$

C. $120 m$

D. $22 \times 10^7 m$

Answer: A

20. In Boh'r series of lines of hydrogen spectrum, the third line from the red corresponds to which one of the following inter orbit jumps of the electron for Boh'r orbit in an atom of hydrogen ?

A. $3 \to 1$

B. $5 \to 2$

C. $2 \to 5$

D. $3 \to 2$

Answer: B

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21. The correct order of energy difference between adjacent energy levels in H - atom .

A. $E_2 - E_1 > E_3 - E_2 > E_4 - E_3$

B. $E_2 - E_1 > E_4 - E_3 > E_3 - E_2$

C. $E_4 - E_3 > E_3 - E_2 > E_2 - E_1$

D. $E_3 - E_2 > E_4 - E_3 > E_2 - E_1$

Answer: A

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22. Which of the following electron transitions in a hydrogen atom will require the largest amount of energy?

A. $n = 1$ to $n = 2$

B. n=2 to n=3

C. n=1 to $n = \infty$

D. n=3 to n=5

Answer: C

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23. Which combinations of quantum number n, l, m, s for the electron in an atom does not provide a permissible solution of the wave equation ?

A. $3, 2, -2, \dfrac{1}{2}$

B. $3, 3, 1, -\dfrac{1}{2}$

C. $3, 2, 1\dfrac{1}{2}$

D. $3, 1, 1, -\dfrac{1}{2}$

Answer: B

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24. The orbital angular momentum of electron in 4s orbital of H atom is ....

A. $\dfrac{1}{2} \cdot \dfrac{h}{2\pi}$

B. zero

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

D. $(2.5)\dfrac{h}{2\pi}$

Answer: B

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25. Radial nodes present in 3s and 3p - orbitals are respectively

A. 0,2

B. 2,1

C. 1,1

D. 2,2

Answer: B

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26. The electrons, identified by quantum numbers n and l(i) n=4,l=1 (ii) n=4, l=0 (iii) n=3,l=2 (iv) n=3, l=1 can be placed in order of increasing energy from the lowest to highest as

A. $A < B < C < D$

B. $D < C < B < A$

C. $D < B < C <$ A

D. $C < B < A < D$

Answer: C

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27. The number of lobes in most of the d- orbitals are

A. 6

B. 8

C. 10

D. 4

Answer: D

28. For which of the following options m=0 for all orbitals ?

A. $2s, 2p_x, 3d_{xy}$

B. $3s, 2p_z, 3d_{z^2}$

C. $2s, 2p_z, 3d_{X^2-y^2}$

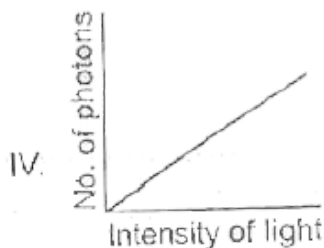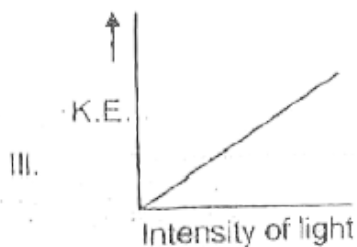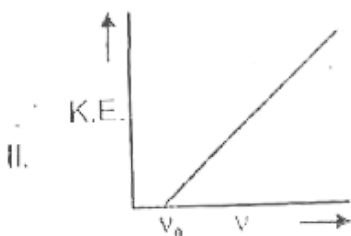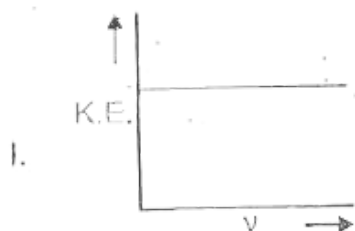D. $3s, 3p_x, 3d_{yz}$

Answer: B

29. Which is the correct graphical representation based on photoelectric effect ?

A. I &II

B. II&III

C. III& IV

D. II&IV

Answer: D

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30. Time taken for an electron to complete one revolution in Bohr orbit of hydrogen atom is

    A. Inversely proportional to n^2

    B. Directly proportional to n^3

    C. Directly proportional to $\dfrac{h}{2\pi}$

    D. Inversely proportional to $\dfrac{n}{h}$

Answer: B

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31. What will be the ratio of wavelength of the first line to that of the second line of paschen series of H - atom ?

    A. $256 : 175$

    B. $175 : 256$

    C. $15 : 16$

D. $24 : 27$

Answer: A

32. In any subshell, the maimum number of electrons having same value of spin quantum number is :

A. $\sqrt{l(l+1)}$

B. $l + 2$

C. $2l + 1$

D. $4l + 2$

Answer: C

33. For the transition from $n = 2 \rightarrow n = 1$, which of the following will produce shortest wavelength ?

A. H atom

B. D atom

C. He^+ ion

D. Li^{2+} ion

Answer: D

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34. If each orbital can hold a maximum of 3 electrons. Then the number of elements in 2nd period of the periodic table is :

A. 27

B. 9

C. 18

D. 12

Answer: D

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1. How many electrons can fit in the orbital for which n = 3 and l = 1 ?

A. 2

B. 6

C. 10

D. 14

Answer: A

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2. Which of the following pairs of d-orbitals will have electron density along the axes ?

    A. d_{z^2}, d_{xy}

    B. d_{xz}, d_{yz}

    C. D_{z^2}, $d_{x^2-y^2}$

    D. D_{xy}, $d_{x^2-y^2}$

Answer: C

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3. Two electrons occupying the same orbital are distinguished by

    A. Spin quantum number

    B. Principal quantum number

    C. Magnetic quantum number

    D. Azimuthal quantum number

Answer: A

---

4. The angular momentum of electrons in d orbital is equal to

A. $0h$

B. $\sqrt{6}h$

C. $\sqrt{2}h$

D. $2\sqrt{3}h$

Answer: B

---

5. What is the maximum number of orbitals that can be identified with the following quantum numbers ?

$n = 3, l = 1,$ and $m_l = 0$

A. 1

B. 2

C. 3

D. 4

Answer: A

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6. Calculate the energy in joule corresponding to light of wavelength 45

nm   :

$\left(\text{Planck's constant } h = 6.63 \times 10^{-34} \text{ Js: speed of light } :c = 3 \times 10^{8} \text{ms}^{-1}\right.$

.

A. 6.67×10^{15}

B. 6.67×10^{11}

C. 4.42×10^{15}

D. 4.42×10^{-18}

Answer: D

7. Be^{2+} is isoelectronic with which of the following ions ?

A. H^+

B. Li^+

C. Na^+

D. Mg^+

Answer: B

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

A. 6

B. 4

C. 2

D. 10

Answer: C

9. The value of Planck's constant is 6.63×10^{-34} Js. The speed of light is $3 \times 10^{17} nms^{-1}$. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of of $6 \times 10^{15} s^{-1}$?

A. 25

B. 50

C. 75

D. 10

Answer: B

10. Based on equation $E = -2.178 \times 10^{-18} J\left(\dfrac{Z^2}{n^2}\right)$, certain conclusions are written. Which of them is not correct ?

A. Larger the value of n , the larger is the orbit radius

B. Equation can be used to Calculate the change in energy when the electron changes orbit

C. For n=1 , the electron has a more negative energy than it does for n=6 which means that the electron is more loosely bound in the smallest allowed orbit

D. The negative sign in equation simpty means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus

Answer: C

---

11. The correct set of four quantum numbers for the valence elections of rubidium atom (Z= 37) is:

A. $5, 0, 0, +\dfrac{1}{2}$

B. $5, 1, 0 +\dfrac{1}{2}$

C. $5, 1, 1, +\dfrac{1}{2}$

D. $6, 0, 0, +\dfrac{1}{2}$

Answer: A

---

12. Maximum number of electrons in a subshell with $l = 3$ and $n = 4$ is

A. 10

B. 12

C. 14

D. 16

Answer: C

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13. The orbital angular momentum of a p-electron is given as :

A. $\dfrac{h}{\sqrt{2\pi}}$

B. $\sqrt{3}\dfrac{h}{2\pi}$

C. $\sqrt{\dfrac{3}{2}}\dfrac{h}{\pi}$

D. $\sqrt{6}\dfrac{h}{2\pi}$

Answer: A

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

A. 4

B. 8

C. 16

D. 32

Answer: C

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15. The energies E_1 and E_2 of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths, i.e., λ_1 and λ_2 will be

A. $\lambda_1 = \dfrac{1}{2}\lambda_2$

B. $\lambda_1 = \lambda_2$

C. $\lambda_1 = 2\lambda_2$

D. $\lambda_1 = 4\lambda_2$

Answer: C

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16. If $n = 6$, the correct sequence for filling of electrons will be

A. $ns \rightarrow np \rightarrow (n-1)d \rightarrow (n-2)f$

B. $ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$

C. $ns \rightarrow (n-1)d \rightarrow (n-2)f \rightarrow np$

D. $ns \rightarrow (n-2)f \rightarrow np(n-1)d$

Answer: B

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17. According to the Bohr Theory , which of the hydrogen atom will give rise to the least energetic photon ?

    A. n=6 to n=5

    B. n=5 to n=3

    C. n=6 to n=1

    D. N=5 to n=4

Answer: A

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18. A 0.66 kg ball is moving with a speed of 100 m/s. The associated wavelength will be $\left(h = 6.6 \times 10^{-34} Js\right)$ -

    A. $6.6 \times 10^{-32} m$

    B. $6.6 \times 10^{-34} m$

    C. $1.0 \times 10^{-35} m$

D. $1.0 \times 10^{-32} m$

Answer: C

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19. The energy absorbed by each molecule (A_2) of a substance is $4.4 \times 10^{-19} J$ and bond energy per molecule is $4.0 \times 10^{-19} J$. The kinetic energy of the molecule per atom will be

A. $2.2 \times 10^{-19} J$

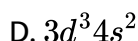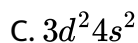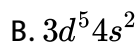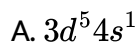B. $2.0 \times 10^{-19} J$

C. $4.0 \times 10^{-20} J$

D. $2.0 \times 10^{-20} J$

Answer: D

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20. Which one of the elementa with the following outer orbit configrations may exhibit the largest number of oxidation states ?

A. $3d^5 4s^1$

B. $3d^5 4s^2$

C. $3d^2 4s^2$

D. $3d^3 4s^2$

Answer: B

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21. Maximum number of electrons in a subshell of an atom is determined by the following

A. $2l + 1$

B. $4l - 2$

C. $2n^2$

D. $4l + 2$

Answer: D

22. Which of the following is not permissible arrangement of electrons in

an atom ?

A. $n = 5, l = 3, m = 0, s = +\dfrac{1}{2}$

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

C. $n = 3, l = 2, m = -2, s = -\dfrac{1}{2}$

D. $n = 4, l = 0, m = 0, s = +\dfrac{1}{2}$

Answer: B

23. A p-n photodiode is made of a material with a band gap of $2.0eV$. The minimum frequency of the radiation that can be absorbed by the material is nearly

A. $20 \times 10^{14} Hz$

B. $10 \times 10^{14} Hz$

C. $5 \times 10^{14} HZ$

D. $1 \times 10^{14} HZ$

Answer: C

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24. If the uncertainties in position and momentum are equal, the uncertainty in the velocity is :

A. $\sqrt{\dfrac{h}{\pi}}$

B. $\dfrac{1}{2m}\sqrt{\dfrac{h}{\pi}}$

C. $\sqrt{\dfrac{h}{2\pi}}$

D. $\dfrac{1}{m}\sqrt{\dfrac{h}{\pi}}$

Answer: B

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25. The measurement of the electron position is associated with an uncertainty in momentum, which is equal to 1×10^{-18} g cm s^{-1}. The uncertainty in electron velocity is :

(Mass of an electron is $9 \times 10^{-28} g$)

A. $1 \times 10^{11} cms^{-1}$

B. $1 \times 10^{9} cms^{-1}$

C. $1 \times 10^{6} sms^{-1}$

D. $1 \times 10^{5} cms^{-1}$

Answer: B

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26. Consider the following sets of quantum numbers

	n	ℓ	m	s
(a)	3	0	0	$+\frac{1}{2}$
(b)	2	2	1	$+\frac{1}{2}$
(c)	4	3	-2	$-\frac{1}{2}$
(d)	1	0	-1	$-\frac{1}{2}$
(e)	3	2	3	$+\frac{1}{2}$

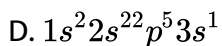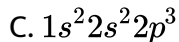which of the following sets of quantum number is not possible ?

A. (a) and (C)

B. (b) , (c) and (d)

C. (a) , (b) ,(c) and (d)

D. (b), (d) and (e)

Answer: D

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27. With which of the following electronic configuration of an atom has the lowest ionization enthalpy:
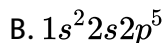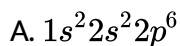
A. $1s^2 2s^2 2p^6$

B. $1s^2 2s 2p^5$

C. $1s^2 2s^2 2p^3$

D. $1s^2 2s^{22} p^5 3s^1$

Answer: D

---

28. A micorscope using suitable photons is employed an electron in an atom within a distance of $0.1A$. What is the uncetrancity involved in the

measurment of its velcity ?

A. $5.79 \times 10^6 ms^{-1}$

B. $5.79 \times 10^7 ms^{-1}$

C. $5.79 \times 10^8 ms^{-1}$

D. $5.79 \times 10^5 ms^{-1}$

Answer: A

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29. Orientation of orbitals is given by

A. Azimuthal quantum number

B. Spin quantum number

C. Magnetic quantum number

D. Principal quantum number

Answer: C

30. The energy of second Bohr orbit of the hydrogen atom is -328 kJ mol^{-1}, hence the energy of fourth Bohr orbit would be

A. $41 KJmol^{-1}$

B. $-1312 KJmol^{-1}$

C. $-164 KJmol^{-1}$

D. $-82 KJmol^{-1}$

Answer: D

31. Uncertainty in position of an electron (mass of an electron is $= 9.1 \times 10^{-28} g$) moving with a velocity of $3 \times 10^4 cm/s$ accurate upto 0.001% will be (use $\dfrac{h}{4\pi}$ in uncertainty expression where $h = 6.626 \times 10^{-27}$ erg s)

A. 5.76cm

B. 7.68cm

C. 1.93cm

D. 3.84cm

Answer: C

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32. Bohr radium for the hydrogen atom (n=1) is approximately 0.530 Å. The radius for the first excited state (n=2) is (in Å)

A. 0.53Å

B. 1.06Å

C. 0.17Å

D. 0.265Å

Answer: C

33. In Bohr 's model of hydrogen when an electron jumps from n=1 to n=3 how much energy will be abosrbed

    A. $2.389 \times 10^{-12} ergs$

    B. $0.239 \times 10^{-10} ergs$

    C. $2.15 \times 10^{-11} ergs$

    D. $0.1936 \times 10^{-10} ergs$

Answer: D

34. The electronic configuration of gadolinium (Atomic number 64) is

    A. $[Xe]4f^3 5d^5 6s^2$

    B. $[Xe]4f^6 5d^2 6d^2$

C. $[Xe]4f^8 5d^9 6s^2$

D. $[Xe]4f^7 5d^1 6s^2$
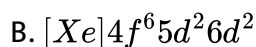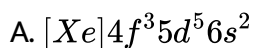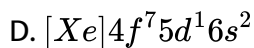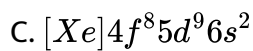
Answer: D

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35. The ion that is isoelectronic with CO is

A. CN^-

B. N_2^+

C. O_2^-

D. N_2^-

Answer: A

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36. Bohr's radius for the H-atom (n =1) is approximately 0.53 Ã.... The radius of the first excited state (n=2) is :

A. 4.77

B. 1.06

C. 0.13

D. 2.12

Answer: D

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37. The position of both an electron and a helium atom is known within $1.0 nm$ and the momentum of the electron is known within $5.0 \times 10^{-26} kgms^{-1}$. The minimum uncertainty in the measurement of the momentum of the helium atom is.

A. $8.0 \times 10^{-26} ms^{-1}$

B. $80 kgms^{-1}$

C. $50 kgms^{-1}$

D. $5.0 \times 10^{-26} kgms^{-1}$

Answer: D

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38. Which of the following electron configurations is correct for iron, (atomic number26)?

A. $1s^2 2s^2 2p^6 3s^6 4s^2 3d^7$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4s^2 3d^5$

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

D. $1s^2 2s^6 3s^2 3p^6 4s^2 3d^6$

Answer: D

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39. Which of the following has maximum of unpaired d- electrons ?

A. Ni^{3+}

B. Fe^{2+}

C. Zn^+

D. Cu^+

Answer: B

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40. Who modified Bohr's theory by introducing elliptical orbits for electron path ?

A. Rutherford

B. Thomson

C. Hund

D. Sommerfield

Answer: D

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41. The de-Broglie wavelength of a particle with mass 1 g and velocity 100 m/s is

    A. $6.63 \times 10^{-35} m$

    B. $6.63 \times 10^{-34} m$

    C. $6.63 \times 10^{33} m$

    D. $6.65 \times 10^{-35} m$

Answer: C

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42. The following quantum numbers are possible for how many orbital (s)

n = 3, l = 2 and m = +2 ?

A. 1

B. 2

C. 3

D. 4

Answer: A

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43. The frequency of radiation emiited when the electron falls n =4 to n=1

in a hydrogen atom will be (given ionization energy of

$H = 2.18 \times 10^{-18} J \, \text{atom}^{-1}$ and $h = 6.625 \times 10^{-34} Js$)

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

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

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

D. $2.00 \times 10^{15} s^{-1}$

Answer: C

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44. Which one of the following ions has electronic configuration $[Ar]3d^6$?

(At. No. Mn=25, Fe=26, Co=27, Ni=28)

A. CO^{3+}

B. Ni^{3+}

C. Mn^{3+}

D. Fe^{3+}

Answer: A

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45. which of the following is not among shortcomings of bohr 's modal ?

A. bohr theory could account for the fine lines in the atomic spectrum

B. Bohr theory was unable to account for the spliiting of the spectral

   lines in the pressence of magnetic field

C. bohr theory failed for He atom

D. It did not give information about energy level

Answer: D

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46. Number of spectral lines falling Balmer series when electrons are de -

excited from n^{th} shell will be given as

A. $(n - 2)$ in UV

B. (n-2) in visible region

C. (n-3) in near IR

D. (n-3) in far IR

Answer: B

47. The ratio of the energy required to remove an electron from the first three Bohr's orbit of Hydrogen atom is

    A. $3 : 2 : 1$

    B. $9 : 4 : 1$

    C. $36 : 9 : 4$

    D. $1 : 4 : 9$

Answer: C

Assignment Section D Assertion Reason Type Questions

1. A : orbital angular momentum of(1s,2s,3s,etc) all s electrons is same

R : orbital angular momentum depends on orientation of orbitals .

    A. IF both assertion & reason are true and the reason is the correct

        explanation of the assertion then mark

    B. IF both assertion & reason are true but the reason is not the

        correct explanation of the assertion , then mark

    C. IF assertion is true statement but reason is false , then mark

    D. If both assertion and reason are false statements then mark

Answer: C

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2. A : Energy of electron is taken negative

R: energy of electron at infinity is zero

A. IF both assertion & reason are true and the reason is the correct

explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the

correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: A

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3. A: bohr's orbits are also called stationary states

R : Electrons are stationary in an orbit .

A. IF both assertion & reason are true and the reason is the correct

explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: C

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4. A: K.E of two subatomic particles having same De - Broglie 's wavelength is same

R : de - Broglie 's wavelength is directly related to mass of subatomic particles

A. IF both assertion & reason are true and the reason is the correct explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: D

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5. A: Electronic energy for hydrogen atom of different orbitals follow the sequence

$$1s < 2s = 2p < 3s = 3p = 3d$$

R : Electronic energy for hydrogen atom depends only on n and is independent of 'l' & 'm' values .

A. IF both assertion & reason are true and the reason is the correct explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: A

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6. Write brief notes on the following: (ii) Heterogeneous catalysis

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7. A: Zn (II) salts are diamagnetic

R : Zn^{2+} ion has one unpaired electron.

   A. IF both assertion & reason are true and the reason is the correct

      explanation of the assertion then mark

   B. IF both assertion & reason are true but the reason is not the

      correct explanation of the assertion , then mark

   C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: C

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8. A : in third energy level there is no -f- subshell .

R : For n=3 the possible values of l are 0,1,2 and for f- subshell l = 3. .

A. IF both assertion & reason are true and the reason is the correct

explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the

correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: A

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9. A : The charge to mass ratio of the particles anode rays depends on nature of gas taken the discharge tube .

R : The particles of anode rays carry positive charge

    A. IF both assertion & reason are true and the reason is the correct explanation of the assertion then mark

    B. IF both assertion & reason are true but the reason is not the correct explanation of the assertion , then mark

    C. IF assertion is true statement but reason is false , then mark

    D. If both assertion and reason are false statements then mark

Answer: B

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10. A: Angular momentum of an electron in an atom is quantized

R : in an atom only orbitals are permitted in which angular momentum of

the electron is a natural number multiple of $\dfrac{h}{2\pi}$

A. IF both assertion & reason are true and the reason is the correct

explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the

correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: A

11. A : The radius of second orbit of he^+ is equal to that of first orbit of

hydrogen

R : The radius of an orbit in hydrogen like species is directly proportional

to n and inversely proportional to Z .

A. IF both assertion & reason are true and the reason is the correct explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: D

12. A : The orbitals having equal energy are known as degenerate orbitals

R : The three 2p orbitals are degenerate in the presence of external magnetic field .

A. IF both assertion & reason are true and the reason is the correct explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the

correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: C

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13. A : in a multielectron atom , the electrons in different sub-shell have different energies

R : energy of an orbital depends upon n+l value .

A. IF both assertion & reason are true and the reason is the correct

explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the

correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: A

14. A : Isotopes of an element have almost similar chemical properties

R : isotopes have same electron configuration .

A. IF both assertion & reason are true and the reason is the correct

explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the

correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: A

15. A : the number of angular nodes in $3d_{z^2}$ is zero

R : Number of angular nodes of atomic orbitals is equal to value of l.

A. IF both assertion & reason are true and the reason is the correct explanation of the assertion then mark

B. IF both assertion & reason are true but the reason is not the correct explanation of the assertion , then mark

C. IF assertion is true statement but reason is false , then mark

D. If both assertion and reason are false statements then mark

Answer: B