NeetPreparation

Structure of Atom and Nuclear Chemistry Important Questions With Answers

NEET Chemistry 2023

1. The energy of photon is given as : $\triangle$E/atom= 3.03 x 10^{-19}J $atom^{-1}$, then the wavelength (λ) of the photon is:
   a) 6.56 nm b) 65.6 nm **c) 656 nm** d) 0.656 nm

   Solution : -
   Expression for the energy of a photon is as follows:
   $\triangle E = \frac{hc}{\lambda}$
   Now, $\triangle E$ = 3.03 x 10^{-19} J $atom^{-1}$, h = 6.63 x 10^{-34}Js, c = 3.00 x 10^{8} ms^{-1}
   Thus, 3.00 x 10^{-19}J $atom^{-1}$
   $= \frac{6.63 \times 10^{-34} Js \times 3.00 \times 10^{8} ms^{-1}}{\lambda}$
   λ = 6.63 x 10^{-7}m
   Now, 1 m=10^{9}nm
   Hence, λ = 6.56 x 10^{-7} x 10^{9} nm
   = 6.56 x 10^{2} nm
   = 656 nm

2. The spectrum of helium is expected to be similar to that of:
   a) H b) Na **c) Li^+** d) He^+

   Solution : -
   Atomic spectra of an element follow a pattern based on the number of electrons present in it. In case of helium the number of electrons present in it is two. Thus, the atom or ion having two electrons must have similar spectrum as that of helium atom. Among the given options, Li^+ have two electrons thus, it resembles spectral pattern of helium.

3. Radius of 3rd Bohr orbit of hydrogen atom is:
   a) 6.529A^o b) 2.116A^o **c) 4.761A^o** d) 8.464A^o

   Solution : -
   The radius of an orbit is given by,
   $r = \frac{n^2 h^2}{4\pi^2 m Z e^2}$
   Substituting the values of h, m, z = 1 for hydrogen and the electron charge army be calculated as
   r = 0.529 $\times$ n^2A^0
   For n = 3
   r = 4.761A^0

4. Which of the following radiation following has highest wave number?
   a) Microwaves **b) X-rays** c) I.R.-rays d) Radiowaves

   Solution : -
   $$\lambda = \frac{1}{v}$$

5. When an electron with charge 'c' and mass 'm ' moves with velocity 'v' around the nucleus having nuclear charge 'Z' in a circular orbit of radius 'r', the potential energy of electron is
   a) $\frac{Ze^2}{r}$ b) $\frac{Ze^2}{r^2}$ **c)** $\frac{-Ze^2}{r}$ d) $\frac{mv^2}{r}$

   Solution : -

PE=$\frac{-Ze^2}{r}$

6. Chlorine exists in two isotopic forms, Cl-37 and Cl-35 but its atomic mass is 35.5. This indicates the ratio of Cl-37 and Cl-35 is approximately

   a) 1:2   b) 1:1   **c) 1:3**   d) 3:1

   Solution : -

   Let relative abundance of Cl-37 = x%
   then relative abundance of Cl-35 = (100 - x)%
   Average atomic mass=$\frac{x\times37+(100-x)35}{100}$=35.5
   ⇒ 37x + 3500 - 35x = 3550 ⇒ x = 25
   ∴ 100-x=75
   Thus, the ratio of Cl-37 and Cl-35 is x : (100 - x)
   = 25:75 = 1:3

7. A helium atom at 300 K is moving with a velocity of 2.40 $\times$ 10^2 ms^{-1}. The de-Broglie wavelength is about [At. Wt. of He = 4.0]

   a) 0.416 nm   b) 0.83 nm   c) 803 Å   d) 8000 Å

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

   a) 2.2 x 10^{-19} J   b) 2.2 x 10^{-19} J   c) 40 x 10^{-20} J   **d) 20 x 10^{-20} J**

   Solution : -

   $$\text{K.E. per atom } = \frac{E_1-E_2}{2}$$
   $$= \frac{(4.4\times10^{-19})-(4.0\times10^{-19})}{2}$$
   $$= \frac{0.4\times10^{-19}}{2} = 2.0 \times 10^{-20} \text{ J}$$

9. Sodium ion is isoelectronic with the atom

   a) Mg^{2+} b) Al^{3+} **c) Ne**   d) N^{3-}

   Solution : -

   Mg^{+2}, Al^{+3}, N^{-3} are iso electronic ions

10. The frequency of the matter wave of a particle is given by

    a) $\frac{2K.E}{h}$ b) $\frac{K.E}{2h}$ c) $\frac{h}{2K.E}$ d) $\frac{K.E}{h}$

    Solution : -

    $$\lambda = \frac{h}{m}; v = \frac{v}{\lambda} = \frac{v}{h/mv} = \frac{mv^2}{h} = \frac{2K.E}{h}$$

11. The incorrect statement regarding cathode rays is

    a) They travel in straight line   **b) They depend on the nature of the gas**
    c) They are deflected by magnetic as well as electric fields   d) They produce mechanical effects

    Solution : -

    Cathode rays are basic particles. They do not depend on nature of gas or electrode.

12. A nuclide of an alkaline earth metal undergoes radioactive decay by emission of the $\alpha-$particles is succession. The group of the periodic table to which the resulting daughter element would belong to:

    a) Gr.4   b) Gr.16   **c) Gr.14**   d) Gr.16

    Solution : -

    A nuclide of an alkaline earth metal undergoes radioactive decay by emission of the α-particles in succession.
    The group of periodic table to which the resulting daughter element belongs to is group 14.
    In this series of alpha emissions, the final stable daughter nucleus is nucleus of Pb (Z=82). It belongs to group 14 (carbon family).

13. The spin-only magnetic moment of free ion is $\sqrt{8}$ B.M. The spin angular momentum of electron will be

a) $\sqrt{2}\frac{h}{2\pi}$ b) $\sqrt{8}\frac{h}{2\pi}$ c) $\sqrt{6}\frac{h}{2\pi}$ d) $\sqrt{\frac{3}{4}}\frac{h}{2\pi}$

Solution : -

$\sqrt{8} = \sqrt{n(n+2)}$; n=2

No. of unpaired electrons = 2

$s = \frac{1}{2} + \frac{1}{2}$ =1

$L_s = \sqrt{s(s+1)}\frac{h}{2\pi}$=$\sqrt{2}\frac{h}{2\pi}$

14. The radioactive isotope $^{60}_{27}\mathrm{Co}$ which is used in treatment of cancer can be made (n, p) reaction. For this reaction the target nucleus is

a) $^{59}_{28}\mathrm{Ni}$ b) $^{59}_{27}\mathrm{Co}$ **c)** $^{60}_{28}\mathrm{Ni}$ d) $^{60}_{27}\mathrm{Co}$

Solution : -

$^{60}_{28}\mathrm{Ni}$+$^{1}_{0}\mathrm{n}\rightarrow$ $^{60}_{27}\mathrm{Co}$+$^{1}_{1}\mathrm{H}$

15. The half-life of a substance in a certain enzyme -catalyzed reaction is 138 s. The time required for the concentration of the substance to fall from 1.28 $1.28\mathrm{mgL}^{-1}$ to $0.04\mathrm{mgL}^{-1}$ is:

a) 414 s b) 552 s **c) 690 s** d) 276 s

Solution : -

As we know that for a first order reaction

Total time T = no. of half-lives (n) x half-life ($t_{1/2}$)

$\frac{\mathrm{N}}{\mathrm{N}_0} = \left(\frac{1}{2}\right)^n$ .....(i)

n = no. of half-lives .

No = initial amount

No = amount (at time T)

Given No = $1.28\mathrm{mg}/\ell$

N = .04 mg/gl and putting the value in (i)

$\therefore \frac{0.04}{1.28} = \left(\frac{1}{2}\right)^n \Rightarrow \frac{1}{32} = \left(\frac{1}{2}\right)^n$

$\left(\frac{1}{2}\right)^5 = \left(\frac{1}{2}\right)^n$

From both side, then

n = 5

$\mathrm{T} = 5 \times 138 \Rightarrow \mathrm{T} = n + t_{1/2}$

= 5 x 138

T = 690

16. The electron in Bohr's model of hydrogen atom is pictured as revolving around the nucleus in order for it to

a) possess energy b) emit protons c) keep from being pulled into the nucleus

d) keep from being repelled by the nucleus

Solution : -

Revolving electrons possess energy

17. Which of the following configurations represents the most electronegative element?

a) $1s^2\ 2s^2\ 2p^6\ 3s^1$ **b) $1s^2\ 2s^2\ 2p^5$** c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ d) $1s^2\ 2s^2\ 2p^4$

Solution : -

Most electronegative element is Fluorine tha has atomic number 9 and thus its electronic configuration is: $1s^2 2s^2 2p^5$

18. The age of most ancient geological formation is estimated by

a) potassium-argon method **b) carbon-14 dating method** c) radium- silicon method

d) uranium-lead method

Solution : -

C -14 dating method is used in estimate the age of most ancient geological formation.

19. Assertion: In electromagnetic spectrum, the small portion around 10^{15} Hz is called visible light.
Reason: Visible region is only a small part of the entire spectrum which our eyes can see.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

Solution : -
The Visible region of electromagnetic spectrum varies from 380nm to 760nm i.e. 7×10^{14} Hz to 4×10^{14} Hz This is the only region which is visible to human eyes. That's why it is termed as the Visible region. Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

20. The energy of an electron in the first Bohr orbit of H atom is -13.6 eV . The possible energy values (s) of the excited state (s) for electrons in Bohr orbits of hydrogen is (are)
a) -3.4 eV b) -4.2 eV c) -6.8 eV d) +6.8 eV

Solution : -
Values of energy in the excited state = $-\frac{13.6}{n^2} eV$
$= \frac{-13.6}{4} = -3.4 \mathrm{eV}$ in which n = 2,3,4 etc.

21. What will be the uncertainty in velocity of a bullet with a mass of 10 g whose position is known with ± 0.01 mm?
a) 5.275×10^{-33} m s^{-1} b) 5.275×10^{-25} m s^{-1} c) 5.275×10^{-5} m s^{-1} **d) 5.275×10^{-28} ms^{-1}**

Solution : -
$\Delta x = \pm\ 0.01$ mm = 1×10^{-5} m
m=10 g = 1×10^{-2} kg
$\Delta v = \frac{h}{4\pi m.\triangle x} = \frac{6.626 \times 10^{-34} Js}{4 \times 3.14 \times 10^{-2} kg \times 10^{-5} m}$
$= 5.275 \times 10^{-28}$ ms^{-1}.

22. An element with mass number 81 contains 31.7% more neutrons as compared to protons. Assign the atomic symbol.
a) ${}^{81}_{34}Br$ **b)** ${}^{81}_{35}Br$ c) ${}^{81}_{36}Sr$ d) ${}^{81}_{37}Sr$

Solution : -
Let x be the number of protons.
The number of neutrons is x + 0.317x = 1.317x.
The mass number is 81.
It is equal to the sum of the number of protons and the number of neutrons.
81 = x + 1.317x = 2.317x
x = 35
Hence, the symbol is ${}^{81}_{35}Br$.

23. Which quantum number defines the orientation of orbital in the space around the nucleus ?
a) Principal quantum number (n) b) Angular momentum quantum number
c) Magnetic quantum number (m_1) d) Spin quantum number (m_s)

Solution : -
Magnetic Quantum Number (m) : Gives the orientation of the orbital in space; in other words, the value of m describes whether an orbital lies along the x-, y-, or z-axis on a three-dimensional graph, with the nucleus of the atom at the origin. m can take on any value from −l to l.

24. Assertion: Elements like Rb, Cs, TI, In, Ga and Sc were discovered when their minerals were analysed by spectroscopic methods.
Reason: The characteristic lines in atomic spectra can be used in chemical analysis to identify unknown atoms.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

25. The energy absorbed by the electron is
a) 8.5 eV b) 3.4 eV c) 68 eV d) 3.78 eV

Solution : -

Total energy absorbed by electron is
3.4 + 5.1= 8.5eV

26. The number of electrons which will together weigh one gram
a) 1.098 x 10^{27} electrons b) 9.1096 x 10^{31} electrons c) 1 electron d) 1 x 10^{4} electrons

Solution : -
Mass of an electron = 9.1096 x 10^{-31} kg
1 g or 10^{-3} kg = $\frac{1}{9.1096\times10^{-31}}\times 10^{-3}$
= 1.098 x 10^{27} electrons.

27. Number of neutrons in a parent nucleus X, which gives $_7\,\mathrm{N}^{14}$ nucleus after two successive β -emissions would be
a) 9 b) 6 c) 7 d) 8

Solution : -
After emitting a β - particle, atomic number is increased by one unit and atomic weight has no change. So, the atomic number of parent nucleus will be 5.
$_5\mathrm{X}^{14} \xrightarrow{-\beta} {_6\mathrm{Y}^{14}} \xrightarrow{-\beta} {_7\,\mathrm{N}^{14}}$
Number of neutrons = mass number - number of protons
= 14 - 5 = 9

28. The correct set of four quantum numbers for the valence electron of rubidium atom (Z=37) is:
a) 5, 1 + 1/2 b) 6, 0, 0 + 1/2 **c) 5, 0, 0 + 1/2** d) 5, 1, 0 + 1/2

29. A certain metal when irradiated by light (v = 3.2 x 10^{16} Hz) emits photoelectrons with twice of K.E. as did photoelectrons when the same metal is irradiated by light (v = 2.0 x 10^{16} Hz). The Vo of the metal is
a) 1.2 x 10^{14} Hz **b) 8 x 10^{15} Hz** c) 1.2 X 10^{16} Hz d) 4 x 10^{12} Hz

Solution : -
$(K.E)_1 = hv_1 - hv_0$
$(K.E.)_2 = hv_2 - hv_0$
As $(K.E)_1 = 2 \times (K.E.)_2$
$\therefore (hv_1-hv_0)=2(hv_2-hv_0)$
or $v_0=2v_2-v_1 = 2 \times (2 \times 10^{16}) - (3.2 \times 10^{16})$
$=0.8 \times 10^{16}$ Hz or 8×10^{15} Hz

30. An excited hydrogen atom emits a photon of wavelength λ while returning to the ground state. If R is the Rydberg's constant, then the quantum number n of the excited state is
a) $\sqrt{\lambda R}$ b) $\sqrt{\lambda R-1}$ **c)** $\sqrt{\frac{\lambda R}{\lambda R-1}}$ d) $\sqrt{\lambda R(\lambda R-1)}$

Solution : -
$\bar{v}=\frac{1}{\lambda}=R\left(\frac{1}{1^2}-\frac{1}{n^2}\right)$
$\Rightarrow\lambda\left(\frac{1}{R(n^2-1)}\right)$, n=$\sqrt{\frac{\lambda R}{\lambda R-1}}$

31. The energy difference between the ground state of an atom and its excited state is 3 x 10^{-19} J. What is the wavelength of the photon required for this transition?
a) 6.6 x 10^{-34} m b) 3 x 10^{-8} m c) 1.8 x 10^{-7} m **d) 6.6 x 10^{-7} m**

Solution : -
$\Delta E=\frac{hc}{\lambda}$
$\lambda=\frac{(6.626\times10^{-34}Js)\times(3\times10^{8}ms^{-1})}{242\times10^{-9}}$=6.6 x 10^{-7} m

32. Energy of an electron in n^{th} Bohr orbit is given as
a) $-\frac{n^2h^2}{4\pi^2mZe^2}$ **b)** $-\frac{2\pi^2Z^2me^4}{n^2h^2}$ c) $-\frac{2\pi Ze^2}{nh}$ d) $-\frac{n^2h^2}{2\pi^2Z^2me^4}$

Solution : -

Formula of E of electrons= $-\frac{2\pi^2 Z^2 me^4}{n^2 h^2}$

33. Assertion: When an iron rod is heated in a furnace, the radiation emitted goes from a lower frequency to a higher frequency as the temperature increases.
Reason: The energy of a quantum of radiation is proportional to its frequency.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

34. The radioactive isotope, tritium $\left({}_1^3\text{H}\right)$ has a half-lilt of 12.3 years. If the initial amount of tritium is 32 mg, how many milligrams of it would remain after 49.2 years?
a) 8 mg b) 1 mg **c) 2 mg** d) 4 mg

Solution : -
Given $t_{1/2}$ = 12.3 years
Initial amount (N_o) = 32 mg
Total time = 49.2 years
We know that n and putting value
No of half lives (n) $= \frac{\text{T}}{t_{1/2}} = \frac{49.2}{12.3} = 4$
Now at t_1, time amount n_t is:
$\text{N}_t = \text{N}_0\left(\frac{1}{2}\right)^n = 32\left(\frac{1}{2}\right)^4 = \frac{32}{16} = 2\text{mg}$
Hence 32 mg becomes 2 mg in 49.2 years.

35. Which of the following is isoelectroic?
a) CO_2, NO_2 **b)** NO_3^-, CO_3^2- c) CN, CO d) SO_2, CO_2

Solution : -
Atoms and ions that have the same electron configuration are said to be isoelectronic.
Number of electrons in NO_3^- = 7 (in nitrogen) + 8 (in oxygen) $\times$ 3 (three oxygen atom) + 1 (1 from negative charge) = 32
Number of electrons in CO_3^{2-} = 6 (in carbon) + 8 (in oxygen) x 3 (three oxygen atom) + 2 (2 from negative charge) = 32
Hence they are the pairs of isoelectronic.

36. The ratio of the orbit of the 1st three radii in an atom of hydrogen is
a) 1 : 4 : 9 b) 9 : 4 : 1 c) 1 : 2 : 3 d) 3 : 2 : 1

Solution : -
Radii of nth orbit in an hydrogen
atom is proportional to n^2
∴ Required ratio is
$(1)^2 : (2)^2 : (3)^2$
= 1 : 4 : 9

37. Consider the following sets of quantum numbers

	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)

Solution : -

(ii) is not possible for any value of n because / varies from 0 to (n - 1) thus for n = 2, 1 can be only 0,1,2.
(iv) is not possible because far l = 0, m = 0.
(v) is not possible because for l = 2,n varies from
2 to +2.

38. (A): The energy of ultraviolet radiation is greater than the energy of infrared radiation
(R) : The velocity of ultraviolet radiation is greater than the velocity of infrared radiation
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is not the correct explanation of A **c) A is true and R is false**
d) R is true and A is false

Solution : -
All EMR travel with same velocity

39. An element has 13 electrons in its M shell and 1 electron in N shell in ground state. Identify the element.
a) Copper **b) Chromium** c) Iron d) Manganese

Solution : -
M orbital with 13 electrons and N orbital with 1 electron correspond to chromium.

40. The potential energy of electron in the ground state of He^+ ion is
a) 4.358 x 10^{-18} J/atom b) -7.112 x 10^{-18} J/atom **c) -1.743 x 10^{-17} J/atom** d) -8.279 x 10^{-18} J/atorn

Solution : -
P.E. = -2TE =-2 x 8.716 x 10^{-18} J/atom
= -1.743 x 10^{-17} J/atom

41. What is the lowest value of n that allows g orbital to exist?
a) 6 b) 7 c) 4 **d) 5**

Solution : -
For g-orbital, Azimuthal quantum number, l = 4 as:
l=0 $\Rightarrow$ s,
l=1 $\Rightarrow$ p,
l=2 $\Rightarrow$ d,
l=3 $\Rightarrow$f,
l=4 $\Rightarrow$g,
as value of l is from o to (n-1) where n=principal quantum number
$\therefore$ 4 = n - 1
n = 5

42. If the energy of H-atom in the ground state is -E, the velocity of photo-electron emitted when a photon having energy E_p strikes a stationary Li^{2+} ion in ground state, is given by:
a) $v=\sqrt{\frac{2\left(E_p-E\right)}{m}}$ b) $v=\sqrt{\frac{2\left(E_p+9E\right)}{m}}$ **c)** $v=\sqrt{\frac{2\left(E_p-9E\right)}{m}}$ d) $v=\sqrt{\frac{2\left(E_p-3E\right)}{m}}$

Solution : -
The energy of the atom in a particular shell\propto Z^2. Hence ground state enegy of Li ion = -3^2E_1 = -9E_1
Work function for Li^{2+} = 9E
(ground level energy)
$\mathrm{E_p=w+\frac{1}{2}mv^2;\quad E_p=9E+\frac{1}{2}mv^2}$
$v=\sqrt{\frac{2\left(E_p-9E\right)}{m}}$

43. The value of e/m for an element is
a) 1.78x10^8 c/g b) 1.6724x10^{-24} c/g c) 0.005486 c/g d) 1.00866 c/g

Solution : -
$\frac{e}{m}$ of e^- =$\frac{1.6\times10^{-19}}{9.1\times10^{-28}g}$ =1.78x10^8 c/g

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

a) $\frac{4\pi^2 mr^2}{nh}$ b) $\frac{nh}{4\pi^2 mr}$ c) $\frac{2\pi mr}{n^2h^2}$ d) $\frac{h}{2\pi mr}$

Solution : -

By Bohr postulate, $\mathrm{mvr} = \mathrm{n}\frac{\mathrm{h}}{2\pi}$ or $\mathrm{v} = \frac{\mathrm{nh}}{2\pi\mathrm{mr}}$

No. of revolutions per sec

$= \frac{\text{Velocity}}{\text{Circumference of the orbit}}$

$= \frac{\mathrm{v}}{2\pi\mathrm{r}} = \frac{\mathrm{nh}}{2\pi\mathrm{mr}} \times \frac{1}{2\pi\mathrm{r}} = \frac{\mathrm{nh}}{4\pi^2\mathrm{mr}^2}$

Time taken for one revolution = $\frac{4\pi^2 mr^2}{nh}$

45. Which of the following is responsible to rule out the existence of defence of definite paths or trajectories of electrons?

a) Pauli's exclusion principle   **b) Heisenberg's uncertainty principle**   c) Hunds rule of maximum multiplicity
d) Aufbau principle

Solution : -

A. Pauli's exclusion principle: No two electrons in an atom can have the same set of four quantum numbers. Or "Only two electrons may exist in the same orbital and these electrons must have opposite spin.

B. Heisenberg's uncertainty principle: It states that you can never simultaneously know the exact position and the exact speed of an object.

C. Hund's rule of maximum multiplicity: It states that pairing of electrons in the orbitals belonging to the same subshell (p, d or f) does not take place until each orbital belonging to that subshell has got one electron each with same spin i.e., it is singly occupied.

D Aufbau principle states that electrons first occupy the lowest energy orbital available to them and enter into higher energy orbitals only after the lower energy orbitals are filled.

Therefore Heisenberg's uncertainty principle is responsible to rule out the existence of definite paths or trajectories of electrons.

46. Which of the sequences given below shows the correct increasing order of energy?

a) 3s, 3p, 4s, 4p, 3d, 5s, 5p, 4d   b) 3s, 3p, 3d, 4s, 4p, 4d, 5s, 5p   **c) 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p**
d) 3s, 3p, 4s, 4p, 5s, 3d, 4d, 5p

Solution : -

The energy of an orbital depends on the (n+l) value. Higher is the (n+l) higher is the energy of the orbital.
Value of n majorly decides the energy of an orbital. For two orbitals with the same value for (n+l), the orbital with a higher value of n will have higher energy.

Thus increasing order of energy for orbitals is:

1s < 2s < 2p < 3s < 3p < 4s < 3d < 4p < 5s < 4d < 5p < 6s < 4f < 5d < 6p < 7s < 5f < 6d < 7p

For the given set of orbitals the order is:

3s < 3p < 4s < 3d < 4p < 5s < 4d < 5p

47. The orbital diagram in which both the Pauli's cxclusing principle and Hund's rule are violated, is:

a) [↑↓] [↓ | ↓ | ↓]   b) [↑↓] [↑↓ | ↑↓ | ↑]   c) [↑↓] [↑↓ | ↑↓ |]   **d)** [↑↓] [↑↑ | ↑↓ |]

Solution : -

Hund's rale & Pauli's principle statements

48. What will be the orbital angular momentum of an electron in 2s-orbital?

a) Zero   b) One   c) Two   d) Three

Solution : -

For 2s orbital l=0, angular momentum $= \frac{\sqrt{(1+1)}\times h}{2\pi} = 0$

49. ${}_{92}\mathrm{U}^{235} + {}_{0}n^{1} \rightarrow$ fission product + neutron $+3.2 \times 10^{-11}$ J The energy released, when 1 g of ${}_{92}\mathrm{U}^{235}$ finally undergoes fission, is:

a) 12.75×10^{8} kJ   b) 18.60×10^{9} kJ   **c) 8.21×10^{7} kJ**   d) 6.55×10^{6} kJ

Solution : -

235 g of U - 235 contains 6.023 x 10^{23} atoms

$1 \text{ gU} - 235 = \frac{6.023\times10^{23}}{235}$ atoms

Energy released

$= \frac{3.2\times10^{-11}\times6.023\times10^{23}}{235}$ J

$= 8.21 \times 10^{10}$ J

$= 8.21 \times 10^{7}$ kJ

50. Which atom (X) is indicated by the following configuration?

X ⟶ [Ne] $3s^2$ $3p^3$

a) Nitrogen b) Chlorine **c) Phosphorus** d) Sulphur