



CHEMISTRY

BOOKS - FULL MARKS CHEMISTRY (TAMIL ENGLISH)

QUANTUM MECHANICAL MODEL OF ATOM

Textual Evaluation Solved Choose The Correct Answer

1. Electronic configuration of species M^{2+} is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$ and its atomic weight is 56. The number of neutrons in the nucleus of species M is.....

- A. 26
- B. 22
- C. 30

D. 24

Answer: C



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2. The energy of light of wavelength 45 nm is

A. $6.67 \times 10^{15} J$

B. $6.67 \times 10^{11} J$

C. $6.67 \times 10^{-18} J$

D. $6.67 \times 10^{-15} J$

Answer: C



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3. The energies E_1 and E_2 of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths i.e. γ_1 and γ_2 will be

A. $\frac{\gamma_1}{\gamma_2} = 1$

B. $\gamma_1 = 2\gamma_2$

C. $\gamma_1 = \sqrt{25 \times 50}\gamma_2$

D. $2\gamma_1 = \gamma_2$

Answer: B



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4. Splitting of spectral lines in an electric field is called.....

A. Zeeman effect

B. Shielding effect

C. Compton effect

D. Stark effect

Answer: D



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5. Based on equation

$$E = -2.178 \times 10^{-18} J \left(\frac{z^2}{n^2} \right)$$

certain conclusions are written. Which of them is not correct ?

(NEET)

A. Equation can be used to calculate the change in energy when the electron changes orbit

- B. 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
- C. The negative sign in equation simply 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.
- D. Larger the value of n , the larger is the orbit radius

Answer: B

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6. According to the Bohr Theory, which of the following transitions in the hydrogen atom will give rise to the least energetic photon?

A. $n = 6$ to $n = 1$

B. $n = 5$ to $n = 4$

C. $n = 5$ to $n = 3$

D. $n = 6$ to $n = 5$

Answer: D



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7. Assertion The spectrum of He is expected to be similar to that of hydrogen Reason: He^+ is also one electron system

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

Answer: A



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8. Which of the following pairs of d-orbitals will have electron density along the axes? (NEET Phase - II)

A. d_z^2, d_{xz}

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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9. Two electrons occupying the same orbital are distinguished by.....

- A. azimuthal quantum number
- B. spin quantum number
- C. magnetic quantum number
- D. orbital quantum number

Answer: B



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10. The electronic configuration of Eu (atomic no.63)Gd (atomic no.64) and Tb (atomic no. 65) are (NEET-Phase II)

- A. $[Xe]4f^65d^16s^2$, $[Xe]4f^75d^16s^2$ and $[Xe]4f^85d^16s^2$
- B. $[Xe]4f^7, 7s^2$, $[Xe]4f^75d^16s^2$ and $[Xe]4f^96s^2$

C. $[Xe]4f^7, 6s^2, [Xe]4f^86s^2$ and $[Xe]4f^85d^16s^2$

D. $[Xe]4f^65d^1, [Xe]4f^75d^16s^2$ and $[Xe]4f^96s^2$

Answer: B

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11. The maximum number of electrons in a sub shell is given by the expression.....

A. $2n^2$

B. $2l+1$

C. $4l+2$

D. none of these

Answer: C

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12. For d-electron, the orbital angular momentum is

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

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

C. $\sqrt{\frac{2 \times 4h}{2\pi}}$

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

Answer: D



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13. What is the maximum number of electrons that can be associated with the

A. 4

B. 6

C. 2

D. 10

Answer: C



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14. Assertion: Number of radial and angular nodes for 3p orbital are 1, 1 respectively. Reason: Number of radial and angular nodes depends only on principle quantum number.

- A. both assertion and reason are true and reason is the correct explanation of assertion.
- B. both assertion and reason are true but reason is not the correct explanation of assertion.

C. assertion is true but reason is false

D. both assertion and reason are false

Answer: C



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15. The total number of orbitals associated with the principal quantum number $n=3$ is.....

A. 9

B. 8

C. 5

D. 7

Answer: A



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

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

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

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

D. none of these are correct

Answer: A



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17. Consider the following sets of quantum numbers:

$n \quad l \quad m \quad s$

(i) $3 \quad 0 \quad 0 \quad +\frac{1}{2}$

(ii) $2 \quad 2 \quad 1 \quad -\frac{1}{2}$

(iii) $4 \quad 3 \quad -2 \quad +\frac{1}{2}$

(iv) $1 \quad 0 \quad -1 \quad +\frac{1}{2}$

(v) $3 \quad 4 \quad 3 \quad -\frac{1}{2}$

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



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18. How many electrons in an atom with atomic number 105 can have $(n+1)l=8$?

A. 30

B. 17

C. 15

D. unpredictable

Answer: B



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19. Electron density in the yz plan of $3d_{xy}$ orbital is.....

A. zero

B. 0.5

C. 0.75

D. 0.9

Answer: A



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20. If uncertainty in position and momentum are equal, then minimum uncertainty in velocity is.....

A. $\frac{1}{m} \sqrt{\frac{h}{\pi}}$

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

C. $\frac{1}{2m} \sqrt{\frac{h}{\pi}}$

D. $\frac{h}{4\pi}$

Answer: C



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21. A macroscopic particle of mass 100 g and moving at velocity of 100 cm s^{-1} will have a de Broglie wavelength of.....

A. $66 \times 10^{29} \text{ cm}$

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

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

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

Answer: C



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22. The ration of de Broglie wavelentghs of a deuterium atom to that of an a-particle,when the velocity of the former is five times greater than that of later is.....

A. 4

B. 0.2

C. 2.5

D. 0.4

Answer: D



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23. The energy of an electron in the 3^{rd} orbit of hydrogen atom is -

E. The energy of an electron in the first orbit will be.....

A. $-3E$

B. $-\frac{E}{3}$

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

D. $-9E$

Answer: D



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24. Time independent Schrodinger wave equation is.....



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25. which of the following does not represent the mathematical expression for the Heisenberg uncertainty principle?



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Textual Evaluation Solved Write Brief Answer To The Following Questions

1. Which quantum number reveal information about the shape,energy,orientation and size of orbitals?

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2. How many orbitals are possible for $n=4$?

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3. How many radial nodes for $2s,4p,5d$ and $4f$ orbitals exist ?
How many angular nodes ?

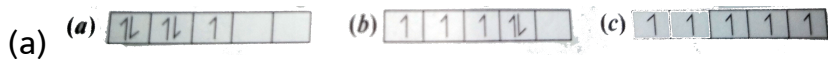
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4. The stabilization of a half filled d-orbitals is more pronounced than that of p-orbital why?



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5. Consider the following electroic arrangments for the d^5 configuration.



(i) Which of these represents the ground state

(ii) Which configuration has the maximum exchange energy.



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6. State and explain Pauli's exclusion principle .



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7. Difine orbitals/What are the n and l values for $3p_x$ and $(4d_x^2 - y^2)$ electron?



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8. Explain briefly the time independent schrodinger wave equation?



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9. Calculate the uncertainty in position of an electron, if

$$\Delta v = 0.1 \% \text{ and } v = 2.2 \times 10^6 \text{ms}^{-1}$$



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10. Determine the values of all the four quantum numbers of the 8^{th} electron in o-atom and 15^{th} electron in Cl atom.



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11. The quantum mechanical treatment of the hydrogen atom gives

the energy value: $E_n = \frac{-13.6}{n^2} \text{ eV atom}^{-1}$

(i) use this expression to find ΔE between $n=3$ and $n=4$

(ii) Calculate the wavelength corresponding to the above transition.

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12. How fast must a 54 g tennis ball travel in order to have a de Broglie wavelength that equal to that of a photon of green light 5400 \AA ?

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13. For each of the following, give the level designation, the allowable m values and the number of orbitals.

(i) $n=4, l=2$, (ii) $n=5, l=3$ (iii) $n=7, l=0$

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14. Give the electronic configuration of Mn^{2+} and Cr^{3+}

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15. Describe the Aufbau principle.

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16. An atom of an element contains 35 electrons and 45 neutrons. Deduce

(i) the number of protons

(ii) the electronic configuration for the element

(iii) All the four quantum numbers for the last electron



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17. Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Broglie wave length associated with the electron revolving around the nucleus.

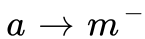


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18. Calculate the energy required for the process.



The ionization energy for the H atom in its ground state is -13.6eV



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19. An ion with mass number 37 possesses unit negative charge. If the ion contains 11.1% more neutrons than electrons. Find the symbol of the ion.

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20. The Li^{2+} ion is a hydrogen like ion that can BE DESCRIBED BY THE Bohr model. Calculate the Bohr radius of the third orbit and calculate the energy of an electron in 4th orbit.

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21. What is the de Broglie wavelength (in cum) of a 160g cricket ball travelling at 140 Km hr^{-1} .

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22. Suppose that the uncertainty in determining the position of an electron in an orbit is 0.6λ what is the uncertainty in its momentum?

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23. Show that if the measurement of the uncertainty in the location of the particle is equal to its de Broglie wavelength, the minimum uncertainty in its velocity (Δv) is equal to $\frac{1}{4}\pi$ of its velocity (v)

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24. What is the de Broglie length of an electron, which is accelerated from the rest, through a potential difference of $100v$?

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25. Identify the missing quantum numbers and the sub energy level

n	l	m	Sub energy level
?	?	0	4d
3	1	0	?
?	?	?	5p
?	?	-2	3d

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In Text Question Evaluate Yourself

1. Calculate the de Broglie wavelength of an electron that has been accelerated from rest through a potential difference of 1 keV.

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2. Calculate the uncertainty in the position of an electron, if the uncertainty in its velocity is $5.7 \times 10^5 \text{ m s}^{-1}$

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3. How many orbitals are possible in the 4th energy level? (n=4)

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4. Calculate the number of angular nodes and radial nodes present in 3d and 4f orbitals.

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5. Energy of an electron in hydrogen atom in ground state is -13.6 eV. What is the energy of the electron in the second excited state?

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6. How many unpaired electrons are present in the ground state of $f e^{3+}$ ($z=26$), $Mn^{(2+)}$ ($Z=25$) and argon ($Z=18$)?

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7. Explain the meaning of the symbol $4f^2$. Write all the four quantum numbers these electrons.

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8. Which ion has the stable electronic configuration? Ni^{2+} or Fe^{3+}

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1. Choose the correct answer

Which of the following experiment proves the presence of an electron in an atom

- A. Rutherford's x-ray scattering experiment
- B. Davisson and Germer experiment
- C. J.J. Thomson cathode ray experiment
- D. G.P. Thomson gold foil experiment

Answer: C



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2. Choose the correct answer

Who proposed the dual nature of light to all forms of matter?

- A. John Dalton

B. Neils Bohr

C. Albert Einstein

D. J.J. Thomson

Answer: C



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3. Choose the correct answer

Which one of the following is the time independent Schrodinger wave equation?

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

B. $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2} = 0$

C. $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2} (E - V)\Psi = 0$

D. $\widehat{H}\Psi - E\psi = -\frac{8\pi^2 m}{h^2}$

Answer: C



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4. Choose the correct answer

Which of the following provides the experimental justification of magnetic quantum number?

- A. Zeeman effect
- B. Stark effect
- C. Uncertainty principle
- D. Quantum condition

Answer: A



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5. Choose the correct answer

What are the values of n, l, m and s for $3P_x$ electron?

A. 3,2,1,0

B. 3,1,-1,+1/2

C. 3,2,+1, -1/2

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

Answer: B



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6. Choose the correct answer

Identify the quantum number for $4d_{x^2-y^2}$ electron

A. 4,2,-2, +1/2

B. 4,0,0,+1/2

C. $4,3,2,+1/2$

D. $4,3,2,-1/2$

Answer: A



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7. Choose the correct answer

How many Orbitals are possible in 3rd energy level?

A. 16

B. 9

C. 3

D. 27

Answer: B



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8. Choose the correct answer

Which one of the following is the Correct increasing order of the effective unclear Charge felt by an electron ?

A. $s > p > d > f$

B. $s < p < d < f$

C. $s > p > f > d$

D. $f < p < d < s$

Answer: A



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9. Choose the correct answer

Which of the following is not use in writing electronic

configuration of an atom?

- A. Aufbau Principle
- B. Hund's rule
- C. Pauli's exclusion principle
- D. Heisenberg's uncertainty principle

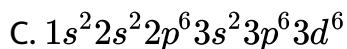
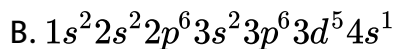
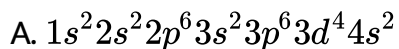
Answer: D

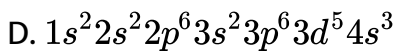


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10. Choose the correct answer

Which of the following is the expected configuration of Cr (Z = 24)?





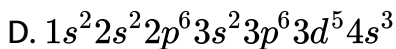
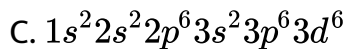
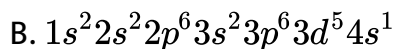
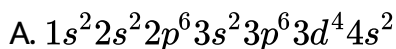
Answer: A



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11. Choose the correct answer

Which of the following is the actual configuration of Cr (Z = 24)?



Answer: B



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Additional Questions Solved | Match The Following

1. Match the following

1. List-I
- A. Principal quantum number
 - B. Azimuthal quantum number
 - C. Magnetic quantum number
 - D. Spin quantum number

Code:

	A	B	C	D
(a)	3	4	1	2
(b)	4	2	3	1
(c)	2	1	4	3
(d)	1	3	2	4

- List-II
- 1. represents the directional orientation of orbital
 - 2. represents the spin of the electron
 - 3. represents the main shell
 - 4. represents the sub shell

A. A-3,B-4,C-1,D-2

B. A-4,B-2,C-3,D-1

C. A-2,B-1,C-4,D-3

D. A-1,B-3,C-2,D-4

Answer: a



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2. Match the following

List-I		List-II	
A.	s – orbital	1.	complex three dimensional shape
B.	p – orbital	2.	symmetrical sphere
C.	d – orbital	3.	dumb-bell shape
D.	f – orbital	4.	clover leaf shape

Code: A B C D

(a) 1 4 3 2

(b) 3 1 2 4

(c) 2 3 4 1

(d) 4 2 1 3

A. A-1,B-4,C-3,D-2

B. A-3,B-1,C-2,D-4

C. A-2,B-3,C-4,D-1

D. A-4,B-2,C-1,D-3

Answer: c



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Additional Questions Solved iii Fill In The Blanks

1. The energy of an electron of hydrogen atom in 2^{nd} main shell is equal to.....

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2. The energy of an electron of Li^{2+} in the 3^{rd} main shell is.....

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3. The energy of an electron of hydrogen atom in 4^{th} main shell in terms of $KJ\ mol^{-1}$ is.....

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4. The Bohr's radius of Li^{2+} of 2^{nd} orbit is.....

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5. The formula used to calculate the Bohr's radius is.....

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6. de Broglie equation is.....

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7. The maximum number of electrons that can be accommodated in N shell is.....

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8. The maximum number of electrons that can be accommodated in F shell is.....



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9. When $l=0$, the number of electrons that can be accommodated in the subshell is.....



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10. The formula used to calculate the angular momentum is.....



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11. The region where the probability density function of electron reduces to zero is called.....



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12. The value of n , l , m and s of 8^{th} electron in an oxygen atom are respectively.....

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13. In a sodium atom(atomic number=11 and mass number=23) and the number of neutrons.....

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14. The idea of stationary orbits was first given by.....

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15. de Broglie equation is.....

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16. The outermost electronic configuration of manganese (at.no.=25) is.....



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Additional Questions Solved | Choose The Odd One Out

1. Choose the odd one out

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

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

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

D.

$$n = 4, l = 3, m = -3, -2, -1, 0, +1, +2, +3, s = -\frac{1}{2}$$

Answer: C



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2. Choose the odd one out

A. $n=1, k$ shell

B. $n=3, m$ shell

C. $n=4, n$ shell

D. $n=0, k$ shell

Answer: D



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3. Choose the odd one out

A. s-orbital, symmetrical sphere

B. p-orbital, dumb bell shape

C. d-orbital, clover bell shape

D. f-orbital, dumb bell shape

Answer: D



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4. Choose the odd one out

A. k shell, $2e^-$

B. l shell, $8e^-$

C. m shell, $18e^-$

D. n shell, $18e^-$

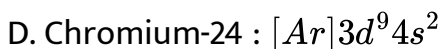
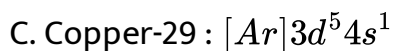
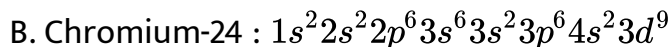
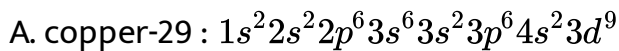
Answer: D



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Additional Questions Solved V Choose The Correct Pair

1. Choose the correct pair



Answer: C



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2. Choose the correct pair

A. Principal quantum number : s

B. Magnetic quantum number : $-m, 0, +m$

C. Spin quantum number : $+\frac{1}{4}$ (or) $-\frac{1}{4}$

D. Azimuthal quantum number : $+\frac{1}{4}$ (or) $-\frac{1}{4}$

Answer: D



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Additional Questions Solved Vi Choose The Correct Pair

1. Choose the correct pair

A. $E=h\nu$

B. $E=mc^2$

C. $\gamma = m \frac{v}{h}$

D. $\gamma = \frac{h}{p}$

Answer: D

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2. Choose the correct pair

A. Spin quantum number : s

B. Magnetic quantum number : m

C. Azimuthal quantum number : 1

D. Magnetix quantum number : 0

Answer: D

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Additional Questions Solved Vii Assertion Reason

1. Assertion (A) : Cr with electronic configuration $[\text{Ar}]3d^5 4s^1$ is more stable than $[\text{Ar}]3d^4 4s^2$.

Reason (R): Half filled orbitals have been found to have extra stability than partially filled orbitals.

- A. A and R are correct and R is the correct explanation of A.
- B. A and R are correct but R is not the correct the explanation of A.
- C. A is correct but R is wrong.
- D. A is wrong but R is correct.

Answer: A



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2. Assertion (A): Copper ($Z=29$) with electronic configuration $[\text{Ar}] 4s^1 3d^{10}$ is more stable than $[\text{Ar}] 4s^2 3d^9$.

Reason (R): Copper with $[\text{Ar}] 4s^1 3d^{10}$ is more stable due to symmetrical distribution and exchange energies of 4 electrons.

- A. A and R are correct and R is the correct explanation of A.
- B. A and R are correct but R is not the correct the explanation of A.
- C. A is correct but R is wrong.
- D. A is wrong but R is correct.

Answer: A



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Additional Questions Solved Viii Choose The Incorrect Statement

1. Choose the incorrect statement

- A. Most of the α -particles were deflected through a small angle.
- B. Most of the α -particles passed through the foil.
- C. Very few α -particles were reflected back by 180°
- D. Later, Rutherford's α -ray scattering experiment results proved that Thomson's model was wrong.

Answer: A



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Additional Questions Solved | Choose The Incorrect Statement

1. Choose the incorrect statement

- A. The energies of electrons are continuously reduced in the form of radiation.
- B. The electron is revolving around the nucleus in a dynamic orbital.
- C. Electrons can revolve only in those orbits in which the angular momentum(mvr) of the electron must be equal to an intergral multiple of $1\frac{h}{2\pi}$.
- D. In an atom,electrons are embedded like seeds in watermelon

Answer: C



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2. Choose the incorrect statement

- A. The region where the probability density of electron is zero, called nodal surface.
- B. The probability of finding the electron is dependent of the direction of the nucleus
- C. The number of radial nodes is equal to $n+l+1$.
- D. The angular distribution function is equal to $\frac{1}{\sqrt{\pi}}$

Answer: A



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3. Choose the incorrect statement

- A. For an electron that has the quantum numbers $n=4$ and $m=-2$, the electron may be in $2p$ orbital.

B. For an electron that has the quantum numbers $n=4$ and $m=-2$, the electron may be in 4p orbital.

C. For an electron that has the quantum numbers $n=4$ and $m=-2$, the electron is the second main shell.

D. For an electron that has the quantum numbers $n=4$ and $m=-2$, the electron must have spin quantum number as $+\frac{1}{2}$

Answer: B

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Additional Questions Solved 2 Mark Questions

1. Write a note about J.J. Thomson's atomic model.

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2. Explain about theory of electromagnetic radiation.

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3. Explain how matter has dual character.

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4. Explain about the significance of de Broglie equation

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5. How many electrons can be accommodated in the shell l, m and n ?

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6. How many electrons that can be accommodated in the subshells, p, d, f?

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7. What are quantum numbers ?

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8. How many orbitals are possible in the 3rd energy level ?

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9. What are diagram and diagram ?

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10. What is meant by nodal surface ?

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11. Mention the shape of s,p,d orbitals.

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12. Calculate the total number of angular nodes and radial nodes present in 4p and 4d orbitals.

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13. Write the equation to calculate the energy of n^{th} orbit.

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14. Energy of an electron in hydrogen atom in ground state is -13.6 eV. What is the energy of the electron in the third excited state?

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15. The energies of the same orbital decreases with an increase in the atomic number. Justify this statement.

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16. State Hund's rule of maximum multiplicity.

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17. How many unpaired electrons are present in the ground state of

(i) Cr^{2+} ($Z = 24$) (ii) Ne ($Z=10$)



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18. What is meant by electronic configuration? Write the electronic configuration of N($Z=7$).



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19. Which is the actual configuration of Cr($Z=24$). Why?



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20. What is the actual configuration of copper($Z=29$)? Explain about its stability.



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1. What are the conclusions of Rutherford's α -rays scattering experiment?

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2. What are the limitations of Bohr's atom model?

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3. Illustrate the significance of de Broglie equation with an iron ball and an electron

(i) 6.626 kg iron ball moving with 10 m s^{-1}

(ii) An electron moving at 72.73 m s^{-1}

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4. Explain Davisson and Germer experiment.

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5. Bohr radius of 1^{st} orbital of hydrogen atom is 0.529 \AA . Assuming that the position of an electron in this orbit is determined with the accuracy of 0.5% of the radius, calculate the uncertainty in the velocity of the electron in hydrogen atom.

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6. Write a note about principle quantum number.

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7. Explain about azimuthal quantum number.

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8. Draw the shapes of 1s, 2s and 3s orbitals.

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9. Explain how effective nuclear charge is related with stability of the orbital.

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10. Calculate the wavelength of an electron moving with a velocity of $2.05 \times 10^7 \text{ms}^{-1}$.

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11. The mass of an electron is 9.1×10^{-31} Kg. If its Kinetic energy is 3.0×10^{-25} J, calculate its wavelength.



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12. From the following sets of quantum numbers, state which are possible. Explain why the other are not possible.

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

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

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

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

(v) $n = 3, l = 3, m_l = - 3, m_s = + (1) / (2)$

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



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13. How many electrons in an atom may have the following quantum numbers?

(a) $n = 4, m_s = -\frac{1}{2}$

(b) $n=3, l=0$

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14. Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Broglie wavelength associated with the electron revolving around the orbit.

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15. An ion with mass number 56 contains 3 units of positive charge and 30.45 more neutrons than electrons. Assign symbol to the ion.

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16. The uncertainty in the position of a moving bullet of mass 10g is 10^{-5} m. Calculate the uncertainty in its velocity?



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17. The uncertainty in the position and velocity of a particle are 10^{-10} m and $5.27 \times 10^{-24} \text{ m s}^{-1}$ respectively. Calculate the mass of the particle.



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18. With what velocity must an electron travel so that its momentum is equal to that of a photon of wavelength = 5200 Å?



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19. Using Aufbau principle, write the ground state electronic configuration of following atoms.

Boron ($Z=5$), (ii) Neon ($Z=10$), (iii) Aluminium ($Z=14$), (iv) Chlorine ($Z=17$),
(v) calcium ($Z=20$), (vi) Rubidium ($Z=37$)

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20. Calculate the de Broglie wavelength of an electron moving with 1% of the speed of light?

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21. What is the wavelength for the electron accelerated by 1.0×10^4 volts?

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22. In a hydrogen atom, the energy of an electron in first Bohr's orbit is $13.12 \times 10^5 \text{ J mol}^{-1}$.

What is the energy required for its excitation to Bohr's second orbit?

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23. Dual behavior of matter proposed by de Broglie led to the discovery of electron microscope often used for the highly magnified images of biological molecules and other type of material. If the velocity of the electron in this microscope is $1.6 \times 10^6 \text{ m s}^{-1}$, calculate de Broglie wavelength associated with this electron.

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24. An element with mass number 81 contains 31.7% more neutrons as compared to protons.

Assign the symbol to the element.

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25. The electron energy in hydrogen atom is given by

$$E_n = \frac{-2.18 \times 10^{-18}}{n^2} J.$$

Calculate the energy required to remove an electron completely from the $n=2$ orbit. What is the longest wavelength of light in cm that can be used to cause this transition?

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Additional Questions Solved 5 Mark Questions

1. Describe about Bohr atom model.

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2. Derive de Broglie equation and give its significance.

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3. What are the main features of quantum mechanical model of an atom

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4. Explain about (i)Magnetic quantum number (ii)Spin number (iii)Magnetic quantum number]

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5. Explain about the shape of orbitals.



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6. What is exchange energy? How it is related with stability of atoms? Explain with suitable example.



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