CHEMISTRY

BOOKS - NCERT CHEMISTRY (HINGLISH)

STRUCTURE OF ATOM

Others

1. Which of the following conclusions couldnot be derived from Rutehrford's α-particle scattering experiment?

  A. Most of the space in the atom is empty

  B. The radius of the atom is about 10^{-10} m while that of nucleus is 10^{-15} m
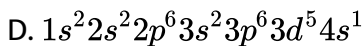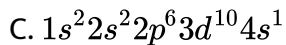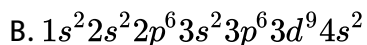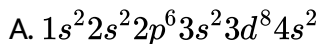
  C. Electrons move in a circular path of fixed energy called orbits.

D. Electrons and the nucleus are held together by electrostatic forces of attraction

Answer: C

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2. Which of the following options does not represent ground state electronic configuration of an atom?

A. $1s^2 2s^2 2p^6 3s^2 3d^8 4s^2$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$

C. $1s^2 2s^2 2p^6 3d^{10} 4s^1$

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

Answer:

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3. The probability density plots of 1 s and 2s orbitals are given in figure.
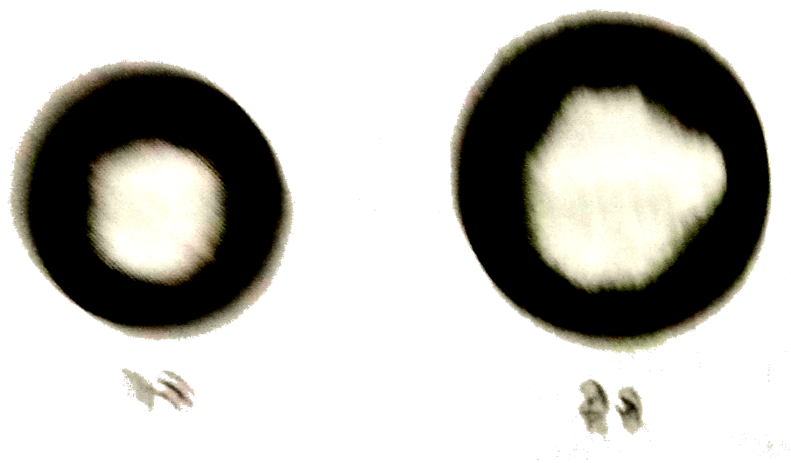
The density of dots in a region represetns the probability density of finding electrons in the region. On the basis of above diagram which of the following statements is incorrect?

A. 1s and 2s orbitals are spherical in shape

B. The probability of finding the electron is maximum near the nucleus

C. The probability of finding the electron at a given distance is equal in all directions

D. The probability density of electrons for 2s orbital dec reases uniformly as distance from the nucleus increases.

Answer:

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4. Which of the following statement is not correct regarding cathode rays

:

A. They star from the cathode and move towards the anode

B. They travel in straight line in the absence of an external electrical or

magnetic field

C. Characteristics of cathoe rays do not depend upn the material of

electrodes in cathode ray tube

D. Characteristics of cathode rays depend upon the nature of gas

present in the cathode ray tube

Answer:

5. Which of the following statements about the electron is incorrect?

A. It is a negatively charged particle

B. The mass of electron is equal to the mass of neutron

C. It is a basic consituent of all atoms

D. It is a constituent cathode rays.

Answer: B

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6. Which of the following properties of atom could be explained correctly by Thomson model of atom?

A. Overall neutrality of atom

B. Spectra of hydrogen atom

C. Position of electrons, Protons and neutrons in atom

D. Stability of atom.

Answer: A

7. Two atoms are said to be isobars is

    A. they have same atomic number but different mass number

    B. they h ave same number of electrons but different number of neutrons

    C. they have same number of neutrons but different number of electrons.

    D. sum of the number of protons and neutrons is same but the number of protons is different.

Answer: D

8. The number of radial nodes for 3p orbital is......

A. 3

B. 4

C. 2

D. sum of the number of protons and neutrons is same but the number of protons is different.

Answer:

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9. Number of angular nodes for 4d orbtial is..........

A. 4

B. 3

C. 2

D. 1

Answer:

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

A. Pauli's exclusion principle

B. Heisenberg's uncertianity principle

C. Hund's rule of maximum multiplicity

D. Aufbau principle

Answer:

11. Total number of orbitals associated with thrid shell will be.....

A. 2

B. 4

C. 9

D. 3

Answer:

12. Orbital angular momentum depends on ....

A. l

B. n and l

C. n and m

D. m and s

Answer:

13. 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. $1:2$

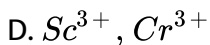   B. $1:1$

    C. $1:3$
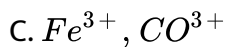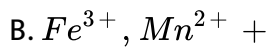
    D. $3:1$

Answer:

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14. Which of the following pairs of ions have the same electronic configuration A)Cr^{+3}, Fe^{+3} B)Fe^{+3}, Mn^{+2} C)Fe^{+3}, Co^{+3} D) Sc^{+3}, Cr^{+3}

    A. Cr^{3+}, Fe^{3+}

B. $Fe^{3+}, Mn^{2+} +$

C. Fe^{3+}, CO^{3+}

D. Sc^{3+}, Cr^{3+}

Answer:

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15. For the electrons of oxygen atom, which of the following statemetns

correct?

A. Z_{eff} for an electron in a 2s orbital is the same as Z_{eff} for an

electron in a 2p orbtial

B. An electron in the 2s orbtial has the same energy as an electron in

the 2p orbital

C. z_{eff} for an electron in 1s orbital is the same as z_{eff} for an electron

in a 2s orbital

D. The two electrons present in the 2s orbtial have spin quantum numbers m_s but of opposite sign.

Answer:

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16. It travelling at same speeds, which of the following matter waves have the shortest wavelength?
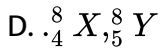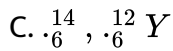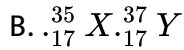
A. Electron

B. Alpha partice (He^{2+})

C. Neutron

D. Proton

Answer:

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17. Identify the paris which are not of isotopes?

A. $._{\cdot 6}^{12}$ $._{\cdot 6}^{13}Y$

B. $._{\cdot 17}^{35}X._{\cdot 17}^{37}Y$

C. $._{\cdot 6}^{14}$, $._{\cdot 6}^{12}Y$

D. $._{\cdot 4}^{8}X_{,5}^{8}Y$
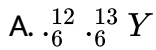
Answer: D

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18. Out of the folowing paris of electorns, identify the pairs of electrons present in degenrate orbitals.

A. in

$$= 3, l = 2, m_1 = \ -2, m_s = \ -\frac{1}{2}i \in \ = 3, l = 2, m_1 = \ -1, m_s =$$

B.

$$\in \ = 3, l = 1, m_1 = 1, m_s = \ +\frac{1}{2}i \in \ = 3, l = 2, m_1 = 1, \ = \ +\frac{1}{2}$$

C.

$$in = 4, l = 1, m_1 = 1, m_s = +\frac{1}{2}iin = 3, l = 2, m_1 = 1, m_s = +$$

D.

$$\in = 3, l = 2, m_1 = +2, m_s = -\frac{1}{2}iin = 3, l = 2, m_1 = +2, m_s$$

Answer:

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19. Which of the following sets of quantum numbers are correct?

n l m n l m

A. 1 1 +2

B. 2 1 +1

C. 3 2 -2

D. 3 4 -2

Answer:

20. In which of the following pairs the ions are isoelectronic?

A. Na^+, Mg^{2+}

B. Al^{3+}. O^-

C. Na^+, O^-

D. Na^{3-}, Cl^-
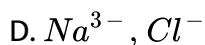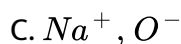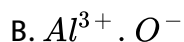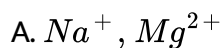
Answer: A

21. Which of the following statements concerning the quantum numbers are correct?

A. Angular quantum number determines the three dimensional shape of the orbital

B. The principal quantum number determines the orientation and

energy of the orbital

C. Magnetic quantum number determ ines the size of the orbital

D. Spin quantum number of an electron determines the orientation of

the spin of electron relative to the choses axis.

Answer:

22. Arrange s,p and d subshells of a shell in the increasing order of effective nuclear charge (Z_{eff}) experienced by the electron present in them.

23. Show the distribution of electrons in oxygen atom (atomic number 8) using orbital diagram.

24. Nickel atom can lose two electrons to form Ni^{2+} ion. The atomic number of nickel is 28. From which orbital will nickel lose two electrons?

25. Which of the following orbitals are degernate?

$3d_{xy}, 4d_{xy}, 3d_{z^2}, 3d_{yz}, 4d_{yz}, 4d_{z^2}$

26. Calculate the total number of angular nodes and radical nodes present in 3p orbital.

27. The arrangement of orbitals on the basis of energy is based upon their (n+l) value. Lower the value of (n+l), lower is the energy . For orbitals having same values of (n+l). The orbital with lower value of n will have lower energy.

I. Based upon the baove information arrange the following orbitals in the increasing order of energy.

(a) 1s,2s,3s,2p (b) 4s,3s,3p,4d

(c) 25p,4d,5d,4f,6s (d) 5f,6d,7s,7p

II. Based upon the above information Solve the question. give below.

(a) hich of the following orbitals has the lowest energy

$4d, 4f, 5s, 5p$

(b) which of the following orbitals has the higher energy?

$5p, 5d, 5f, 6s, 6p$

28. Which of the following will not show deflection from the path on passing through an electric field?

Proton,cathode rays, electron,neutron.

29. An atom having atomic mass number 13 has 7 neutrons. What is the atomic number of the atom.

30. Wavelength of different ra diations are given below.

λ (A) $= 300nm\lambda$ (B) =300 $\mu m\lambda$ (C) $= 3nm\lambda$ (D)=30$\overset{\circ}{A}$

Arrange these radiations in the increasing order of their energies.

31. The electronic configuration of valence shell of Cu is $3d^{10}4s^1$ and not $3d^9 4s^2$. How is this configuration explained?

32. The Balmer series in the hydrogen spectrum corresponds to the transition from $n_1 = 2$ to $n_2 = 3, 4.......$ This series lies in the visible region. Calculate the wave number of line associated with the transition in Balmer series when the electron moves to n=4 orbit.

$\left(R_H = 109677cm^{-1}\right)$

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33. According to de-Brogile, matter should exhibit dual behaviour, that is both particle and wave like properties. However, a cricket ball of mass 100 g does not move like a wave when it is thrown by a b owler at a speed of 100km/h. calculate the wavelength of the ball and explain why it does not show wave nature.

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34. What is the experimental evidence in support of the diea that electronic energies in an atom are quantized?

35. Out of electron and proton which one will have, a higher velocity to produce matter waves of the same wavelength ? Explain it.

36. A hypothetical electromagnetic wave is shown in figure. Find out the wavelength of the radiation.
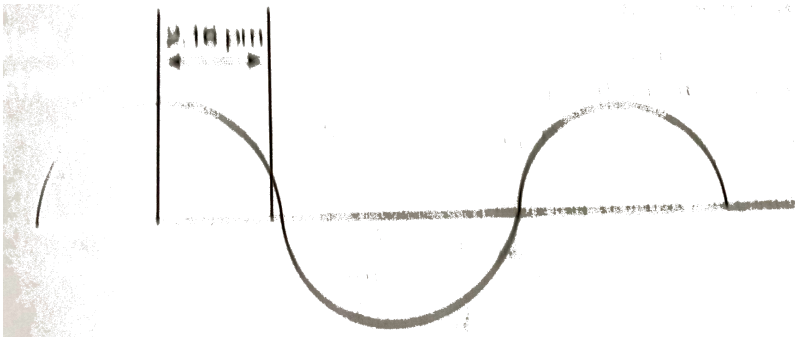
37. Chlorophyll present in green leaves of plants absorbs light at $4.620 \times 10^{14} Hz$. Calculate the wavelength of radiation in nanometer. Which part of the electromagnetic spectrum does it belong to?

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38. What is the difference between the terms orbit and orbital?

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39. Table-tennis ball has mass 10g and s peed of 90m/s. if speed can be meausred within an accuracy of 4%. What will be the uncertainly in speed and position?

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40. The effect of uncertainty principle is significant only for motion of microscopic particles and is negligible for the macroscopic particles. Justify the statement with the help of a suitable example.

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41. Hydrogen atom has only one electron, So, mutual repulsion between electrons is absent. However, in multielectron atoms mutual repulsion between the electrons is significant. How does this affect the energy of an electron in the orbitals of the same prinicipal quantum number in multielectron atoms?

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42. Match the following species with their corresponding ground state electronic configuration

Atom / Ion		Electronic configuration
A.	Cu	1. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$
B.	Cu^{2+}	2. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$
C.	Zn^{2+}	3. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$
D.	Cr^{3+}	4. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9$
		5. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$

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43. Match the quantum numbers with the information provided by these.

Quantum number		Information provided
A.	Principal quantum number	1. Orientation of the orbital
B.	Azimuthal quantum number	2. Energy and size of orbital
C.	Magnetic quantum number	3. Spin of electron
D.	Spin quantum number	4. Shape of the orbital

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44. Match the following rules with their statements.

Rules	Statements
A. Hund's Rule	1. No two electrons in an atom can have the same set of four quantum numbers.
B. Aufbau Principle	2. Half-filled and completely filled orbitals have extra stability.
C. Pauli Exclusion Principle	3. Pairing of electrons in the orbitals belonging to the same subshell does not take place until each orbital is singly occupied.
D. Heisenberg's Uncertainty Principle	4. It is impossible to determine the exact position and exact momentum of a subatomic particle simultaneously.
	5. In the ground state of atoms, orbitals are filled in the order of their increasing energies.

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45. Match the following.

Column I	Column II
A. X-rays	1. $v = 10^0 - 10^4$ Hz
B. Ultraviolet wave (UV)	2. $v = 10^{10}$ Hz
C. Long radio waves	3. $v = 10^{16}$ Hz
D. Microwave	4. $v = 10^{18}$ Hz

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46. Match the following.

Column I		Column II
A. Photon	1.	Value is 4 for N-shell
B. Electron	2.	Probability density
C. ψ^2	3.	Always positive value
D. Principal quantum number n	4.	Exhibits both momentum and wavelength

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47. Match species given in column I with the electronic configuration given in column II.

Column I	Column II
A. Cr	1. $[Ar]3d^8 4s^0$
B. Fe^{2+}	2. $[Ar]3d^{10} 4s^1$
C. Ni^{2+}	3. $[Ar]3d^6 4s^0$
D. Cu	4. $[Ar]3d^5 4s^1$
	5. $[Ar]3d^6 4s^2$

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48. Assertion(A): All isotopes of a given element show the same type of chemical behaviour.

Reason(R) The chemical properties of an atom are controlled by the numb er of electron s in the atom.

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 but R is false

D. Both A and R are false.

Answer:

49. Assertion(A) Black body is an ideal body that emits and absorbs radiations of all frequencies.

Reason(R) The frequency of radiation emitted by a body goes from a lower frequency to higher frequency with an increase in temperature.

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 but R is false

D. Both A and R are false.

Answer:

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50. Assertion (A) It is impossible to determine the exact position and exact momentum of an electron simultaneously.

Reason (R) The path of an electron in an atom is clearly defiened.

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. Both A and R are false.

Answer:

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51. What is photoelectric effect? State the result of photoelectric effect experiment.

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52. Thershold frequency, v_0 is the minimum frequency which a photon must possess to eject an electron from a metal. It is different for different metals. When a photon of frequency $1.0 \times 10^{15} s^{-1}$ was allowed to hit a metal surface, an electron having $1.988 x 10^{-19} J$ of kinetic energy was emitted. Calculated the threshold frequency of this metal.

equal to 600nm hits the metal surface.

53. When an electric discharge is passed through hydrogen gas, the hydrogen molecules dissociate to produce excited to produce excited hydrogen atoms. These excited atoms emit electromagnetic radiation of discrete frequencies which can be given by the general formula

$$\vec{v} = 109677 \left[\frac{1}{n_i^2} - \frac{1}{n_f^2} \right]$$

What points of Bohr's model of an atom can be used to arrive at this formula? Based on these points derive the above formula giving description of each step and each term.

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54. Calculate the energy and frequency of the radiation emitted when an electron jumps from n=3 to n=2 ina hydrogen atom.

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55. Why was a chagne in the Bohr Model of atom required? Due to which important development concept of movement of an electron in an orbit was replaced by the concept of probabiltiy of finding electron in an orbital?what is the name given to the changed model fo atom?