



CHEMISTRY

BOOKS - NCERT CHEMISTRY (ENGLISH)

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

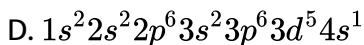
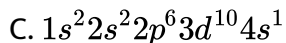
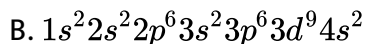
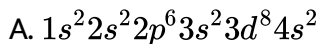
C. Electrons move in a circular path of fixed energy called orbits.

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

Answer: C

 [Watch Video Solution](#)

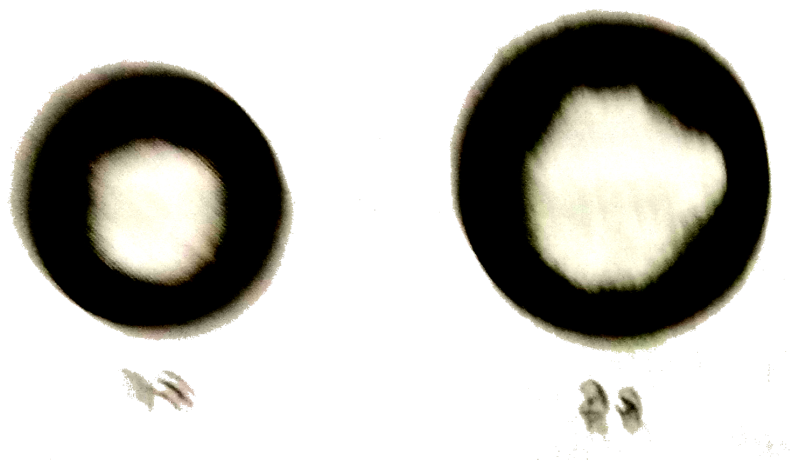
2. Which of the following options does not represent ground state electronic configuration of an atom?



Answer:

 [Watch Video Solution](#)

3. The probability density plots of 1s and 2s orbitals are given in figure.



The density of dots in a region represents the probability density of finding electrons in the region. On the basis of above diagram which of the following statements is incorrect?

- A. a) 1s and 2s orbitals are spherical in shape
- B. b) The probability of finding the electron is maximum near the nucleus
- C. c) The probability of finding the electron at a given distance is equal in all directions
- D. d) The probability density of electrons for 2s orbital decreases uniformly as distance from the nucleus increases.

Answer:



[Watch Video Solution](#)

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:



[Watch Video Solution](#)

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 constituent of all atoms
- D. It is a constituent cathode rays.

Answer:



[Watch Video Solution](#)

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:



[Watch Video Solution](#)

7. Two atoms are said to be isobars if

- A. they have same atomic number but different mass number
- B. they have 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:



[Watch Video Solution](#)

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

A. 3

B. 4

C. 2

D. 1

Answer:



[Watch Video Solution](#)

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

A. 4

B. 3

C. 2

D. 1

Answer:

 [Watch Video Solution](#)

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 uncertainty principle
- C. Hund's rule of maximum multiplicity
- D. Aufbau principle

Answer:

 [Watch Video Solution](#)

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

A. 2

B. 4

C. 9

D. 3

Answer:



[Watch Video Solution](#)

12. Orbital angular momentum depends on

A. l

B. n and l

C. n and m

D. m and s

Answer:



[Watch Video Solution](#)

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

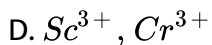
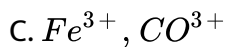
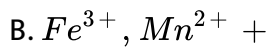
D. 3:1

Answer:

 [Watch Video Solution](#)

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. $Cr^{(+3)}, Fe^{(+3)}$



Answer:

 [Watch Video Solution](#)

15. For the electrons of oxygen atom, which of the following statements correct?

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

B. An electron in the 2s orbital 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 orbital have spin quantum numbers m_s but of opposite sign.

Answer:



[Watch Video Solution](#)

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

A. Electron

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

C. Neutron

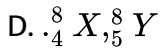
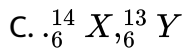
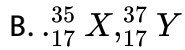
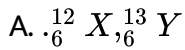
D. Proton

Answer:



[Watch Video Solution](#)

17. Identify the pairs which are not of isotopes?



Answer: D



Watch Video Solution

18. Out of the following pairs of electrons, identify the pairs of electrons present in degenerate 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.

$$n = 4, l = 1, m_l = 1, m_s = +\frac{1}{2} \quad n = 3, l = 2, m_l = 1, m_s = +\frac{1}{2}$$

D.

$$n = 3, l = 2, m_l = +2, m_s = -\frac{1}{2} \quad n = 3, l = 2, m_l = +2, m_s = +\frac{1}{2}$$

Answer:



[Watch Video Solution](#)

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

$n \quad l \quad m_l \quad m_s$

A. 1 1 +2

B. 2 1 +1

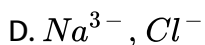
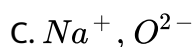
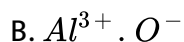
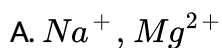
C. 3 2 -2

D. 3 4 -2

Answer:

 [Watch Video Solution](#)

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



Answer:

 [Watch Video Solution](#)

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 determines the size of the orbital

D. Spin quantum number of an electron determines the orientation of the spin of electron relative to the chosen axis.

Answer:

 [Watch Video Solution](#)

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.

 [Watch Video Solution](#)

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



[Watch Video Solution](#)

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?



[Watch Video Solution](#)

25. Which of the following orbitals are degenerate?

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



[Watch Video Solution](#)

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



[Watch Video Solution](#)

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 above information arrange the following orbitals in the increasing order of energy.

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

(c) $2p, 4d, 5d, 4f, 6s$ (d) $5f, 6d, 7s, 7p$

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

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

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

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

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



[Watch Video Solution](#)

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

Proton, cathode rays, electron, neutron.

 [Watch Video Solution](#)

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

 [Watch Video Solution](#)

30. Wavelength of different radiations are given below.

$$\lambda (A) = 300nm \quad \lambda (B) = 300 \mu m \quad \lambda (C) = 3nm \quad \lambda (D) = 30 \text{ \AA}$$

Arrange these radiations in the increasing order of their energies.

 [Watch Video Solution](#)

31. The electronic configuration of valence shell of Cu is $3d^{10}4s^1$ and not $3d^94s^2$. How is this configuration explained?

 [Watch Video Solution](#)

32. The Balmer series in the hydrogen spectrum corresponds to the transition from $n_1 = 2$ to $n_2 = 3, 4, \dots$. 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.

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

 [Watch Video Solution](#)

33. According to de-Broglie, 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 bowler at a speed of 100 km/h. Calculate the wavelength of the ball and explain why it does not show wave nature.

 [Watch Video Solution](#)

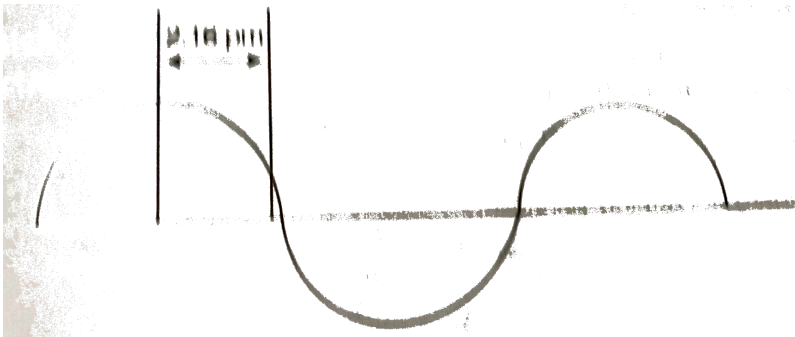
34. What is the experimental evidence in support of the idea that electronic energies in an atom are quantized?

[Watch Video Solution](#)

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

[Watch Video Solution](#)

36. A hypothetical electromagnetic wave is shown in figure. Find out the wavelength of the radiation.



[Watch Video Solution](#)

37. Chlorophyll present in green leaves of plants absorbs light at $4.620 \times 10^{14} \text{ Hz}$. Calculate the wavelength of radiation in nanometer.

Which part of the electromagnetic spectrum does it belong to?

 [Watch Video Solution](#)

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

 [Watch Video Solution](#)

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

 [Watch Video Solution](#)

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.

 [Watch Video Solution](#)

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 principal quantum number in multielectron atoms?

 [Watch Video Solution](#)

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

 [Watch Video Solution](#)

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

 [Watch Video Solution](#)

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.



[Watch Video Solution](#)

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

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

 [Watch Video Solution](#)

46. 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 number of electrons 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:



[Watch Video Solution](#)

47. 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:



[Watch Video Solution](#)

48. 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 defined.

- 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:

 [Watch Video Solution](#)

49. What is photoelectric effect? State the result of photoelectric effect experiment that could not be explained on the basis of laws of classical physics. Explain this effect on the basis of quantum theory of electromagnetic radiations.

 [Watch Video Solution](#)

50. Threshold frequency, ν_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 $1.0 \times 10^{15} \text{ s}^{-1}$ was allowed to hit a metal surface, an electron having $1.988 \times 10^{-19} \text{ J}$ of kinetic energy was emitted. Calculate the threshold frequency of this metal.

equal to 600nm hits the metal surface.



[Watch Video Solution](#)

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

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

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.



[Watch Video Solution](#)

52. Calculate the energy and frequency of the radiation emitted when an electron jumps from $n=3$ to $n=2$ in a hydrogen atom.



[Watch Video Solution](#)

53. Why was a change 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 probability of finding electron in an orbital? what is the name given to the changed model of atom?



[Watch Video Solution](#)