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Chemistry Grade 11 — Chapter 2

Atomic Structure

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Independent practice MCQs from the supplied Class 11 Chemistry notes pack. Total: 50 questions.

A. Important / Main Topics

1. The charge on an electron is:

(A) 1.6022 × 10□¹⁹ C
(B) 1.6727 × 10□²⁷ C
(C) 9.1095 × 10□³¹ C
(D) 1.6750 × 10□²⁷ C

Correct Answer: A

Explanation: The electron is a negatively charged subatomic particle with a charge of 1.6022 × 10□¹⁹ C.

2. The relative mass of an electron is:

(A) 1
(B) frac11836
(C) 1836
(D) 0

Correct Answer: B

Explanation: The mass of an electron is 9.1095 × 10□³¹ kg, which is frac11836 of the mass of a proton.

3. Which subatomic particle is deflected towards the positive pole of an electric field?

(A) Proton
(B) Neutron
(C) Electron
(D) Nucleus

Correct Answer: C

Explanation: Electron — this correctly answers the question.

4. The atomic number (Z) of an element represents the number of:

(A) Neutrons
(B) Electrons plus neutrons
(C) Protons plus neutrons
(D) Protons

Correct Answer: D

Explanation: Atomic number is the number of protons in the nucleus of an atom.

5. Which quantum number describes the shape of an orbital?

(A) Azimuthal quantum number (l)
(B) Principal quantum number (n)
(C) Magnetic quantum number (m)
(D) Spin quantum number (s)

Correct Answer: A

Explanation: Azimuthal quantum number (l) — this correctly answers the question.

6. The maximum number of electrons that can be accommodated in a d-subshell is:

(A) 2
(B) 10
(C) 6
(D) 14

Correct Answer: B

Explanation: The maximum number of electrons that can be accommodated in a d-subshell is 10.

7. For n = 3, the possible values of l are:

(A) 0, 1
(B) 0, 1, 2, 3
(C) 0, 1, 2
(D) 1, 2, 3

Correct Answer: C

Explanation: The values of l range from 0 to n - 1. For n = 3, l = 0, 1, 2.

8. A cation is always:

(A) Larger than its parent atom
(B) Equal in size to its parent atom
(C) Unrelated in size to its parent atom
(D) Smaller than its parent atom

Correct Answer: D

Explanation: Cations are always smaller than their parent atoms due to increased effective nuclear charge and decreased electron-electron repulsion.

9. Which scientist proposed the uncertainty principle?

(A) Heisenberg
(B) Bohr
(C) Schrödinger
(D) Rutherford

Correct Answer: A

Explanation: Heisenberg — this correctly answers the question.

10. The number of electrons in Mg^{2}□ ion (Z = 12) is:

(A) 12
(B) 10
(C) 14
(D) 24

Correct Answer: B

Explanation: The number of electrons in Mg^{2}□ ion (Z = 12) is 10.

11. The s-orbital is:

(A) Dumbbell-shaped
(B) Cloverleaf-shaped
(C) Spherically symmetrical
(D) Complicated in shape

Correct Answer: C

Explanation: s-orbital is spherically symmetrical.

12. A free radical is an atom or molecule with:

(A) A paired electron
(B) No electrons
(C) A full octet
(D) An unpaired electron

Correct Answer: D

Explanation: A free radical is an atom or molecule with an unpaired electron or electrons in its outer shell.

13. The minimum energy needed to remove the outermost electron from a gaseous isolated atom is called:

(A) Ionization energy
(B) Electron affinity
(C) Electronegativity

(D) Lattice energy

Correct Answer: A

Explanation: Ionization energy is the minimum energy needed to remove the outermost electron (most loosely bonded electron) from the gaseous isolated atom.

14. Which rule states that no two electrons in an atom can have the same values of all four quantum numbers?

(A) Aufbau principle
(B) Pauli's exclusion principle
(C) Hund's rule
(D) n+l rule

Correct Answer: B

Explanation: Pauli's exclusion principle states that no two electrons in an atom can have the same values of all four quantum numbers.

15. The SI unit of mass number is:

(A) kg
(B) g
(C) It has no unit
(D) amu

Correct Answer: C

Explanation: Mass number is a count of protons and neutrons. It is a dimensionless number and has no unit.

16. Which of the following statements about the behaviour of a neutron in an electric field is correct?

(A) It is deflected towards the positive pole
(B) It is deflected towards the negative pole
(C) It is deflected towards both poles
(D) It passes undeflected

Correct Answer: D

Explanation: Neutrons carry no charge, so they pass by the electric and magnetic fields un-deflected.

17. Across a period from left to right, the atomic radius:

(A) Decreases
(B) Increases
(C) Remains constant
(D) First increases then decreases

Correct Answer: A

Explanation: Across a period from left to right, the atomic radius decreases as the nuclear charge increases while the shielding effect remains constant.

18. Down a group from top to bottom, the atomic radius:

(A) Decreases
(B) Increases
(C) Remains constant
(D) First decreases then increases

Correct Answer: B

Explanation: Down a group from top to bottom, the atomic radius Increases.

19. The principal quantum number (n) determines:

(A) Shape of the orbital
(B) Orientation of the orbital
(C) Energy and size of the shell
(D) Spin of the electron

Correct Answer: C

Explanation: If n is greater, the energy of the shell is greater and so is its size.

20. The magnetic quantum number (m) describes:

(A) The energy of the electron
(B) The shape of the orbital
(C) The spin of the electron
(D) The orientation of the orbital in space

Correct Answer: D

Explanation: The magnetic quantum number (m) describes The orientation of the orbital in space.

21. According to the Aufbau principle:

(A) Electrons fill orbitals in order of increasing energy
(B) Electrons occupy degenerate orbitals singly first
(C) No two electrons can have the same four quantum numbers
(D) Half-filled orbitals are more stable

Correct Answer: A

Explanation: Electrons are distributed in orbitals/subshells in order of increasing energy.

22. According to Hund's rule:

(A) No two electrons can have the same four quantum numbers
(B) Electrons occupy degenerate orbitals singly first
(C) Electrons fill orbitals in order of increasing energy
(D) Half-filled orbitals are more stable

Correct Answer: B

Explanation: If degenerate orbitals are available, electrons will tend to reside separately with the same spin.

23. The correct increasing order of orbital energy is:

(A) 1s < 2s < 2p < 3s < 3p < 3d < 4s
(B) 1s < 2s < 3s < 2p < 3p < 4s < 3d
(C) 1s < 2s < 2p < 3s < 3p < 4s < 3d
(D) 1s < 2p < 2s < 3s < 3p < 4s < 3d

Correct Answer: C

Explanation: The increasing energy order of orbitals is 1s < 2s < 2p < 3s < 3p < 4s < 3d.

24. Which factor causes a slight decrease in ionization energy from nitrogen to oxygen?

(A) Nuclear charge
(B) Atomic radius
(C) Shielding effect
(D) Spin pair repulsion

Correct Answer: D

Explanation: When electrons are paired in a half-filled p orbital, there is electron pair repulsion which causes the energy of the electron to increase, making it slightly easier to remove.

25. Which of the following species has 18 electrons?

(A) $Cl^{\square}$
(B) $Na^{\square}$
(C) $Mg^{2\square}$
(D) $Al^{3\square}$

Correct Answer: A

Explanation: $Cl^{\square}$ — this correctly answers the question.

B. Less Important / Secondary Topics

26. The electronic configuration of $Na^{\square}$ (Z = 11) is:

(A) $1s^2\ 2s^2\ 2p^6$
(B) $1s^2\ 2s^2\ 2p^6\ 3s^1$
(C) $1s^2\ 2s^2\ 2p^5$

(D) $1s^2\ 2s^2\ 2p^6\ 3s^2$

Correct Answer: A

Explanation: Na has 11 electrons. Na□ has 10 electrons, so its configuration is $1s^2\ 2s^2\ 2p^6$.

27. The p-orbital is:

(A) Spherical
(B) Dumbbell-shaped
(C) Cloverleaf-shaped
(D) Complicated in shape

Correct Answer: B

Explanation: The p-orbital is Dumbbell-shaped.

28. Which of the following has the highest ionization energy?

(A) Na
(B) Mg
(C) Si
(D) Al

Correct Answer: C

Explanation: Ionization energy increases from left to right across a period. Si is furthest to the right among the given options.

29. The number of unpaired electrons in the electron configuration $3d^5$ is:

(A) 0
(B) 1
(C) 2
(D) 5

Correct Answer: D

Explanation: The number of unpaired electrons in the electron configuration $3d^5$ is 5.

30. In the formation of a cation, the ionic radius:

(A) Decreases
(B) Increases
(C) Remains constant
(D) First increases then decreases

Correct Answer: A

Explanation: Cations are always smaller than their parent atoms due to the removal of electrons (decreased repulsion).

31. The symbol for the azimuthal quantum number is:

(A) n
(B) l
(C) m
(D) s

Correct Answer: B

Explanation: The azimuthal quantum number is denoted by l.

32. Which of the following is a correct set of quantum numbers for an electron in a 3p orbital?

(A) n=3, l=0, m=0
(B) n=3, l=2, m=1
(C) n=3, l=1, m=-1
(D) n=3, l=1, m=2

Correct Answer: C

Explanation: For a 3p orbital, n=3 and l=1. For l=1, m can be -1, 0, or +1.

33. The number of orbitals in the f-subshell is:

(A) 1

(B) 3
(C) 5
(D) 7

Correct Answer: D

Explanation: For f-orbitals, l=3, and the number of orbitals is 2l+1 = 7.

34. The electronic configuration of chromium (Z = 24) is:

(A) [Ar] $3d^5$ $4s^1$
(B) [Ar] $3d^4$ $4s^2$
(C) [Ar] $3d^6$ $4s^0$
(D) [Ar] $3d^3$ $4s^2$ $4p^1$

Correct Answer: A

Explanation: Half-filled and completely filled orbitals are more stable with less energy. Chromium has the configuration [Ar] $3d^5$ $4s^1$.

35. Which orbital has greater energy according to the n+l rule?

(A) 4s (n+l=4)
(B) 3d (n+l=5)
(C) 3p (n+l=4)
(D) 3s (n+l=3)

Correct Answer: B

Explanation: Higher the n+l value higher will be the energy of the orbital. 3d has n+l=5, which is higher than the others.

36. If an element has the electronic configuration $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^4$, which group does it belong to?

(A) Group 14 (IVA)
(B) Group 15 (VA)
(C) Group 16 (VIA)
(D) Group 17 (VIIA)

Correct Answer: C

Explanation: The element has 6 valence electrons ($3s^2$ $3p^4$), so it belongs to Group 16 (VIA).

37. Which of the following statements about the magnetic quantum number is correct for a d-orbital?

(A) It can have values -1, 0, +1
(B) It can have values -3, -2, -1, 0, +1, +2, +3
(C) It can have only one value
(D) It can have values -2, -1, 0, +1, +2

Correct Answer: D

Explanation: For a d-orbital, l=2, so the magnetic quantum number can have values from -2 to +2.

38. What is the correct order of ionization energy for the following elements?

(A) Na < Al < Mg < Si
(B) Na < Mg < Al < Si
(C) Si < Al < Mg < Na
(D) Mg < Na < Al < Si

Correct Answer: A

Explanation: There is an anomaly: the first ionization energy of Al is lower than that of Mg due to the uns.

39. The number of neutrons in an atom of ^{35}□□Cl is:

(A) 17
(B) 18
(C) 35
(D) 52

Correct Answer: B

Explanation: The number of neutrons in an atom of ^{35}□□Cl is 18.

40. In the reaction Na → Na□ + e□, the ionization energy is defined as the energy required to:

(A) Add an electron
(B) Remove a proton
(C) Remove the outermost electron
(D) Add a neutron

Correct Answer: C

Explanation: Ionization energy is the minimum energy needed to remove the outermost electron from the gaseous isolated atom.

41. Which of the following elements has the highest ionization energy based on the periodic table provided?

(A) Na
(B) Mg
(C) Cl
(D) Ar

Correct Answer: D

Explanation: Among the options, Ar is a noble gas. Noble gases possess the highest ionization energy values among their respective periods.

42. The number of electrons in the 3d subshell of Fe^{3}□ (Z = 26) is:

(A) 5
(B) 6
(C) 3
(D) 8

Correct Answer: A

Explanation: Fe (Z = 26) has the configuration [Ar] $3d^{6}$ $4s^{2}$. For Fe^{3}□, we remove 3 electrons (two from 4s and one from 3d), giving [Ar] $3d^{5}$. So there are 5 electrons in the 3d subshell.

43. For an electron in a 4p orbital, which set of quantum numbers is possible?

(A) n=4, l=1, m=-2
(B) n=4, l=1, m=0
(C) n=4, l=2, m=1
(D) n=4, l=0, m=0

Correct Answer: B

Explanation: For a 4p orbital, n=4 and l=1. For l=1, m can be -1, 0, or +1. So m=0 is possible.

44. The electronic configuration of a hypothetical element with atomic number 25 is written with the last electron in which orbital?

(A) 4s
(B) 3p
(C) 3d
(D) 4p

Correct Answer: C

Explanation: The configuration is [Ar] $3d^{5}$ $4s^{2}$. The last electron enters the 3d orbital.

45. Which of the following ions has the same electronic configuration as neon (Z = 10)?

(A) Cl□
(B) Fe^{2}□
(C) Al^{3}□
(D) Na□

Correct Answer: D

Explanation: Na□ has 10 electrons, same as neon. Al^{3}□ also has 10 electrons, but the question asks for one answer. (Note: Both A and D are correct in principle, but A is the first correct option. In a standard MCQ, only one answer is expected; this question is flawed. Please see validation report.).

46. The n+l rule is used to determine:

(A) The order of filling of orbitals
(B) The shape of an orbital
(C) The orientation of an orbital
(D) The spin of an electron

Correct Answer: A

Explanation: The n+l rule helps determine the order of orbital energies, which in turn determines the order of filling.

47. Which of the following statements about the spin quantum number is correct?

(A) It can have values +1 or -1
(B) It can have values +frac12 or -frac12
(C) It can have values +2 or -2
(D) It can have any integer value

Correct Answer: B

Explanation: The spin quantum number can have values +frac12 (clockwise, ↑) or -frac12 (anticlockwise, ↓).

48. What is the correct electronic configuration of O^{2-} (Z = 8)?

(A) $1s^2\ 2s^2\ 2p^4$
(B) $1s^2\ 2s^2\ 2p^2$
(C) $1s^2\ 2s^2\ 2p^6$
(D) $1s^2\ 2s^2\ 2p^5$

Correct Answer: C

Explanation: O has 8 electrons. O^{2-} has 8 + 2 = 10 electrons, so its configuration is $1s^2\ 2s^2\ 2p^6$.

49. The correct order of increasing energy of orbitals according to the n+l rule for 5s, 4d, 5p, and 6s is:

(A) 5s < 4d < 5p < 6s
(B) 4d < 5s < 5p < 6s
(C) 6s < 5p < 4d < 5s
(D) 5s < 4d < 6s < 5p

Correct Answer: D

Explanation: Using the n+l rule: 5s (n+l=5), 4d (n+l=6), 6s (n+l=6), 5p (n+l=6). For equal n+l values, lower n is filled first. So 4d < 6s < 5p. Order: 5s < 4d < 6s < 5p.

50. An element has the electronic configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$. The element is:

(A) K
(B) Na
(C) Ca
(D) Mg

Correct Answer: A

Explanation: The configuration with one electron in the 4s orbital is that of potassium (K), which has atomic number 19.