CHEMISTRY

BOOKS - UNIVERSAL BOOK DEPOT 1960 CHEMISTRY (HINGLISH)

ATOMIC STRUCTURE

ORDINARY THINKING

1. What is the ratio of mass of an electron to the mass of a proton ?

A. Infinite

B. 1.8×10^{3}

C. 1.8

D. None of these

Answer: B

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2. The atomic nucleus contains :

A. Four protons

B. Four neutrons

C. Two neutrons and two protons

D. Four protons and two electrons

Answer: C

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3. The nucleus of the atom consists of:

A. proton and neutron

B. proton and electron

C. Neutron and electron

D. proton, neutron and electron

Answer: A

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4. Which is correct statement about proton?

A. Proton is nucleus of deuterium

B. Proton is ionized hydrogen molecule

C. Proton is ionized hydrogen atom

D. proton is α -particle

Answer: C

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5. The density of the nucleus is

A. 10^{8} kg / cc

B. 10^{-8} kg / cc

C. 10^{-9} kg / cc

D. 10^{11} kg / cc

Answer: D

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6. Penetration power of proton is

A. More than electron

B. Less than electron

C. More than neutron

D. None

Answer: B

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7. Cathode rays have:

A. mass only

B. Charge only

C. No mass and charge

D. Mass and charge both

Answer: D

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8. The proton and neutron are collectively called as

A. Deutron

B. Positron

C. Meson

D. Nucleon

Answer: D

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9. The discovery of neutron becomes very late because.

A. Neutrons are present in nucleus

B. Neutrons are highly unstable particles

C. Neutrons are chargeless

D. Neutrons do not move

Answer: C

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10. Neutron is a fundamental particle carrying

A. A charge of +1 unit and a mass of 1 unit

B. No charge and a mass of 1 unit

C. No charge and no mass

D. A charge of -1 and a mass of 1 unit

Answer: B

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11. Proton was discovered by

A. Chadwick

B. Thomson

C. Goldstein

D. Bohr

Answer: C

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12. One would expect proton to have very large

A. Ionization potential

B. Radius

C. Charge

D. Hydration energy

Answer: D

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13. Which of the following statements is true

A. The Kinetic energy of an electron is inversely proportional to square of its momentum

B. de-Broglie wavelength associated with a particle is directly proportional to its mass.

C. de-Broglie wavelength associated with a particle is directly proportional to square of its velocity

D. The wavelength associated with an electron is directly proportional to square root of accelerating potential

Answer: A

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14. Heaviest particle is

A. Meson

B. Neutron

C. Proton

D. Electron

Answer: B

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15. Anode rays were discovered by

A. Goldstein

B. J. Stoney

C. Rutherford

D. J.J. Thomson

Answer: A

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16. Cathode rays are

A. positively charged particles

B. Negatively charged particles

C. Neutral particles

D. None of these

Answer: B

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17. Which of the following phrases would be incorrect to use ?

A. A molecule of a compound

B. A molecule of an element

C. An atom of an element

D. None of these

Answer: C

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18. The density of the nucleus is

A. $2.4 \times 10^{15} kgm^{-3}$

B. $2.4 \times 10^{19} kgm^{-3}$

C. $2.4 \times 10^{17} kgm^{-3}$

D. $2.4 \times 10^{14} kgm^{-3}$

Answer: C

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19. The e/m ratio for electron was determined by ....

A. J.J. Thomson

B. Dalton

C. Chadwick

D. Goldstein

Answer: A

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20. The average distance of electron from the nucleus in an atom is of the order of

A. 10^{6} m

B. 10^{-6} m

C. 10^{-10} m

D. 10^{-15} m

Answer: D

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21. The ratio of specific charge of a proton and an alpha-particle is :

A. $2:1$

B. $1:2$

C. $1:4$

D. $1:1$

Answer: A

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22. Which one of the following pairs is not correctly matched

A. Rutherford-Proton

B. J.J. Thomson-Electron

C. J.H. Chadwick-Neutron

D. Bohr-Isotope

Answer: A

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23. The nature of anode rays depends upon

A. Nature of electrode

B. Nature of residual gas

C. Nature of discharge tube

D. All the above

Answer: B

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24. Cathode rays are

A. William Crookes

B. G . J. Stoney

C. R.A. Millikan

D. J.J. Thomson

Answer: D

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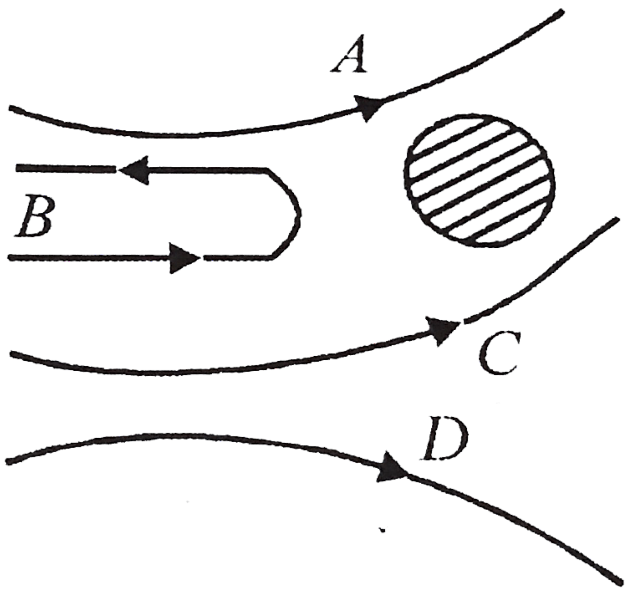
25. In the Rutherford experiment, α-particles are scattered from a nucleus as shown. Out of the four paths, which path is not possible?



A. Electron

B. Proton

C. Atom

D. Nucleus

Answer: D

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26. The minimum real charge on any particle which can exist is

A. 1.6×10^{-19} Coulomb

B. 1.6×10^{-10} Coulomb

C. 4.8×10^{-10} Coulomb

D. Zero

Answer: A

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27. Splitting of signals is caused by

A. proton

B. neutron

C. Positron

D. Electron

Answer: A

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28. Magnitude of K.E. in an orbit is equal to

A. Half of the potential energy

B. Twice of the potential energy

C. One fourth of the potential energy

D. None of these

Answer: A

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29. Number of neutron in C^{12} is

A. 6

B. 7

C. 8

D. 9

Answer: A

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30. What is the ratio of mass of an electron to the mass of a proton ?

A. $1:2$

B. $1:1$

C. $1:1837$

D. $1:3$

Answer: C

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31. Cathode rays do not travel in straight lines.

Cathode rays do not penetrate through thick sheets.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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32. Assertion : Cathode rays are a stream of α-particles.

Reason : They are generated under high pressure and high voltage.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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Atomic number, Mass number, Atomic species

1. Which of the following ion is not isoelectronic with O^{2-} ?

A. N^{3-}

B. F^{-}

C. TI^{+}

D. Na^{+}

Answer: C

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2. The charge on the atom containing 17 protons, 18 neutrons and 18 electrons is.

A. $+1$

B. -2

C. 1

D. Zero

Answer: C

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3. The most probable radius (in pm) for finding the electron in He^+ is.

A. 0.0

B. 52.9

C. 26.5

D. 105.8

Answer: C

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4. If W is atomic weight and N is the atomic number of an element, then

A. Number of e^{-1} =W-N

B. Number of $._0 n^1$ =W-N

C. number of $._1 H^1$=W-N

D. Number of $._0 n^1$=N

Answer: B

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5. Six protons are found in the nucleus of

A. Boron

B. Lithium

C. Carbon

D. Helium

Answer: C

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6. An atom has 26 electrons and its atomic weight is 56. The number of neutrons in the nucleus of the atom will be

A. 26

B. 30

C. 36

D. 56

Answer: B

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7. Atomic number of an element represents:

A. Number of neutrons in the nucleus

B. Number of protons in the neucleus

C. Atomic weight of element

D. Valency of element

Answer: B

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8. The nucleus of the element having atomic number 25 and atomic weight 55 will contain

A. 25 protons and 30 neutrons

B. 25 neutrons and 30 protons

C. 55 protons

D. 55 neutrons

Answer: A

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9. An atom which has lost one electron would be

A. Negatively charged

B. Positively charged

C. Electrically neutral

D. Carry double positive charge

Answer: B

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10. Number of unpaired electrons in inert gas is

A. Zero

B. 8

C. 4

D. 18

Answer: A

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11. The number of electrons in $\left[{}_{19}^{40}K\right]^{-1}$ is

A. 19

B. 20

C. 18

D. 40

Answer: B

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12. The number of electrons and neutrons of an element is 18 and 20 respectively . Its mass number is

A. 17

B. 37

C. 2

D. 38

Answer: D

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13. The atomic number of an element is 17. The number of orbitals containing electron pairs in its valence shell is

A. Eight

B. Six

C. Three

D. Two

Answer: C

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14. The hydride ions $\left(H^{-}\right)$ are isoelectronic with

A. Li

B. He^{+}

C. He

D. Be

Answer: C

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15. Number of protons, neutrons and electrons in the element $._{89}^{231}Y$ is.

A. 89,231,89

B. 89,89,242

C. 89,142,89

D. 89,71,89

Answer: C

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16. The charge of an electron is -1.6×10^{-19} C. The value of free charge on Li^{+} ion will be

A. 3.6×10^{-19} C

B. 1×10^{-19} C

C. 1.6×10^{-19} C

D. 2.6×10^{-19} C

Answer: C

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17. In which one of the following , the number of protons is greater than neutrons but number of protons is less than the number of electrons

A. D_3O^+

B. SO_2

C. H_2O

D. OH^-

Answer: D

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18. Which one of the following combinations will give the highest stability to a nucleus with atomic number Z and mass number N

A. Even Z and odd N

B. Odd Z and even N

C. Even Z and even N

D. Odd Z and odd N

Answer: C

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19. The number of electrons, neutrons and protons in a species are equal to 10,8 and 8 respectively. The proper symbol of the species is

A. .$^{16}O_8$

B. .$^{18}O_8$

C. .$^{18}Ne_{10}$

D. .$^{16}O_8^{2-}$

Answer: D

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20. The mass of an atom is constituted mainly by

A. Neutron and neutrino

B. Neutron and electron

C. Neutron and proton

D. proton and electron

Answer: C

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21. The modern atomic weight scale is based on

A. C^{12}

B. O^{16}

C. H^{1}

D. C^{13}

Answer: A

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22. The ratio between the neutrons in C and Si with respect to atomic masses 12 and 28 is

A. $2:3$

B. $3:2$

C. $3:7$

D. $7:3$

Answer: C

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23. Be^{2+} is isoelectronic with which of the following ions ?

A. Mg^{2+}

B. Na^{+}

C. Li^{+}

D. H^{+}

Answer: C

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24. The atomic number of an element is 35. What is the toal number of electrons present in all the p-orbitals of the ground state atom of that element?

A. 6

B. 11

C. 17

D. 23

Answer: C

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25. Number of electrons in $-CONH_2$ is

A. 22

B. 24

C. 20

D. 28

Answer: B

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26. Number of neutrons in heavy hydrogen atom is

A. 0

B. 1

C. 2

D. 3

Answer: B

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27. An atom has the electronic configuration of $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^2 4p^5$. Its atomic weight is 80.its atomic number and the number of neutrons in its nucleus shall be

A. 35 and 45

B. 45 and 35

C. 40 and 40

D. 30 and 50

Answer: A

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28. Which of the following particles has more electrons than neutrons

A. C

B. F

C. O^{-2}

D. Al^{+3}

Answer: C

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29. The atomic number of an element having the valency shell electronic configuration $4s^2 4p^6$ is

A. 35

B. 36

C. 37

D. 38

Answer: B

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30. The atomic number of an element is always equal to

A. Atomic weight divided by 2

B. Number of neutrons in the nucleus

C. Weight of the nucleus

D. Electrical charge of the nucleus

Answer: D

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31. Which of the following is isoelectronic with carbon?

A. Na^{+}

B. Al^{3+}

C. O^{2-}

D. N^{+}

Answer: D

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32. Chlorine atom differs from chloride ion in the number of

A. Proton

B. Neutron

C. Electron

D. protons and electrons

Answer: C

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33. Neutrons are found in atoms of all elements except in

A. Chlorine

B. Oxygen

C. Argon

D. Hydrogen

Answer: D

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34. The mass number of an anion, X^{3-}, is 14. if there are ten electrons in the anion, the number of neutrons in the nucleus of atom, X_2 of the element will be

A. 10

B. 14

C. 7

D. 5

Answer: C

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35. The nucleus of tritium contains

A. 1 proton + neutron

B. 1 proton + 3 neutron

C. 1 proton +0 neutron

D. 1 proton + 2 neutron

Answer: D

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36. Nucleus of an element contains 9 protons Its valency would be :

A. 1

B. 3

C. 2

D. 5

Answer: A

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37. The number of neutrons in oxygen-18 are

A. 2

B. 18

C. 10

D. 12

Answer: C

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38. An ion has a charge of -1 . It has eighteen electrons and twenty neutrons. Its mass number is

A. 17

B. 37

C. 18

D. 38

Answer: B

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39. Which of the following is not isoelectronic ?

A. Na^{+}

B. Mg^{2+}

C. O^{2-}

D. Cl^{-}

Answer: D

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40. In neutral atom, which particles are equivalent

A. p^{+}, e^{+}

B. e^{-}, e^{+}

C. e^{-}, p^{+}

D. p^{+}, n^{0}

Answer: C

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41. Iso-electronic species are

A. F^{-}, O^{-2}

B. F^{-}, O

C. F^{-}, O^{+}

D. F^{-}, O^{+2}

Answer: A

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42. Which one of the following has unit positive charge and 1 amu mass

A. Electron

B. Neutron

C. proton

D. None of these

Answer: C

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43. Nitrogen has an atomic number of 7 and oxygen has an atomic number of 8. The total number of electron in the nitrate ion $\left(NO_3^-\right)$ is :

A. 8

B. 16

C. 32

D. 64

Answer: C

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44. which among the following species has the same number of electrons in its outermost as well as penultimate shell ?

A. Mg^{2+}

B. O^{2-}

C. F^{-}

D. Ca^{2+}

Answer: D

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45. An isotone of $._{32}^{76}Ge$ is-

(a) $._{32}^{77}Ge$

(b). $_{33}^{77}As$

(c). $_{34}^{77}Se$

(d). $_{34}^{78}Se$

A. $._{32}^{77}Ge$

B. $._{33}^{77}As$

C. $._{34}^{77}Se$

D. $._{36}^{78}Sc$

Answer: B

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46. The nitride ion in lithium nitride is composed of

A. 7 protons + 10 electrons

B. 10 protons + 10 electrons

C. 7 protons + 7 protons

D. 10 protons + 7 electrons

Answer: A

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47. Which is not isoelectronic with the other three

A. CO

B. NO^+

C. CN^-

D. O_2

Answer: D

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48. An element has 8 electrons in the valence shell

A. it will lose electron

B. it will gain an electron

C. It neither gains or lose electron

D. it will make bond with itself

Answer: C

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49. An isostere is

A. NO_2^- and O_3

B. NO_2^- and PO_4^{3-}

C. CO_2, N_2O, NO_3^-

D. CIO_4^- and OCN^-

Answer: A

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50. The atomic number of an element is 35 and mass number is 81.The number of electrons in the outer most shell is

A. 7

B. 6

C. 5

D. 3

Answer: A

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51. The compound in which cation is isoelectronic with anion is.

A. NaCl

B. CsF

C. NaI

D. K_2S

Answer: D

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52. The mass of the neutron is of the order of

A. 10^{-23} kg

B. 10^{-24} kg

C. 10^{-26} kg

D. 10^{-27} kg

Answer: D

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53. The atomic weight of an element is 39.The number of neutrons in its nucleus is one more than the number of protons. The number of protons, neutrons and electrons respectively in its atom would be

A. 19,20,19

B. 19,19,20

C. 20,19,19

D. 20,19,20

Answer: A

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54. The atoms of different elements having same mass number but different atomic number are known as isobars.

The sum of protons and neutrons, in the isobars is always different.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: C

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55. Assertion : In case of isoelectronic ions the ionic size increases with the increase in atomic number.

Reason: The greater the attraction of nucleus , greater is the ionic radius.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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56. Which one is the wrong statement ?

A. The uncertainty principle is $\Delta E \times \Delta t \geq h/4\pi$

B. Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement.

C. The energy of 2s orbital is less than the energy of 2p orbital in case of Hydrogen like atoms

D. de-Broglies's wavelength is given by $\lambda = \frac{h}{mv}$, where m= mass of the particle, v=group velocity of the particle

Answer: C

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Atomic models and Plancks quantum theory

1. Which of the following statement does not form part of Bohr's model of the hydrogen atomn?

A. Energy of the electrons in the orbit is quantized

B. the electron in the orbit nearest the nucleus has the lowest energy

C. Electrons revolve in different orbits around the nucleus

D. The position and velocity of the electrons in the orbit cannot be determined simultaneously

Answer: D

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2. Electron occupies the available orbital singly before pairing in any one orbital occurs, it is

A. Pauli's exclusion principle

B. Hund's Rule

C. Heisenberg's principle

D. Prout's hypothesis

Answer: B

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3. Who modified Bohr's theory of introducing elliptical orbits for electron path?

A. Hund

B. Thomson

C. Rutherford

D. Sommerfield

Answer: D

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4. If change in energy $(\Delta E) = 3 \times 10^{-8}$ J, $h = 6.64 \times 10^{-34}$ J-s and $c = 3 \times 10^{8}$m/s, then wavelength of the light is

A. 6.36×10^{3} Å

B. 6.36×10^{5} Å

C. 6.64×10^{-8} Å

D. 6.36×10^{18} Å

Answer: C

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5. The frequency of radiaiton emitted when the electron falls form $n = 4$ to $n = 1$ in a hydrogen atom will be (Given ionization enegry of $H = 2.18 \times 10^{-18} J$and $h = 6.625 \times 10^{-34} Js)$

A. $3.08 \times 10^{15} s^{-1}$

B. $2.00 \times 10^{15} s^{-1}$

C. $1.54 \times 10^{15} s^{-1}$

D. $1.03 \times 10^{15} s^{-1}$

Answer: A

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6. The energy of second Bohr orbit of the hydrogen atom is $-328 kJmol^{-1}$, hence the energy of fourth Bohr orbit would be.

A. -41 kJ mol^{-1}

B. -1312 kJ mol^{-1}

C. -164 kJ mol^{-1}

D. -82 kJ mol^{-1}

Answer: D

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7. The energy absorbed by each molecule (A_2) of a substance is $4.4 \times 10^{-19} J$ and bond energy per molecule is $4.0 \times 10^{-19} J$. The kinetic energy of the molecule per atom will be.

A. 2.0×10^{-20} J

B. 2.2×10^{-19} J

C. 2.0×10^{-19} J

D. 4.0×10^{-20} J

Answer: A

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8. The total number of atomic orbitals in fourth energy level of an atom is.

A. 4

B. 8

C. 16

D. 32

Answer: C

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9. The energies E_1 and E_2 of two radiations are $25eV$ and $50eV$ respectively. The relation between their wavelengths, i.e., λ_1 and λ_2 will be.

A. $\lambda_1 = \frac{1}{2}\lambda_2$

B. $\lambda_1 = \lambda_2$

C. $\lambda_1 = 2\lambda_2$

D. $\lambda_1 = 4\lambda_2$

Answer: C

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10. What is the value of electron gain enthalpy of Na^{+} if IE_{1} of Na = 5.1 eV?

A. $+2.55$ eV

B. $+10.2$ eV

C. -5.1 eV

D. -10.2 eV

Answer: C

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11. According to Bohr theory, which of the following transition in hydrogen atom will give rise to the least energetic proton?

A. n=6 to n=5

B. n=5 to n=3

C. n=6 to n=1

D. n=5 to n=4

Answer: A

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12. Calculate the energy in joule corresponding to light of wavelength $45nm$:

(Planck' constant $h = 6.63 \times 10^{-34} Js$, speed of light $c = 3 \times 10^{8} ms^{-1}$)

A. 4.42×10^{-15}

B. 4.42×10^{-18}

C. 6.67×10^{15}

D. 6.67×10^{11}

Answer: B

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13. The spectrum of He is expected to be similar to that of

A. H

B. Li^+

C. Na

D. He^+

Answer: B

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14. Which one of the following is not the characteristic of Planck's quantum theory of radiation

A. The energy is not absorbed or emitted in whole number or multiple of quantum

B. Radiation is associated with energy

C. Radiation energy is not emitted or absorbed continuously but in the form of small packets called quanta

D. This magnitude of energy associated with a quantum is proportional to the frequency

Answer: A

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15. The energy equivalent of 2.0 mg mass defect is

A. 1.8×10^{4} erg

B. 9×10^{-19} erg

C. 1.5×10^{20} erg

D. 1.8×10^{18} erg

Answer: D

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16. Wave length associated with electron motion

A. Increase with increase in speed in electron

B. Remains same irrespective of speed of electron

C. Decreases with increase in speed of e^-

D. Is zero

Answer: C

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17. Ratio of radii of second and first Bohr orbits of H atom

A. 2

B. 4

C. 3

D. 5

Answer: B

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18. According to the bohr's atomic model, the relation between principal quantum number (n) and radius of orbit (r) is

A. $r \propto n$

B. $r \propto n^2$

C. $r \propto \frac{1}{n}$

D. $r \propto \frac{1}{n^2}$

Answer: A

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19. When beryllium is bombarded with $\alpha - \text{particles}$, extremely penetrating radiations which cannot be deflected by electrical or magnetic field are given out. These are

A. A beam of protons

B. α - rays

C. A beam of neutrons

D. X-rays

Answer: C

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20. When an electron drops from a higher energy level to a low energy level, then

A. Energy is emitted

B. Energy is absorbed

C. Atomic number increases

D. Atomic number decreases

Answer: A

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21. if electron falls from n=3 to n=2, then emitted energy is

A. 10.2 eV

B. 12.09 eV

C. 1.9 eV

D. 0.65 eV

Answer: C

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22. The positive charge of an atom is.

A. Spread all over the atom

B. Distributed around the nucleus

C. Concentrated at the nucleus

D. All of these

Answer: C

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23. The ratio of area covered by second orbital to the first orbital is.

A. $1:2$

B. $1:16$

C. $8:1$

D. $16:1$

Answer: D

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24. What is the packet of enegry called ?

A. Electron

B. Photon

C. Positron

D. Proton

Answer: B

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25. The energy of hydrogen atom in its ground state is $-13.6eV$. The energy of the level corresponding to the quantum number n is equal 5 is

A. -0.54 eV

B. -0.85 eV

C. -0.64 eV

D. -0.40 eV

Answer: A

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26. Time taken by an electrons to complete one revolution in the Bohr orbit of the H atom is

A. $\frac{4\pi^2 mr^2}{nh}$

B. $\frac{nh}{4\pi^2 mr}$

C. $\frac{nh}{4\pi^2 mr^2}$

D. $\frac{h}{2\pi mr}$

Answer: A

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27. The energy of a radiation of wavelength 8000 Å is E_1 and energy of a radiation of wavelength 16000 Å is E_2. What is the relation between these two

A. $E_1 = 6E_2$

B. $E_1 = 2E_2$

C. $E_1 = 4E_2$

D. $E_1 = 1/2E_2$

Answer: B

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28. The maximum kinetic energy of photoelectrons ejected from a metal, when it is irradiated with radiation of frequency $2 \times 10^{14} s^{-1}$ is 6.63×10^{-20}J. the threshold frequency of the metal is:

A. $2 \times 10^{14} s^{-1}$

B. $3 \times 10^{14} s^{-1}$

C. $2 \times 10^{-14} s^{-1}$

D. $1 \times 10^{-14} s^{-1}$

Answer: D

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29. The shortest wavelength in hydrogen spectrum of Lyman series when $R_H = 109678 cm^{-1}$ is :-

A. 1002.7 Å

B. 1215.67 Å

C. 1127.30 Å

D. 911.7 Å

Answer: D

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30. A 600 W mercury lamp emits monochromatic radiation of wave length 313.3 nm. How many photons are emitted from the lamp per second ? ($h = 6.626 \times 10^{-34} Js$, velocity of light $= 3 \times 10^8 ms^{-1}$)

A. 1×10^{19}

B. 1×10^{20}

C. 1×10^{21}

D. 1×10^{23}

Answer: C

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31. For balmer series in the spectrum of atomic hydrogen the wave number of each line is given by $\overline{V} = R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$ where R_H is a constant and n_1 and n_2 are integers. Which of the following statements (s), is (are correct)

1. As wave length decreases the lines in the series converge

2. The integer n_1 is equal to 2.

3. The ionisation energy of hydrogen can be calculated from the wave numbers of three lines.

4. The line of shortest wavelength corresponds to = 3.

A. 1, 2 and 3

B. 2 , 3 and 4

C. 1,2 and 4

D. 2 and 4 only

Answer: C

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32. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4$ to $n = 2$ of He^{+} spectrum ?

A. n=4 to n=3

B. n=3 to n=2

C. n=4 to n=2

D. n=2 to n=1

Answer: D

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33. The ratio of the frequency corresponding to the third line in the lyman series of hydrogen atomic spectrum to that of the first line in Balmer series of Li^{2+} spectrum is

A. $\frac{4}{5}$

B. $\frac{5}{4}$

C. $\frac{4}{3}$

D. $\frac{3}{4}$

Answer: D

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34. As we move away from nucleus, the energy of orbit

A. Increases as we move away from nucleus

B. Decreases as we move away from nucleus

C. Remains same as we move away from nucleus

D. None of these

Answer: A

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35. Bohr's radius can have

A. Discrete values

B. $+ve$ values

C. $-ve$ values

D. Fractional values

Answer: B

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36. A metal surface is exposed to solar radiations. Which of the following is true?

A. The emitted electrons have energy less than a maximum value of energy depending upon frequency of incident radiations

B. The emitted electrons have energy less than maximum value of energy depending upon intensity of incident radiations

C. The emitted electrons have zero energy

D. The emitted electrons have energy equal to energy of photons of incident light.

Answer: B

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37. Which of the following transitions have minimum wavelength

A. $n_4 \rightarrow n_1$

B. $n_2 \rightarrow n_1$

C. $n_4 \rightarrow n_2$

D. $n_3 \rightarrow n_1$

Answer: A

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38. How is the radius of a nucleus related to its mass number ?

A. $R = R_O A^{1/2}$

B. $R = R_O A$

C. $R = R_O A^2$

D. $R = R_O A^{1/3}$

Answer: D

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39. The wavelengths of electron waves in two orbits is 3:5. The ratio of kinetic energy of electrons will be

A. $25:9$

B. $5:3$

C. $9:25$

D. $3:5$

Answer: A

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40. Electrons with a kinetici energy of $6.023 \times 10^4 J/mol$ are evolved from the surface of a metal, when it is exposed to radiation of wavelength of 600 nm. The minimum amount of energy required to remove an electron fro the metal atom is:

A. 2.3125×10^{-19} J

B. 3×10^{-19} J

C. 6.02×10^{-19} J

D. 6.62×10^{-34} J

Answer: A

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41. Which one of the following is considered as the main postulate of Bohr's model of atom.

A. protons are present in the nucleus

B. Electrons are revolving around the nucleus

C. Centrifugal force produced due to the revolving electrons balances the force of attraction between the electron and the protons

D. Angular momentum of electron is an integral multiple of $\frac{h}{2\pi}$

Answer: D

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42. The electronic energy levels of the hydrogen atom in the Bohr's theory are called

A. Rydberg levels

B. orbits

C. Ground level

D. orbitals

Answer: B

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43. Energy of the electron in Hydrogen atom is given by

A. $E_n = -\frac{131.28}{n^2} \text{kJ mol}^{-1}$

B. $E_n = -\frac{131.33}{n^2} \text{kJ mol}^{-1}$

C. $E_n = -\frac{1313.3}{n^2} \text{kJ mol}^{-1}$

D. $E_n = -\frac{131.13}{n^2} \text{kJ mol}^{-1}$

Answer: C

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44. The radius of the first orbit of H-atom is r. then the radius of the first orbit of Li^{2+} will be:

A. r/9

B. r/3

C. 3r

D. 9r

Answer: B

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45. Probability of finding an electrons at the nodal surface is

A. Unity

B. Low

C. High

D. Zero

Answer: D

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46. Write an expression for Bohr's radius in hydrogen atom.

A. $r = \frac{n^2h^2}{4\pi^2me^4z^2}$

B. $r = \frac{n^2h^2}{4\pi^2me^2z}$

C. $r = \frac{n^2h^2}{4\pi^2me^2z^2}$

D. $r = \frac{n^2h^2}{4\pi^2m^2e^2z^2}$

Answer: B

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47. In Balmer series of H atom spectrum, which electronic transitions represents 3^{rd} line?

A. Fifth Bohr orbit to second one

B. Fifth Bohr orbit to first one

C. Fourth Bohr orbit to second one

D. Fourth Bohr orbit to first one

Answer: A

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48. Energy of electron of hydrogen atom in second Bohr orbit is

A. $-5.44 \times 10^{-19} J$

B. $-5.44 \times 10^{-19} kJ$

C. -5.44×10^{-19} cal

D. -5.44×10^{-19} eV

Answer: A

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49. Radius of first bohr's orbit of hydrogen atom is 0.53 A then the radius of 3^{rd} bohr orbit is :-

A. 0.79 Å

B. 1.59 Å

C. 3.18 Å

D. 4.77 Å

Answer: D

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50. The Bohr model of atoms

A. Pauli exclusion principle

B. planck quantum theory

C. Heisenberg uncertainty principle

D. All of these

Answer: C

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51. The radius of electron in the first excited state of hydrogen atom is

A. a_0

B. $4a_0$

C. $2a_0$

D. $8a_0$

Answer: B

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52. The principle which gives a system to fill the electrons in increasing order of energy level is

A. Hund's rule

B. pauli's exclusion principle

C. Aufbau's principle

D. None of these

Answer: C

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53. The value of planck constant is

A. 6.62×10^{-34} Joule-second

B. 6.62×10^{-27} Joule-second

C. 6.62×10^{-30} Joule-second

D. 6.62×10^{-24} Joule-second

Answer: B

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54. In spectral series of hydrogen , the series which does not come in infrared region is

A. Pfund

B. Brackett

C. paschen

D. Lyman

Answer: D

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55. When electrons revolve in stationary orbits,

A. it absorbs energy

B. It gains kinetic energy

C. it emits radiation

D. Its energy remains constant

Answer: D

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56. In Bohr's mode, the atomic radius of the first orbit is r_0 then the radius of the third orbit is

A. $\gamma/3$

B. γ

C. 3γ

D. 9γ

Answer: D

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57. The energy of an electron in n^{th} orbit of hydrogen atom is

A. $\frac{13.6}{n^4}eV$

B. $\frac{13.6}{n^3}eV$

C. $\frac{13.6}{n^2}eV$

D. $\frac{13.6}{n}$ eV

Answer: C

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58. If wavelength of photon is $2.2 \times 10^{-11} m$, $h = 6.6 \times 10^{-34} Js$, then momentum of photons is

A. $3 \times 10^{-23} \text{kg ms}^{-1}$

B. $3.33 \times 10^{22} \text{kg ms}^{-1}$

C. $1.452 \times 10^{-44} \text{kg ms}^{-1}$

D. $6.89 \times 10^{43} \text{kg ms}^{-1}$

Answer: A

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59. Which one of the following frequency of radiation (in Hz) has a wavelength of 600 nm

A. 5.0×10^{14} Hz

B. 2.5×10^{7} Hz

C. 5.0×10^{7} Hz

D. 2.5×10^{14} Hz

Answer: A

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60. The value of the energy for the first excited state of hydrogen will be

A. -13.6 eV

B. -3.40 eV

C. -1.51 eV

D. -0.85 eV

Answer: B

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61. The frequency corresponding to transition $n=1$ to $n=2$ in hydrogen atom is.

A. 15.66×10^{10} Hz

B. 24.66×10^{14} Hz

C. 30.57×10^{14} Hz

D. 40.57×10^{24} Hz

Answer: B

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62. The splitting of line into groups under the effect of magnetic field is called

A. Zeeman effect

B. Stark effect

C. Photoelectric effect

D. None of these

Answer: A

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63. What is the frequency of photon, whose momentum is $1.1 \times 10^{-23} kgms^{-2}$

A. 5×10^{16} Hz

B. 5×10^{17} Hz

C. 0.5×10^{18} Hz

D. 5×10^{18} Hz

Answer: D

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64. The energy of an electron in the 3rd orbit of an H like 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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65. The radus of hydrogen atom in the ground state 0.53Å. The radius of Li^{2+} ion (Atomic number = 3) in a similar state is

A. 1.27Å

B. 0.17Å

C. 0.57 Å

D. 0.99 Å

Answer: B

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66. The wavelength of the radiation emitted , when in a hydrogen atom electron falls from infinity to stationary state 1 , would be :

(Rydberg constant = $1.097 \times 10^7 m^{-1}$)

A. 409 nm

B. 192 nm

C. 91 nm

D. 9.1×10^{-8} nm

Answer: C

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67. According to Bohr's theory the angular momentum of an electron in 5th orbit is :

A. $25h / \pi$

B. $1.0h / \pi$

C. $10h / \pi$

D. $2.5h / \pi$

Answer: D

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68. The ionization enthalpy of hydrogen atom is $1.312 \times 10^6 \text{J mol}^{-1}$. The energy required to excite the electron in the atom from n=1 to n=2 is

A. $6.56 \times 10^5 \text{J mol}^{-1}$

B. $7.56 \times 10^5 \text{J mol}^{-1}$

C. $9.84 \times 10^5 \text{J mol}^{-1}$

D. $8.51 \times 10^5 \text{J mol}^{-1}$

Answer: C

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69. The energy required to break one mole of $Cl-Cl$ bonds in Cl_2 is $242kJmol^{-1}$. The longest wavelength of light capable of breaking a since $Cl-Cl$ bond is

A. 494 nm

B. 594 nm

C. 640 nm

D. 700 nm

Answer: A

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70. Ionisation energy of He^{+} is $19.6 \times 10^{-18} J \text{atom}^{-1}$. The energy of the first stationary state $(n = 1)$ of Li^{2+} is.

A. $8.82 \times 10^{-17} \text{J atom}^{-1}$

B. $4.41 \times 10^{-16} \text{J atom}^{-1}$

C. $-4.41 \times 10^{-17} \text{J atom}^{-1}$

D. $-2.2 \times 10^{-15} \text{J atom}^{-1}$

Answer: C

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71. A gas absorbs a photon of $355 nm$ and emits at two wavelengths . If one of the emission is at 680 nm , the other is at :

A. 1035 nm

B. 325 nm

C. 743 nm

D. 518 nm

Answer: C

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72. When atoms are bombarded with alpha particles, only a few in millon suffer deflection, other pass out undeflected. This is because.

A. The force of repulsion on the moving alpha particle is small

B. The force of attraction on the alpha particle to the oppositely charged electrons is very small

C. There is only one nucleus and large number of electrons

D. The nucleus occupies much smaller volume compared to the volume of the atom

Answer: D

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73. The ratio between kinetic enegry and total enegry of the electrons of hydrogen atom according to Bohr's model is

A. $2:1$

B. $1:1$

C. $1: \ -1$

D. $1:2$

Answer: C

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74. The mass of a photon with a wavelength equal to $1.54 \times 10^{-8} cm$ is.

A. 0.8268×10^{-34} kg

B. 1.2876×10^{-33} kg

C. 1.4285×10^{-32} kg

D. 1.8884×10^{-32} kg

Answer: C

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75. The specific charge of a proton is $9.6 \times 10^{7} Ckg^{-1}$, then for and $\alpha -$ particles it will be.

A. $38.4 \times 10^7 \quad \mathrm{C\,kg}^{-1}$

B. $19.2 \times 10^7 \quad \mathrm{C\,kg}^{-1}$

C. $2.4 \times 10^7 \quad \mathrm{C\,kg}^{-1}$

D. $4.8 \times 10^7 \quad \mathrm{C\,kg}^{-1}$

Answer: D

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76. What is the energy in eV requried to excite the electron from n=1 to n=2 state in hydrogen atom? (n=principal quantum number)

A. 13.6

B. 3.4

C. 17.0

D. 10.2

Answer: D

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77. What is the maximum number of emission lines are obtained when the excited electron of a H atom in n = 5 drops to the ground state?

A. 10

B. 5

C. 12

D. 15

Answer: A

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78. In photoelectric effect, the kinetic energy of photoelectrons increases linearly with the

A. Wavelength of incident light

B. Frequency of incident light

C. Velocity of incident light

D. Atomic mass of an element

Answer: B

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79. The H-spectrum confirms

A. Heisenberg's uncertainty principle

B. Diffraction

C. polarisation

D. presence of quantised energy level

Answer: D

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80. The colour of sky is due to

A. Absorption of light by atmospheric gases

B. Transmission of light

C. Wavelength of scattered light

D. All of these

Answer: C

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81. The wave number of the spectral line in the emission spectrum of hydrogen will be equal to $\frac{8}{9}$ times the Rydberg's constant if the electron jumps from ....:-

A. n=3 to n=1

B. n=10 to n=1

C. n=9 to n=1

D. n=2 to n=1

Answer: A

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82. If ionising energy of H atom is 13.6 eV, then the second ionising energy of He should be

A. 27.2 eV

B. 40.8 eV

C. 54.4 eV

D. 108.8 eV

Answer: C

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83. 1 mole of photon, each of frequency $2500s^{-1}$, would have approximately a total energy of

A. 10 erg

B. 1 Joule

C. 1 eV

D. 1 MeV

Answer: A

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84. Which of the following is not true in Rutherford's nuclear model of atom

A. protons and neutrons are present inside nucleus

B. Volume of nucleus is very small as compared to volume of atom

C. The number of protons and neutrons are always equal

D. the number of electrons and protons are always equal

Answer: C

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85. In hydrogen spectrum the different lines of Lyman series are present is

A. UV field

B. IR field

C. Visible field

D. Far IR field

Answer: A

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86. The emission spectrum of hydrogen is found to satisfy the expression for the energy change ΔE (in joules) such that

$$\Delta E = 2.18 \times 10^{-18}\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) J$$

where $n_1 = 1, 2, 3, ...$ and $n_2 = 2, 3, 4, ...$ The spectral lines correspond to Paschen series if

A. $n_1 = 1$ and n_2=2,3,4

B. $n_1 = 3$ and n_2=4,5,6

C. $n_1 = 1$ and n_2=3,4,5

D. $n_1 = 2$ and n_2=3,4,5

Answer: B

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87. An electronic transition from 1s orbital of an atom causes

A. Absorption of energy

B. Release of energy

C. Both release or absorption of energy

D. Unpredictable

Answer: A

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88. visible line of hydrogen spectrum will be

A. Pfund

B. Lyman

C. Balmer

D. Brackett

Answer: C

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89. Radius of Bohr's orbit of hydrogen atom is

A. 1.06 Å

B. 0.22 Å

C. 0.28 Å

D. 0.53 Å

Answer: D

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90. 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 ?

A. 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

B. The negative sign in equation simply means that the energy of electron bound to nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus

C. larger the value of n, the larger is the orbit radius

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

Answer: A

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91. Positronium consists of an electron and a positron (a particle which has the same mass as an electron , but opposite charge) orbiting round their common centre of mass. Calculate the value of the Rydberg constant for this system

A. $R_{\infty}/4$

B. $R_{\infty}/2$

C. $2R_{\infty}$

D. R_{∞}

Answer: B

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92. The postulate of Bohr theory that electrons jump from one orbit to the other, rather than flow is according to

A. The quantisation concept

B. The wave nature of electron

C. The probability expression for electron

D. Heisenberg uncertainty principle

Answer: A

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93. The frequency of an electromagnetic radiation is 2×10^6 Hz. What is its wavelength in metres

(Velocity of light =$3 \times 10^8 ms^{-1}$)

A. 6.0×10^{14}

B. 1.5×10^4

C. 1.5×10^2

D. 0.66×10^{-2}

Answer: C

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94. The value of n for a line Balmer series of hydorgen spectrum having the highest wave length is 4 and 6.

For Balmer series of hydorgen spectrum, the value $n_1 = 2$ and $n_2 = 3, 4, 5$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: D

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95. Electrons revolving around the nucleus do not fall into the nucleus because of centrifugal force.

Revolving electrons are planetary electrons.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: B

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96. Assertion (A) : A spectral line will be seen for $2p_x$-$2p_y$ transition

Reason (R) : Energy is raleased in the form of wave of light when the electron drops from $2p_x$, to $2p_y$ orbital.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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97. Assertion :Absorption spectrum conists of some bright lines separated by dark spaces .

Reason : Emission spectrum consists of dark lines

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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98. Assertion(A): Threshold frequency is a characteristic for a metal

Reason(R): Threshold frequency is a maximum frequency required for the ejection of electron from the metal surface.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: C

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99. Assertion : The radius of the first orbit of hydrogen atom is 0.529 Å.

Reason : Radius for each circular orbit $(r_n) = 0.529\text{Å}\left(n^2 / Z\right)$, where r=1,2,3 and Z = atomic number.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: A

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100. Assertion : Splitting of the spectral lines in the presence of magnetic field is known as stark effect.

Reason : Line spectrum is simplest for hydrogen atom.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: D

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101. Assertion : Thomson's atomic model is known as 'raisin pudding' model.

Reason: The atom is visualized as a pudding of positive charge with electrons (raisins) embedded in it.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: A

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102. Assertion : The transition of electrons $n_3 \rightarrow n_2$ in H atom will emit greater energy than $n_4 \rightarrow n_3$

Reason : n_3 and n_2 are closer to nucleus than n_4

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: B

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Dual nature of electron

1. In which one of the following pairs of experimental observations and phenomemnon does the experimental observation correctly account for phenomenon does the experimental observation correctly account for phenomenon

A. $\begin{array}{ll} \text{Experimental observation} & \text{Phenomenon} \\ \text{X-ray spectra} & \text{Charge on the nucleus} \end{array}$

B. $\begin{array}{ll} \text{Experimental observation} & \text{Phenomenon} \\ \alpha\text{-particle scattering} & \text{Quantized electron orbit} \end{array}$

C. $\begin{matrix} \text{Experimental observation} & \text{Phenomenon} \\ \text{Emission spectra} & \text{The quantization of energy} \end{matrix}$

D. $\begin{matrix} \text{Experimental observation} & \text{Phenomenon} \\ \text{The photoelectric effect} & \text{The nuclear atom} \end{matrix}$

Answer: C

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2. The de-Broglie wavelength associated with a particle of mass $10^{-6}kg$ moving with a velocity of $10ms^{-1}$, is

A. 6.63×10^{-22} m

B. 6.63×10^{-29} m

C. 6.63×10^{-31} m

D. 6.63×10^{-34} m

Answer: B

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3. The de Broglie wavelength associated with a ball of mass $1kg$ having kinetic enegry $0.5J$ is

A. 6.626×10^{-34} m

B. 13.20×10^{-34} m

C. 10.38×10^{-21} m

D. 6.626×10^{-34} Å

Answer: A

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4. Calculate de Broglie wavelength of an electron travelling at 1% of the speed of light.

A. 2.73×10^{-24} m

B. 2.42×10^{-10} m

C. 242.2×10^{10} m

D. None of these

Answer: B

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5. The de-Broglie wavelength of a particle with mass $1g$ and velocity $100m/\sec$ is.

A. 6.63×10^{-33} m

B. 6.63×10^{-34} m

C. 6.63×10^{-35} m

D. 6.65×10^{-35} m

Answer: A

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6. What is the de-Broglie wavelength associated with the hydrogen electron in its third orbit

A. 9.96×10^{-10} cm

B. 9.96×10^{-8} cm

C. 9.96×10^{4} cm

D. 9.96×10^{8} cm

Answer: B

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7. de-Broglie equation describes the relationship of wavelength associated with the motion of an electron and its

A. Mass

B. Energy

C. Momentum

D. Charge

Answer: C

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8. Which of the following expressions gives the de-Broglie relationship?

A. $h = \frac{\lambda}{\mathrm{mv}}$

B. $\lambda = \frac{h}{\mathrm{mv}}$

C. $\lambda = \frac{m}{\mathrm{hv}}$

D. $\lambda = \frac{v}{mh}$

Answer: B

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9. If the velocity of hydrogen molecule is $5 \times 10^4 cm \sec^{-1}$, then its de-Broglie wavelength is.

A. 2 Å

B. 4 Å

C. 8 Å

D. 100 Å

Answer: B

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10. The de-Broglie equation applies

A. To electrons only

B. To neutrons only

C. To protons only

D. All the material object in motion

Answer: D

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11. The wavelength associated with an electron moving with a velocity of 10^8cm s^{-1} is

A. 72.7 Å

B. 7.27 Å

C. 0.727 Å

D. 0.277 Å

Answer: B

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12. The wave charaters of electron was experimenally verified by ....

A. Bohr

B. De-Broglie

C. Davison and Germer

D. Schrodinger

Answer: C

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13. The kinetic energy of one electron is 2.8×10^{-13} J. What is the de-Broglie wavelength

A. 9.25×10^{-13} m

B. 9.25×10^{-16} m

C. 9.25×10^{-8} m

D. 18.5×10^{-13} m

Answer: A

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14. What will be de-Broglie wavelength of an electron moving with a velocity of $1.2 \times 10^5 \text{ms}^{-1}$

A. 6.071×10^{-9}

B. 3.133×10^{-37}

C. 6.626×10^{-9}

D. 6.018×10^{-7}

Answer: A

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15. A 200 g golf ball is moving with a speed of 5 m per hour. The associated wavelength is ($h = 6.625 \times 10^{-34}$ J -sec) of the order of

A. 10^{-10} m

B. 10^{-20} m

C. 10^{-30} m

D. 10^{-40} m

Answer: C

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16. if Helium atom and Hydrogen molecule are moving with the same velocity , their wavelength ratio will be

A. $4:1$

B. $1:2:$

C. $2:1$

D. $1:4$

Answer: B

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17. Minimum de-Broglie wavelength is associated with.

A. Electron

B. proton

C. CO_2 molecule

D. SO_2 molecule

Answer: D

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18. Calculate the wavelength (in nanometer) associated with a proton moving at $1.0 \times 10^3 ms^{-1}$(Mass proton $= 1.67 \times 10^{-27} kg$ and $h = 6.63 \times 10^{-34} Js$):-

A. 0.032 mm

B. 0.40 mm

C. 2.5 mm

D. 14.0 mm

Answer: B

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19. Give the equation which gives the relationship between wavelength (λ) and momentum (p) of the particle.

A. $\lambda = \dfrac{h}{P}$

B. $\pi = \dfrac{h}{P}$

C. $P = \dfrac{h}{\lambda m}$

D. $h = \dfrac{P}{\lambda}$

Answer: A

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20. If the de-Broglie wavelength of a particle of mass m is 100 times its velocity then its value in terms of its mass (m) and Planck's constant (h) is

A. $\frac{1}{10}\sqrt{\frac{m}{h}}$

B. $10\sqrt{\frac{h}{m}}$

C. $\frac{1}{10}\sqrt{\frac{h}{m}}$

D. $10\sqrt{\frac{m}{h}}$

Answer: B

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21. A cricket ball of $0.5kg$ moving with a velocity of $100ms^{-1}$. The wavelength associated with its motion is

A. 1/100 cm

B. 6.6×10^{-34} m

C. 1.32×10^{-35} m

D. 6.6×10^{-28} m

Answer: C

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22. The wave nature of an electron was first given by

A. de-Broglie

B. Heisenberg

C. Mosley

D. Sommerfield

Answer: A

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23. A body of mass x kg is moving with a velocity of $100 ms^{-1}$. Its de-Broglie wavelength is $6.62 \times 10^{-35} m$. Hence, x is: $(h = 6.62 \times 10^{-34} Js)$

A. 0.25 kg

B. 0.15 kg

C. 0.2 kg

D. 0.1 kg

Answer: D

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24. The de Broglie wavelength associated with particle is

A. Directly proportional to its energy

B. Directly proportional to momentum

C. Inversely proportional to its energy

D. Inversely proportional to momentum

Answer: D

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25. The dual nature of radiation was proposed by ....

A. heisenberg's

B. lowry

C. de-Broglie

D. Schrodinger

Answer: C

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26. if electron , hydrogen , helium and neon nuclei are all moving with the velocity of light , then the wavelength associated with these particles are in the order

A. Electron gt hydrogen gt helium gt neon

B. Electron gt helium gt hydrogen gt neon

C. Electron gt hydrogen lt helium lt neon

D. neon lt hydrogen lt helium lt electron

Answer: A

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27. The de-Broglie wavelength of a tennis ball mass $60g$ moving with a velocity of $10m$ per second is approximately :

A. 10^{-33} metres

B. 10^{-31} metres

C. 10^{-16} metres

D. 10^{-25} metres

Answer: A

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28. The position of both an electron and a helium atom is known within $1.0 nm$ and the momentum of the electron is known within $50 \times 10^{-26} kgms^{-1}$. The minimum uncertainty in the measurement of the momentum of the helium atom is.

A. $50 kgms^{-1}$

B. $60 kgms^{-1}$

C. $80 \times 10^{-26} \mathrm{kg\ ms}^{-1}$

D. $50 \times 10^{-26} \mathrm{kg\ ms}^{-1}$

Answer: D

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Uncertainty principle and Schrodinger wave equation

1. Given: The mass of electron is 9.11×10^{-31}Kg Planck constant is 6.626×10^{-34}Js, the uncertainty involved in the measurement of velocity within a distance of 0.1Å is:-

A. $5.79 \times 10^{8} \text{ms}^{-1}$

B. $5.79 \times 10^{5} \text{ms}^{-1}$

C. $5.79 \times 10^{6} \text{ms}^{-1}$

D. $5.79 \times 10^{7} \text{ms}^{-1}$

Answer: C

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2. If uncertainty in position and momentum are equal then uncertainty in velocity is.

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

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

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

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

Answer: C

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3. The measurement of the electron position is associated with an uncertainty in momentum, which is equal to $1 \times 10^{-18} gcms^{-1}$. The uncertainty in electron velocity is (mass of an electron is $9 \times 10^{-28} g$)

A. $1 \times 10^{5} \text{cm s}^{-1}$

B. $1 \times 10^{11} \text{cm s}^{-1}$

C. $1.1 \times 10^{9} \text{cm s}^{-1}$

D. $1 \times 10^{6} \text{cm s}^{-1}$

Answer: C

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4. The uncertainties in the velocities of two particles, A and B are 0.05 and 0.02 ms^{-1}, respectively. The mass of B is five times to that of the mass A. What is the ratio of uncertainties $\left(\frac{\Delta_{X_A}}{\Delta_{X_B}}\right)$ in their positions

A. 2

B. 0.25

C. 4

D. 1

Answer: A

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5. "The position and velocity of a small particle like electron cannot be simultaneously determined. "This statement is

A. Heisenberg uncertainly principle

B. principle of de Broglie's wave nature of electron

C. pauli's exclusion principle

D. Aufbau's principle

Answer: A

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6. According to Heisenberg's uncertainly principle, the product of uncertainties in position and velocities for an electron of mass $9.1 \times 10^{-31} kg$ is.

A. $2.8 \times 10^{-3} m^2 s^{-1}$

B. $3.8 \times 10^{-5} m^2 s^{-1}$

C. $5.8 \times 10^{-5} m^2 s^{-1}$

D. $6.8 \times 10^{-6} m^2 s^{-1}$

Answer: C

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7. If the uncertainty in the position of an electron is zero the nucertainty in its momentum be

A. Zero

B. $< \frac{h}{2\lambda}$

C. $> \frac{h}{2\lambda}$

D. Infinite

Answer: D

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8. The uncertainty in momentum of an electron is $1 \times 10^{-5} kg - m/s$. The uncertainty in its position will be $\left(h = 6.62 \times 10^{-34} kg = m^2/s\right)$.

A. 1.05×10^{-28} m

B. 1.05×10^{-26} m

C. 5.27×10^{-30} m

D. 5.25×10^{-28}m

Answer: C

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9. For an electron if the uncertainty in velocity is Δv, the uncertainty in its position (Δx) is given by

A. $\dfrac{hm}{4\pi\Delta v}$

B. $\dfrac{4\pi}{hm\Delta v}$

C. $\frac{h}{4\pi m\Delta v}$

D. $\frac{4\pi m}{h.\Delta v}$

Answer: C

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10. orbital is

A. Circular path around the nucleus in which the electron revolves

B. Space around the nucleus where the probability of finding the electron is maximum

C. Amplitude of electrons wave

D. None of these

Answer: B

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11. According to Heisenberg's uncertainly principle.

A. $E = mc^2$

B. $\Delta x \times \Delta p \le \frac{h}{4\pi}$

C. $\lambda = \frac{h}{p}$

D. $\Delta x \times \Delta p = \frac{h}{6\pi}$

Answer: B

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12. The maximum probability of finding electron in the d_{xy} orbital is -

A. Along the x-axis

B. Along the y-axis

C. At an angle of 45° from the x and y-axis

D. At an angle of 90° from the x and y-axis

Answer: C

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13. Which quantum number is not related with Schrodinger equation :-

A. Principal

B. Azimuthal

C. Magnetic

D. Spin

Answer: D

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14. Uncertainty in position of a 0.25 kg particle is 10^{-5} , uncertainty of velocity is $(h = 6.6 \times 10^{-34} Js)$

A. 1.2×10^{34} m/sec

B. 2.1×10^{-29} m/sec

C. 1.6×10^{-20} m/sec

D. 1.7×10^{-9} m/sec

Answer: B

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15. In an atom, an electron is moving with a speed of $600m/s$ with an accuracy of 0.005% . Certainty with which the position of the electron can be localized is :

$(h = 6.6 \times 10^{-34} kgm^2 s^{-1}$,

mass of electron $(e_m) = 9.1 \times 10^{-31} kg)$.

A. 1.52×10^{-4} m

B. 5.10×10^{-3} m

C. 1.92×10^{-3}m

D. 3.84×10^{-3} m

Answer: C

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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.

A. 5.2×10^{-28} m/sec

B. 3.0×10^{-28} m/sec

C. 5.2×10^{-22} m/sec

D. 3×10^{-22} m/sec

Answer: A

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17. Which of the following does not represent the mathematical expression for the Heisenberg uncertainty principle

A. $\Delta x.\ \Delta p \geq h/(4\pi)$

B. $\Delta x.\ \Delta v \geq h/(4\pi m)$

C. $\Delta E.\ \Delta t \geq h/(4\pi)$

D. $\Delta E.\ \Delta x \geq h/(4\pi)$

Answer: D

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18. Uncertainty principle gave the concept of

A. probability

B. An orbital

C. Physical meaning of Ψ the Ψ^2

D. All the above

Answer: D

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19. The Schrodinger wave equation for hydrogen atom is

$$\psi_{2s} = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left(2 - \frac{r}{a_0}\right)e^{-t/a_0}$$

where a_0 is Bohr's radius. If the radial node in 2 s be at r_0, then r_0 would be equal to

A. $r_0 = 2a_0$

B. $2r_0 = a_0$

C. $3/2r_0 = a_0$

D. $r_0 = a_0$

Answer: A

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20. Which of the following represents schrodinger equations

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

B. $\widehat{H}\Psi=E\Psi$

C. $\left(\widehat{T}=\widehat{V}\right)\Psi=E\Psi$

D. all of them

Answer: D

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21. The uncertainty in the position of an electron $\left(mass=9.1\times10^{-28}g\right)$ moving with a velocity of $3.0\times10^{4}cms^{-1}$ accurate up to 0.001% will be

(Use $\frac{h}{4\pi}$ in the uncertainty expression, where $h=6.626\times10^{-27}erg-s$)

A. 1.92 cm

B. 7.68 cm

C. 5.76 cm

D. 3.84 cm

Answer: A

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22. Assertion (A) : The position of electron can be determined with the help of an electronic microscope.

Reason (R) : The product of uncertainty in momentum and the uncertainty in the position of an electron cannot be less than a finite limit.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: D

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Quantum numbers , Electronic configuration and Shape of orbitals

1. Krypton (At. No 36) has the electronic configuraiton [Ar] $4s^2 3d^{10} 4p^6$.

The 37th electron will go into which one of the following sub-levels?

A. 4f

B. 4d

C. 3p

D. 5s

Answer: D

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2. If an electron has spin quantum number of $-\frac{1}{2}$ and magnetic quantum number of -1 it cannot be present in:

A. d-orbital

B. f-orbital

C. p-orbital

D. s-orbital

Answer: D

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3. Which of the following principles/limits the maximum number of electrons in an orbital to two ?

A. Aufbau's principle

B. pauli's exclusion principle

C. Hund's rule of maximum multiplicity

D. Heisenberg uncertainty principle

Answer: B

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4. how many electrons can be accommodated in a sub-shell for which n=3, l=1

A. 8

B. 6

C. 18

D. 32

Answer: B

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5. For azimuthal quantum number l=3, the maximum number of electrons will be

A. 2

B. 6

C. 0

D. 14

Answer: D

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6. Maximum number of electrons in a sub-shell with $l = 3$ and $n = 4$ is.

A. 2

B. 6

C. 0

D. 14

Answer: D

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7. The order of filling of electrons in the orbitals of an atom will be

A. 3d, 4s, 4p, 4d, 5s

B. 4s, 3d, 4p, 5s, 4d

C. 5s, 4p, 3d, 4d, 5s

D. 3d,4p,4s,4d,5s

Answer: B

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8. The electronic configuration of gadolinium (atomic number 64) is:

A. $[Xe]4f^8 5d^9 6s^2$

B. $[Xe]4f^7 5d^1 6s^2$

C. $[Xe]4f^3 5d^5 6s^2$

D. $[Xe]4f^6 5d^2 6s^2$

Answer: B

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

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

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

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

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

Answer: B

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10. What is the maximum number of orbitals that can be identified with the following quantum numbers ? $n = 3, l = 1, m_l = 0$.

A. 3

B. 4

C. 1

D. 2

Answer: C

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11. Elements up to atomic number 103 have been synthesized and studied. If a newly discovered element is found to have an atomic number 106, its electronic configuration will be

A. $[Rn]5f^{14}, 6d^4, 7s^2$

B. $[Rn]5f^{14}, 6d^{1}, 7s^{2}7p^{3}$

C. $[Rn]5f^{14}, 6d^{6}, 7s^{0}$

D. $[Rn]5f^{14}, 6d^{5}, 7s^{1}$

Answer: D

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12. The statements.

(i) In filling a group of orbitals of equal energy, it is energetically preferable to assign electrons to empty orbital rather than pair placed in two different.

(ii) When two electrons are placed in two different orbitals, energy is lower of the spins are parallel, are valid for.

A. Aufbau principle

B. Hund's Rule

C. pauli's exclusion principle

D. Uncertainty principle

Answer: B

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13. For the energy level is an atom which one of the following statement is correct ?

A. There are seven principal electron energy levels

B. The second principal energy level can have four sub-energy levels and contains a maximum of eight electrons

C. The M energy level can have maximum of 32 electrons

D. The 4s sub-energy level is at a higher energy than the 3d sub-energy level

Answer: B

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14. The total number of orbitals in an energy level designated by principal quantum number n is equal to

A. 2n

B. $2n^2$

C. n

D. n^2

Answer: D

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15. The configuration $1s^2 2s^2 2p^5 3s^1$ shows

A. Excited state of O_2^-

B. Excited state of neon

C. Excited state of fluorine

D. Ground state of fluorine atom

Answer: B

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16. Which of the following explains the sequence of filling the electrons in different shells.

A. Hund's rule

B. Octet rule

C. Aufbau's principle

D. All of these

Answer: C

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17. Quantum number of an atom can be defined on the basis of

A. Hund's rule

B. Aufbau's principle

C. pauli's exclusion principle

D. Heisenberg uncertainty principle

Answer: C

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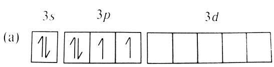
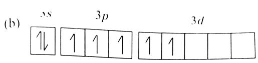
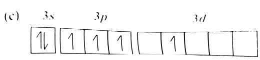
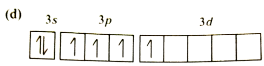
18. Which of the following has maximum energy ?

A. 

B. 

C. 

D. 

Answer: B

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19. The quantum numbers 'm' of a free gaseous atom is associated with :

A. The effective volume of the orbital

B. The shape of the orbital

C. The spatial orientation of the orbital

D. The energy of the orbital in the absence of a magnetic field

Answer: C

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20. For principle quantum number n=4,the total number of orbitals having l=3 is

A. 3

B. 7

C. 5

D. 9

Answer: B

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21. Azimuthal quantum number defines.

A. e/m ratio of electron

B. Spin of electron

C. Angular momentum of electron

D. Magnetic momentum of electron

Answer: C

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22. The electronic configuration of copper $(._{29}\,Cu)$ is

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

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

C. $1s^2. 2s^2 2p^6, 3s^2 3p^6, 4s^2 4p^6$

D. $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}$

Answer: B

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23. The quantum number which may be designated by s,p,d and f instead of number is

A. n

B. l

C. m_1

D. m_s

Answer: B

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24. There is no difference between a 2 p and 3p orbital regarding ?

A. Shape

B. Size

C. Energy

D. Value of n

Answer: A

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25. An electron has principal quantum number 3. The number of its (i) sub-shell and (ii) orbitals would be respectively.

A. 3 and 5

B. 3 and 7

C. 3 and 9

D. 2 and 5

Answer: C

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26. The magnetic quantum number specifies.

A. Size of orbitals

B. Shape of orbitals

C. Orientation of orbitals

D. Nuclear stability

Answer: C

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27. Principal azimuthal , and magnetic quantum numbers are respetively related to

A. Size , shape and orientation

B. Shape , size and orientation

C. Size, orientation and shape

D. None of the above

Answer: A

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28. The atomic orbitals are progerssively filled in order of increasing energy. The principle is called as :

A. Hund's rule

B. Aufbau's principle

C. Exclusion principle

D. de-Broglie rule

Answer: B

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29. Electronic configuration of $._{21}Sc$ is

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

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

C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^3$

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

Answer: A

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30. If the magnetic quantum number of a given atom is represented by -3, then what will be its principal quantum number?

A. 2

B. 3

C. 4

D. 5

Answer: C

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31. Correct statement is

A. $K = 4s^1, Cr = 3d^4 4s^2, Cu = 3d^{10} 4s^2$

B. $K = 4s^2, Cr = 3d^4 4s^2, Cu = 3d^{10} 4s^2$

C. $K = 4s^2, Cr = 3d^5 4s^1, Cu = 3d^{10} 4s^2$

D. $K = 4s^1, Cr = 3d^5 4s^1, Cu = 3d^{10} 4s^1$

Answer: D

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32. The number of orbitals in d sub-shell is

A. 5

B. 15

C. 17

D. 19

Answer: A

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33. The total number of electrons that can be accommodated in all the orbitals having principal quantum number 2 and azimuthal quantum number 1 are

A. 2

B. 4

C. 6

D. 8

Answer: C

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34. Electronic configuration of C is

A. $1s^2, 2s^2 2p^2$

B. $1s^2, 2s^2 2p^3$

C. $1s^2, 2s^2$

D. $1s^2, 2s^2 2p^6$

Answer: A

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35. The number of electrons in the atom which has 20 protons in the nucleus

A. 20

B. 10

C. 30

D. 40

Answer: A

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36. The electronic configuration $1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$ is of

A. Oxygen

B. Nitrogen

C. Hydrogen

D. Fluorine

Answer: B

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37. Number of unpaired electrons in $1s^2 2s^2 2p^3$ is

A. 2

B. 0

C. 3

D. 1

Answer: C

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38. The maximum number of electrons that can be accommodated in 'f' sub shell is

A. 2

B. 8

C. 32

D. 14

Answer: D

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39. Which one of the following configuration represents a noble gas ?

A. $1s^2, 2s^2 2p^6, 3s^2$

B. $1s^2, 2s^2 2p^6, 3s^1$

C. $1s^2, 2p^2 2p^6$

D. $1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2$

Answer: C

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40. Which of the following orbitals have a dumb bell shape?

A. s-orbital

B. p-orbital

C. d-orbital

D. f-orbital

Answer: B

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41. Total Number of unpaired electrons in $d-$ orbitals of an atom element of atomic number 29 is :

A. 10

B. 1

C. 0

D. 5

Answer: C

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42. Total number of unpaired electrons in an atom of atomic number 29 is

A. 1

B. 3

C. 4

D. 2

Answer: A

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43. The electronic configuration of silver atom in ground state is.

A. $[Kr]3d^{10}4s^1$

B. $[Xe]4f^{14}5d^{10}6s^1$

C. $[Kr]4d^{10}5s^1$

D. $[Kr]4d^9 5s^2$

Answer: C

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44. The electronic configuration of H^- is

A. $1s^0$

B. $1s^1$

C. $1s^2$

D. $1s^1 2s^1$

Answer: C

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45. When the azimuthal quantum number l = 1, the shape of the orbital will be

A. Unsymmetrical

B. Spherically symmetrical

C. Dumb-bell

D. Complicated

Answer: C

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46. The four quantum number for the valence shell electron or last electron of sodium (Z=11) is

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

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

C. n=3, l=2, m=-2, $s = -\frac{1}{2}$

D. n=3, l=2, m=2, $s = +\frac{1}{2}$

Answer: B

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47. An atom has 2 electrons in K shell, 8 electrons in L shell and 6 electrons in M shell. The number of s-electrons present in that element is

A. 6

B. 5

C. 7

D. 10

Answer: A

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48. The number of unpaired electrons in $1s^2, 2s^2 2p^4$ is

A. 4

B. 2

C. 0

D. 1

Answer: B

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49. The principal quantum number represent

A. Shape of an orbital

B. Distance of electron from nucleus

C. Number of electrons in an orbit

D. Number of orbitals in an orbit

Answer: B

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50. if n=3, then the value of 'l' which is incorrect

A. 0

B. 1

C. 2

D. 3

Answer: D

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51. Which statement is correct for n=5, m=3

A. l=4

B. l=0, l,3, s=$+\frac{1}{2}$

C. l=3

D. All are correct

Answer: D

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52. $1s^2 2s^2 2p^6 3s^1$ shows configuration of

A. Al^{3+} in ground state

B. Ne in excited state

C. Mg^+ is excited state

D. None of these

Answer: C

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53. Which of the following set of quantum number belongs to highest energy.

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

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

C. n=3,l=1,m=1,$s = +\frac{1}{2}$

D. n=3,l=2,m=1,$s = +\frac{1}{2}$

Answer: D

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54. Which of the following electronic configurations is not possible

A. $1s^2 2s^2$

B. $1s^2 2s^2 2p^6$

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

D. $1s^2 2s^2 2p^2 3s^1$

Answer: D

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55. The orbital with maximum energy is

A. 3d

B. 5p

C. 4s

D. 6d

Answer: D

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56. Energy of atomic orbitals in a particular shell is in the order.

A. s lt p lt dlt f

B. s gt p gt d gt f

C. p lt d lt flt s

D. f gt dgt s gt p

Answer: A

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57. Aufbau principle is obeyed in which of the following electronic configuration

A. $1s^2 2s^2 2p^6$

B. $1s^2 3p^3 3s^2$

C. $1s^2 3s^2 3p^6$

D. $1s^2 2s^2 3s^2$

Answer: A

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58. Quantum numbers n=2, l=1 represent :

A. 1s orbital

B. 2s orbital

C. 2p orbital

D. 3d orbital

Answer: C

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59. Maximum number of electrons in a sub-shell of an atom is determined by the following.

A. 4l+2

B. 2l+1

C. 4l-2

D. $2n^2$

Answer: A

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60. The outer electronic structure of $3s^2 3p^5$ is possessed by

A. Cl

B. O

C. Ar

D. Br

Answer: A

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61. The maximum number of electrons in p-orbital with n=5, m=1 is

A. 6

B. 2

C. 14

D. 10

Answer: B

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62. Which of the following electronic configuration is not possible according to Hund's rule.

A. $1s^2 2s^2$

B. $1s^2 2s^2$

C. $1s^2 2s^2 2p_x^2 2p_y^1 2p_z^1$

D. $1s^2 2s^2 2p_x^2$

Answer: D

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63. The angular momentum of an electron is zero. In which orbital may it be present?

A. 2s

B. 2p

C. 3d

D. 4f

Answer: A

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64. The quantum number which specifies the location of an electron as well as energy is

A. Principal quantum number

B. Azimuthal quantum number

C. Spin quantum number

D. magnetic quantum number

Answer: A

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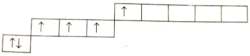
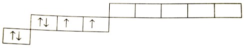
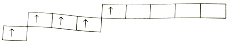
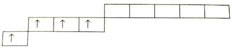
65. Which one is the ground state

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: B

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66. Which of the following sequence is correct as per Aufbau principle ?

A. 3s lt 3d lt 4s lt 4p

B. 1s lt 2p lt 4s lt 3d

C. 2s lt 5s lt 4p lt 5d

D. 2s lt 2p lt 3d lt 3p

Answer: B

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67. Number of unpaired electrons in Mn^{4+} is

A. 3

B. 5

C. 6

D. 4

Answer: A

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68. In a potassium atom, electronic energy levels are in the following order

A. 4s gt 3d

B. 4s gt 4p

C. 4s gt 3d

D. 4s gt 3p

Answer: C

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69. When $3d$ orbital is complete, the new electron will enter the

A. 4p-orbital

B. 4f-orbital

C. 4s-orbital

D. 4d-orbital

Answer: A

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70. Maximum number of electrons present in 'N' shell is

A. 18

B. 32

C. 2

D. 8

Answer: B

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71. Which of the following represents the electronic configuration of an element with atomic number 17

A. $1s^2, 2s^2 2p^6, 3s^1 3p^6$

B. $1s^2, 2s^2 2p^6, 3s^2 3p^4, 4s^1$

C. $1s^2, 2s^2 2p^6, 3s^2 3p^5$

D. $1s^2, 2s^2 2p^6, 3s^1 3p^4, 4s^2$

Answer: C

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72. The energy of an electron of $2p_y$ orbital is

A. Greater than that of $2p_x$ orbital

B. less than that of $2p_x$ orbital

C. Equal to that of 2s orbital

D. Same as that of $2p_z$ orbital

Answer: D

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73. The atom of the element having atomic number 14 should have

A. One unpaired electron

B. Two unpaired electrons

C. Three unpaired electrons

D. Four unpaired electrons

Answer: B

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74. The five d-orbitals are designated as $d_{xy}, d_{yz}, d_{xz}, d_{x^2-y^2}$ and d_{z^2} . Choose the correct statement.

A. The shapes of the first three orbitals are similar but that of the fourth and fifth orbitals are different

B. The shapes of all five d-orbitals are similar

C. The shapes of the first four orbitals are similar but that of the fifth orbital is different

D. The shapes of all five d-orbitals are different

Answer: C

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75. Arrabge in decreasing order, the energy of 2s orbital in the following atoms H, Li, Na, K

A. $E_{2s(H)} > E_{2s(Li)} > E_{2s(Na)} > E_{2s(K)}$

B. $E_{2s(H)} > E_{2s(Na)} > E_{2s(Li)} > E_{2s(K)}$

C. $E_{2s(H)} > E_{2s(Na)} = E_{2s(K)} > E_{2s(Li)}$

D. $E_{2s(K)} < E_{2s(Na)} < E_{2s(Li)} < E_{2s(H)}$

Answer: D

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76. Which of the following orbitals has / have zero — probability of finding the electron in xy plane ?

A. p_x

B. p_z

C. d_{yz}

D. $d_{x^2-y^2}$

Answer: C

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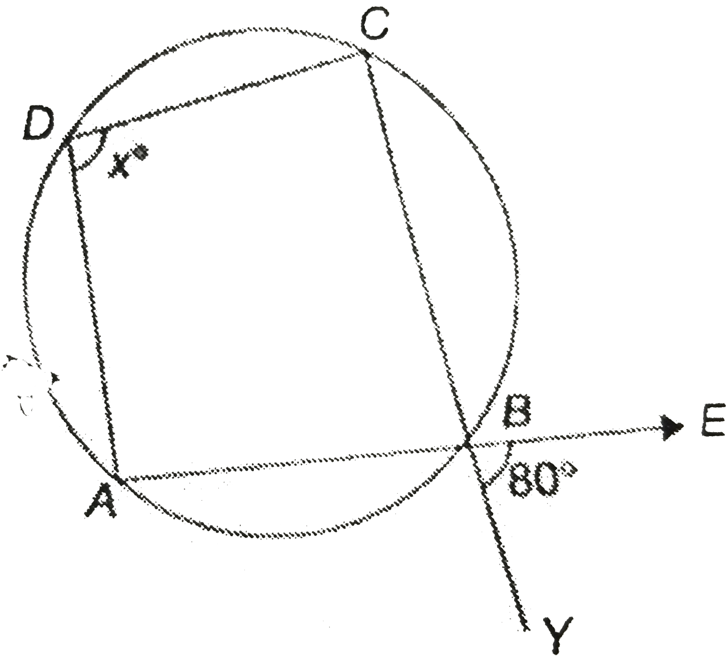
77. In Fig, find the value of x.



A. (i)

B. (ii)

C. (iii)

D. (iv)

Answer: B

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78. The electronic configuration of Cu^{2+} ion is :

A. $[Ar]4s^1 3d^8$

B. $[Ar]4s^2 3d^{10} 4p^1$

C. $[Ar]4s^1 3d^{10}$

D. $[Ar]3d^9$

Answer: D

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79. How many electrons can fit into the orbitals that comprise the 3^{rd} quantum shell $n = 3$?

A. 2

B. 8

C. 18

D. 32

Answer: C

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80. Match the following columns

Column A	Column B
15. Changing a term from one side of an equation to the other side	(a) Subject
16. Coefficient of the subject of a formula	(b) Transposition
17. In a formula, a variable which is expressed in terms of other variables	(c) $C = \pi d$
18. The circumference (C) of a circle is π times its diameter (d).	(d) 1

A. Nitrogen

B. Oxygen

C. Fluorine

D. Neon

Answer: C

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81. if the value of azimuthal quantum number is 3, the possible values of the magnetic quantum number would be

A. 0,1,2,3

B. 0,-1,-2,-3

C. $0, \pm 1, \pm 2, \pm 3$

D. $\pm 1, \pm 2, \pm 3$

Answer: C

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82. The electronic configuration (outermost) of Mn^{+2} ion (atomic number of Mn=25) in its ground state is

A. $3d^5, 4s^0$

B. $3d^4, 4s^1$

C. $3d^3, 4s^2$

D. $3d^2, 4s^2 4p^2$

Answer: A

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83. The number of orbitals in 2p sub-shell is

A. 6

B. 2

C. 3

D. 4

Answer: C

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84. The shape of an orbital is given by the quantum number

A. n

B. l

C. m

D. s

Answer: B

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85. Aufbau principle is not satisfied by

A. Cr and Cl

B. Cu and Ag

C. Cr and Mg

D. Cu and Na

Answer: B

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86. The electronic configuration of Ti^{3+} ion is ....

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

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

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

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

Answer: A

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87. What is the maximum number of electrons which can be accommodated in an atom in which the highest principal quantum number is 4 ?

A. 10

B. 18

C. 36

D. 54

Answer: C

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88. The correct orders of increasing energy of atomic orbitals is

A. 5p lt 4f lt 6s lt 5d

B. 5p lt 6s lt 4f lt 5d

C. 4f lt 5p lt 5d lt 6s

D. 5p lt 5d lt 4f lt 6s

Answer: B

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89. The correct set of quantum numbers for 4d-electrons is

A. 4,3,2,+1/2

B. 4,2,1,0

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

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

Answer: D

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90. Which orbital give an electron the greatest probability of being found close to the nucleus

A. 3p

B. 3d

C. 3s

D. Equal

Answer: C

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91. The electronic configuration of chromium (z=24) is

A. 2,8,14

B. 2,8,8,6

C. 2,8,12,2

D. 2,8,13,1

Answer: D

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92. Which of the following metal ions will have maximum number of unpaired electrons

A. Fe^{+2}

B. Co^{+2}

C. Ni^{+2}

D. Mn^{+2}

Answer: D

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93. The correct set of four quantum numbers for outermost electron of potassium (Z = 19) is:

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

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

C. n=3,l=1, m=1, $s = +\frac{1}{2}$

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

Answer: B

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94. The maximum number of electrons accommodated in 5f orbitals are

A. 5

B. 10

C. 14

D. 18

Answer: C

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95. All electrons on the 4p sub-shell must be characterized by the quantum number

A. n=4, m=0, $s = \pm\frac{1}{2}$

B. l=1

C. $l = 0, s = \pm\frac{1}{2}$

D. $s = \pm\frac{1}{2}$

Answer: B

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96. The maximum number of electrons in an atom with l=2 and n=3 is

A. 2

B. 6

C. 12

D. 10

Answer: D

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97. Which of the following sets of quantum number is not possible for an electron?

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

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

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

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

Answer: C

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98. The valency of the element having atomic number 9 is

A. 1

B. 2

C. 3

D. 4

Answer: A

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99. The most stable orbitals are

A. p^2 and d^3

B. p^4 and d^4

C. p^3 and d^5

D. d^5 and d^7

Answer: C

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100. Which of the following sets of quantum number is restricted

A. n=3, l=1, m=+2

B. n=3, l=2, m=-2

C. n=3, l=1, m=+1

D. n=3, l=1, m=-1

Answer: A

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101. In a given atom no two electrons can have the same values for all the four quantum numbers. This is called

A. Hund's rule

B. Aufbau's principle

C. Uncertainty principle

D. pauli's exclusion principle

Answer: D

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102. Which one is the electronic configuration of Fe^{+2}

A. $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^6$

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

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

D. None of these

Answer: A

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103. According to Aufbau's principle, which of the three 4d, 5p and 5s will be filled with electrons first

A. 4d

B. 5p

C. 5s

D. 4d and 5s will be filled simultaneously

Answer: C

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104. For the n=2 energy level, how many orbitals of all kinds are possible

A. 2

B. 3

C. 4

D. 5

Answer: C

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105. When the principal quantum number (n=3) , the possible values of azimuthal quantum number (l) is

A. 0,1,2,3

B. 0,1,2

C. $-2, \ -1, 0, 1, 2$

D. 1,2,3

Answer: B

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106. If $n + l = 6$, then total possible number of subshells would be

A. 3

B. 4

C. 2

D. 5

Answer: A

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107. Which of the following orbitals are not possible ?

2s, 2p, 3f, 3d.

A. 3 f

B. 4 f

C. 5f

D. 6f

Answer: A

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108. For sodium atom the number of electrons with m=0 will be

A. 2

B. 7

C. 9

D. 8

Answer: B

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109. The explanation for the presence of three unpaired electrons in the nitrogen atom can be given by -

A. Pauli's exclusion principle

B. Hund's Rule

C. Aufbau's principle

D. Uncertainty principle

Answer: B

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110. Electron enters the sub-shell for which (n+l) value is minimum. This is enunciated as

A. Hund's rule

B. Aufbau's principle

C. Heisenberg uncertainty principle

D. pauli's exclusion principle

Answer: B

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111. Following Hund's rule which element contains six unpaired electron

A. Fe

B. Co

C. Ni

D. Cr

Answer: D

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112. Which of the following sets of quantum numbers is correct for an electron in 4f-orbtial ?

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

B. n=4, l=4, m=-4, $s = -\frac{1}{2}$

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

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

Answer: A

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113. Consider the ground state Cr atom $(Z = 24)$. The number of electron with the azimuthal number $l = 1$ and 2 ,respectively are

A. 16 and 4

B. 12 and 5

C. 12 and 4

D. 16 and 5

Answer: B

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114. In a malti-electrons atom which of the following orbitals deseribed by the three quantum number will have the same energy in the absence of megnetic and electric field ?

I.$n = 1, l = 0, m = 0$

II. $n = 2, l = 0, m = 0$

III.$n = 2, l = 1, m = 1$

IVgt$n = 3, l = 2, m = 1$

V$n = 3, l = 2, m = 0$

A. (1) and (2)

B. (2) and (3)

C. (3) and (4)

D. (4) and (5)

Answer: D

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115. Which of the following sets of quantum numbers represents the highest energy of an atom?

A. n=3, l=2, m=1, s=+1/2

B. n=3, l=2, m=1, s=-1/2

C. n=4, l=0, m=0, s=+1/2

D. n=3, l=0, m=0, s=+1/2

Answer: B

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116. The electrons identified by quantum numbers n and l

A. n=4 , l=1

B. n=4 , l=0

C. n=3 , l=2

D. n=3 , l=1

Answer: B

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117. Which of the following configuration is correct for iron

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

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

C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$

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

Answer: D

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118. The number of orbitals in d sub-shell is

A. 1

B. 3

C. 5

D. 7

Answer: C

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119. The number of valence electrons in carbon atom is

A. 0

B. 2

C. 4

D. 6

Answer: C

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120. Pauli's exclusion principle states that

A. Two electrons in the same atom can have the same energy

B. Two electrons in the same atom cannot have the same spin

C. The electrons tend to occupy different orbitals as far as possible

D. None of these

Answer: D

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121. For d subshell , the azimuthal quantum number is

A. 0

B. 1

C. 2

D. 3

Answer: C

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122. The number of unpaired electrons in carbon atom is -

A. One

B. Two

C. Three

D. Four

Answer: D

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123. A completely filled d-orbital $\left(d^{10}\right)$ is

A. Spherically symmetrical

B. has octahedral symmetry

C. Has tetrahedral symmetry

D. Depends on the atom

Answer: B

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124. The two electrons in K sub-shell will differ in

A. Principal quantum number

B. Azimuthal quantum number

C. Magnetic quantum number

D. Spin quantum number

Answer: D

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125. Which of the following represents the correct sets of the four quantum numbers of a 4d electron

A. $4, 3, 2, \frac{1}{2}$

B. $4, 2, 1, 0$

C. $4, 3, -2, +\frac{1}{2}$

D. $4, 2, 1, -\frac{1}{2}$

Answer: D

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126. Which of the following statements is not correct for an electron that has the quantum numbers n=2 and m=2

A. The electron may have the quantum number $s = +\frac{1}{2}$

B. The electron may have the quantum number $l = 2$

C. The electron may have the quantum number $l = 3$

D. The electron may have the quantum number $l = 0, 1, 2, 3$

Answer: D

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127. The number of d electrons in Fe^{2+} (atomic number of $Fe = 26$) is not equal to that of the.

A. p-electrons in Ne (At. No. =10)

B. s-electrons in Mg (At. No. =12)

C. d-electrons in Fe

D. p-electrons in Cl^{-} (At. No. Of Cl =17)

Answer: D

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128. Which set of quantum numbers for an electron of an atom is not possible

A. $n=1, l=0, m=0, s=+1/2$

B. $n=1, l=1, m=1, s=+1/2$

C. $n=1, l=0, m=0, s=-1/2$

D. $n=2, l=1, m=-1, s=+1/2$

Answer: B

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129. p-orbitals of an atom in presence of magnetic field are :

A. Two fold degenerate

B. Non degenerate

C. Three fold degenerate

D. none of these

Answer: C

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130. The number of electrons that can be accommodated in dz^2 orbital is

A. 10

B. 1

C. 4

D. 2

Answer: D

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131. Electronic configuration of deuterium atom is

A. $1s^1$

B. $2s^2$

C. $2s^1$

D. $1s^2$

Answer: A

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132. According to aufbau principle, the correct order of energy of 3d,4s and 4p-orbitals is

A. 4p lt 3d lt 4s

B. 4s lt 4p lt 3d

C. 4s lt 3d lt 4p

D. 3d lt 4s lt 4p

Answer: C

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133. The set of quantum numbers n=4 , l=0 m=0 and $s = +\frac{1}{2}$ correspond to the most loosely bound , ground state electron of which one of the following atoms

A. Na

B. Cl

C. Cr

D. Rb

Answer: C

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134. The maximum number of electrons in the shell with principal quantum number n is equal to

A. n

B. 2n

C. n^2

D. $2n^2$

Answer: D

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135. Which of the following set of quantum numbers is correct for the 19^{th} electron of chromium

A. $\begin{matrix} n & l & m & s \\ 3 & 0 & 0 & 1/2 \end{matrix}$

B. $\begin{matrix} n & l & m & s \\ 3 & 2 & -2 & 1/2 \end{matrix}$

C. $\begin{matrix} n & l & m & s \\ 4 & 0 & 0 & 1/2 \end{matrix}$

D. $\begin{matrix} n & l & m & s \\ 4 & 1 & -1 & 1/2 \end{matrix}$

Answer: C

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136. Which of the following is not possible?

A. n=4, l=3, m=0

B. n=4, l=2 , m=1

C. n=4, l=4 , m=1

D. n=4 , l=0 , m=0

Answer: C

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137. Electrons will first enter into which set of quantum numbers-n = 5, l = 0 or n = 3, l = 2

A. n=5, l=0

B. Both possible

C. n=3, l=2

D. Data insufficient

Answer: C

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138. The following quantum numbers are possible for how many orbitals $(s) n = 3, l = 2, m = +2$?

A. 3

B. 2

C. 1

D. 4

Answer: C

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139. Correct configuration of Fe^{+3} [26] is

A. $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^5$

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

C. $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^6, 4s^2$

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

Answer: A

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140. The number of $2p$ electrons having spin quantum number $s = -1/2$ are

A. 6

B. 0

C. 2

D. 3

Answer: D

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141. When the azimuthal quantum number has the value 2, the number of orbitals possible is

A. 3

B. 0

C. 7

D. 5

Answer: D

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142. The set of quantum numbers of the outermost electron for copper in its ground state is.............

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

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

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

D. 4,2,2,+1/2

Answer: C

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143. The ground state electronic configuration of CO molecule

A. $1\sigma^2 2\sigma^2 1\pi^4 3\sigma^2$

B. $1\sigma^2 2\sigma^2 3\sigma^2 1\pi^2 2\pi^2$

C. $1\sigma^2 2\sigma^2 1\pi^2 3\sigma^2 2\pi^2$

D. $1\sigma^2 1\pi^4 2\sigma^2 3\sigma^2$

Answer: A

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144. Identify the CORRECT statement

A. Quantum numbers (n,l,m,s) are obtained arbitrarily

B. All the Quantum numbers (n,l,m,s) for any pair of electrons in an atom can be identical under special circumstance

C. All the quantum numbers (n,l,m,s) may not be required to described an electron of an atom completely

D. All the quantum numbers (n,l,m,s) are required to described an electron of an atom completely

Answer: D

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145. Which of the following statement(s) is (are) correct

A. The electronic configuration of Cr (at. No:24) is $[Ar]3d^5 4s^1$

B. The magnetic quantum number may have a negative value

C. In Ag (at. No. 47), 23 electrons have spins of one type and 24 electrons have spins of opposite type

D. The oxidation state of nitrogen in HN_3 is -3

Answer: A::B::C

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146. The maximum number of 2p electrons with the electronic spin= $-\frac{1}{2}$ are

A. 6

B. 0

C. 2

D. 3

Answer: D

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147. An electron having the quantum numbers n=4, l=3 , m=0 , $s = -\frac{1}{2}$ would be in the orbital

A. 3s

B. 3p

C. 4d

D. 4f

Answer: D

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148. Which of the following sets of quantum numbers is not allowed

A. $n=1, l=0, m=0$, s=+1/2`

B. $n=1, l=1, m=0$, s=-1/2`

C. $n=2, l=1, m=1$, s=+1/2`

D. $n=2, l=1, m=0$, s=-1/2`

Answer: B

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149. The total magnetic quantum numbers for d-orbitals is given by

A. 2

B. $0, \pm 1, \pm 2$

C. 0,1,2

D. 5

Answer: B

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150. For n=2 the correct set of azimuthal and magnetic quantum numbers are

A. l=2 , m=-2 , -1,0,+1,+2

B. l=1 , m=-2 , -1,0,+1,+2

C. l=0 , m=-1 , -1,0,+1

D. l=1, m=-1 ,0,+1

Answer: D

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151. An element forms diatomic molecule with a triple bond. The configuration of the element may be

A. $1s^2 2s^2 2p^5$

B. $1s^2 2s^2 2p^6$

C. $1s^2 2s^2 2p^3$

D. $1s^2 2s^2 2p^4$

Answer: C

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152. Which law represents the pairing of electron in a sub-shell after each orbital is filled with one electron

A. Pauli's exclusion principle

B. Hund's Rule

C. Heisenberg's principle

D. Hess's law

Answer: B

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153. The ground state electronic configuration of chromium is against

A. Heisenberg's principle

B. Hund's Rule

C. Aufbau's principle

D. pauli's exclusion principle

Answer: C

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154. Number of two electron can have the same values of ... quantum numbers

A. One

B. Two

C. Three

D. Four

Answer: C

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155. The number of orbitals present in the shell with n=4 is

A. 16

B. 8

C. 18

D. 32

Answer: A

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156. The structure of external most shell of inert gases in

A. s^2p^3

B. s^2p^6

C. s^1p^2

D. $d^{10}s^2$

Answer: B

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157.

https://d10lpgp6xz60nq.cloudfront.net/physics_images/PS_MATH_VII_C08_E04_

A. AB,XYZ, BY

B. AB

C. XYZ , AZ

D. AB,XYZ

Answer: B

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158. Which one pair of atoms or ions will have same configuration ?

A. F^{+} and Ne

B. Li^{+} and He^{-}

C. Cl^{-} and Ar

D. Na and K

Answer: C

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159. Number of nodal centres for 2s orbital

A. 1

B. 0

C. 4

D. 3

Answer: A

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160. Which of the following sets is possible for quantum numbers

A. n=4,l=3,m=-2, s=0

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

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

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

Answer: D

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161. What is the maximum number of electrons that can be associated with a following set of quantum numbers ? $(n = 3, l = 1 \text{ and } m = -1)$.

A. 2

B. 10

C. 6

D. 4

Answer: A

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162. Two electrons occupying the same orbital are distinguished by :

A. Principal quantum number

B. magnetic quantum number

C. Azimuthal quantum number

D. Spin quantum number

Answer: D

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163. Which of the following pairs of d-orbitals will hare electron density along the axes ?

A. $d_{\text{xy}}, d_{x^2-y^2}$

B. d_z^2, d_{xz}

C. d_{xz}, d_{yz}

D. $d_{z^2}, d_{x^2-y^2}$

Answer: D

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164. How many electrons can fit in the orbital for which n = 3 and l = 1 ?

A. 14

B. 2

C. 6

D. 10

Answer: B

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165. The electronic configuration of calcium ion $\left(Ca^{2+}\right)$ is

A. $1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2$

B. $1s^2, 2s^2 sp^6, 3s^2 3p^6, 4s^1$

C. $1s^2, 2s^2 2p^6, 3s^2 3p^6, 3d^2$

D. $1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^0$

Answer: D

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166. How many quantum numbers are required to define the electron in atom?

A. 1

B. 2

C. 3

D. 4

Answer: D

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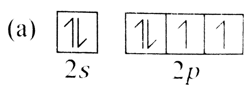
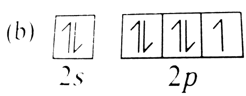
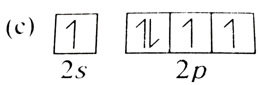
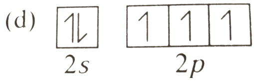
167. Which is not in accordance to Aufbau principle

A. 

B. 

C. 

D. 

Answer: C

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168. An element has the electronic configuration $1s^2, 2s^2 2p^6, 3s^2 3p^2$ Its valency electrons are

A. 6

B. 2

C. 3

D. 4

Answer: D

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169. Chromium has the electronic configuration $4s^1 3d^5$ rather than $4s^2 3d^4$ because

A. 4s and 3d have the same energy

B. 4s has a higher energy than 3d

C. $4s^1$ is more stable than $4S^2$

D. $4s^1 3d^5$ half-filled is more stable than $4s^2 3d^4$

Answer: D

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170. For a given value of quantum number l , the number of allowed values of m is given by

A. l+2

B. 2l+2

C. 2l+1

D. l+1

Answer: C

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171. Which electronic configuration for oxygen is correct according to Hund's rule of multiplicity.

A. $1s^2, 2s^2 2p_x^2 2p_y^1 2p_z^1$

B. $1s^2, 2s^2 2p_x^2 2p_y^2 2p_z^0$

C. $1s^2, 2s^2 2p_x^3 2p_y^1 2p_z^0$

D. None of these

Answer: A

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172. Which electronic configuration is not observing the $(n + l)$ rule.

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

B. $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^7, 4s^2$

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

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

Answer: C

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173. For p-orbital, the magnetic quantum number has value

A. 2

B. 4,-4

C. $-1, 0, \ +1$

D. 0

Answer: C

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174. Which of the following ions is not having the configuration of neon

A. F^{-}

B. Mg^{+2}

C. Na^{+}

D. Cl^{-}

Answer: D

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175. Ions which have the same electronic configuration are those of

A. Lithium and sodium

B. Sodium and potassium

C. potassium and calcium

D. oxygen and chlorine

Answer: C

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176. The shape of s-orbital is

A. Pyramidal

B. Spherical

C. Tetrahedral

D. Dumb-bell shaped

Answer: B

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177. Which of the following sets of orbitals may be degenerate

A. $2s, 2p_x, 2p_y$

B. $3s, 3p_x, 3p_{xy}$

C. 1s,2s,3s

D. $2p_x, 2p_y, 2p_z$

Answer: D

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178. The set of quantum numbers n=3, l=0, m=0, s=-1/2 belongs to the element

A. Mg

B. Na

C. Ne

D. F

Answer: A

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179. Which of the following has the least energy

A. 2p

B. 3p

C. 2s

D. 4d

Answer: C

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180. Number of unpaired electrons in the ground state of beryllium atom is

A. 2

B. 1

C. 0

D. All of above

Answer: C

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181. Doubly magic nucleus is ...

A. $._{82} Pb^{207}$

B. $._{82} Pb^{206}$

C. $._{82} Pb^{208}$

D. $._{83} Pb^{209}$

Answer: C

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182. Values of the four quantum numbers for the last electron in the atom are n=4, l=1, m=+1 and s=-1/2. Atomic number of the atom will be

A. 22

B. 32

C. 33

D. 36

Answer: D

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183. Which of the following is not correct for electron distribution in the ground state

		4s	3d				
(a)	$Co(Ar)$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
(b)	$Ni(Ar)$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$	$\uparrow$
(c)	$Cu(Ar)$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$
(d)	$Zn(Ar)$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$

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184. The total number of electrons present in all s orbitals, all the p orbitals, and all the d orbitals of cesium ion are, respectively,

A. 8,26,10

B. 10,24,20

C. 8,22,24

D. 12,20,22

Answer: B

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185. Which of the following pair of orbitals possess two nodal planes

A. $p_{\mathrm{xy}}, d_{x^2-y^2}$

B. $d_{\mathrm{xy}}, d_{\mathrm{zx}}$

C. $p_{\mathrm{xy}}, d_{\mathrm{zx}}$

D. $d_z^2, d_{x^2-y^2}$

Answer: B

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186. Assertion : The energy of an electron is mainly determined by principal quantum number.

Reason : The principal quantum number is the measure of the most probable distance of finding the electron around the nucleus.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: A

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187. Statement-I : No two electrons in an atom can have the same values of four quantum number.

Because

Statement-II : No two electrons in an atom can be simultaneously in the same shell, same subshell, same orbitals and have same spin.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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188. (A) $3d_{z^2}$ orbital is spherically symmetrical.

(R) $3d_{z^2}$ orbital is the only d-orbital which is spherical in shape.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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189. Satement-1: Spin quantum number can have two values $+\frac{1}{2}$ and $-\frac{1}{2}$.

Statement-2: + ve and -ve signs signify the positive and negative wave functions.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: C

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190. Assertion: Total number of orbitals associated with principal quantum number n=3 is 6.

Reason : Number of orbitals in a shell equals to 2n.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: D

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191. Assertion: Atomic orbital in an atom is designated by n,l,m_1 and m_s

Reason: These are helpful in designating electron present in an orbital.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: D

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192. Assertion: Energy of the orbitals increases as $1s < 2s = 2p < 3s = 3p < 3d < 4s = 4p = 4d = 4f <$ ...... in a hydrogen atom.

Reason:Energy of the electron depends completely on principal quantum number.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false

Answer: C

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193. Which one is a wrong statement ?

A. Total orbital angular momentum of electron in 's ' orbital is equal to zero

B. An orbital is designated by three quantum numbers while an electron in an atom is designgted by four quantum numbers

C. The electronic configuration of N atom is $\overset{1s^2}{\boxed{\uparrow\downarrow}}\ \overset{2s^2}{\boxed{\uparrow\downarrow}}\ \overset{2p_x^1\,2p_y^1\,2p_z^1}{\boxed{\uparrow\,|\,\uparrow\,|\,\downarrow}}$

D. The value of m for d_z^2 is zero

Answer: C

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CRITICAL THINKING

1. The total number of valence electrons in $4.\ 2g$ of N_3^- ion are :

A. $1.6N_A$

B. $3.2N_A$

C. $2.1N_A$

D. $4.2N_A$

Answer: A

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2. In Bohr 's model of hydrogen when an electron jumps from n=1 to n=3 how much energy will be abosrbed

A. 2.15×10^{-11} erg

B. 0.1911×10^{-10} erg

C. 2.389×10^{-12} erg

D. 0.239×10^{-10} erg

Answer: B

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3. Bohr's radius for the H-atom (n =1) is approximately 0.53 Ã.... The radius of the first excited state (n=2) is :

A. 0.13 Å

B. 1.06 Å

C. 4.77 Å

D. 2.12 Å

Answer: D

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4. The value of Planck's constant is $6.63 \times 10^{-34} Js$. The velocity of light is $3.0 \times 10^{8} ms^{-1}$. Which value is closest to the wavelength in nanometers of a quantum of light with frequency $8 \times 10^{15} s^{-1}$?

A. 3×10^{7}

B. 2×10^{-25}

C. 5×10^{-18}

D. 4×10^{1}

Answer: D

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5. The orbital angular momentum of a p-electron is given as :

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

B. $\sqrt{3}\frac{h}{2\pi}$

C. $\sqrt{\frac{3}{2}\frac{h}{\pi}}$

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

Answer: A

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6. Select the correct statement

A. Cyanamide ion $\left(CN_2^{2-}\right)$ is isoelectronic with CO_2 and has the same linear structure

B. Mg_2C_3 reacts with water to form propyne

C. CaC_3 has NaCl type lattice

D. All of the above

Answer: D

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7. The ionization energy of hydrogen atom is -13.6 eV. The energy required to excite the electron in a hydrogen atom from the ground state to the first excited state is (Avogadro's constant $=6.022 \times 10^{23}$)

A. 1.69×10^{-20} J

B. 1.69×10^{-23} J

C. 1.69×10^{23} J

D. 1.69×10^{25} J

Answer: B

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8. Cyclotron is not capable of accelerating

A. Neutrons

B. Protons

C. Deutrons

D. α-particles

Answer: A

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9. The frequency of one of the lines in Paschen series of hydrogen atom is $2.340 \times 10^{11} Hz$. The quantum number n_2 Which produces this transition is.

A. 6

B. 5

C. 4

D. 3

Answer: B

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10. The series limit for Balmer series of H-spectra is

A. 3800

B. 4200

C. 3646

D. 4000

Answer: C

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11. Third line in Balmer series corresponds t o an electron transition between which bohara's orbits in hydrogen

A. $5 \rightarrow 3$

B. $5 \rightarrow 2$

C. $4 \rightarrow 3$

D. $4 \rightarrow 2$

Answer: B

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12. In Boh'r series of lines of hydrogen spectrum, the third line from the red corresponds to which one of the following inter orbit jumps of the electron for Boh'r orbit in an atom of hydrogen ?

A. $3 \rightarrow 2$

B. $5 \rightarrow 2$

C. $4 \rightarrow 1$

D. $2 \rightarrow 5$

Answer: B

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13. The electronic configuration of a dipositive ion M^{2+} is 2, 8, 14 and its atomic mass is 56. what is the number of neutrons in its nucleus ?

A. 30

B. 32

C. 34

D. 42

Answer: A

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14. The frequency of a wave of light is $12 \times 10^{14} s^{-1}$. The wave number associated with this light is

A. $5 \times 10^{-7} m$

B. $4 \times 10^{-8} cm^{-1}$

C. $2 \times 10^{-7} m^{-1}$

D. $4 \times 10^{4} cm^{-1}$

Answer: D

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15. The energy required to dislodge electron from excited isolated H-atom $(IE_1 = 13.6 eV)$ is

A. $= 13.6 eV$

B. $> 13.6 eV$

C. lt 13.6 and gt 3.4 eV

D. $\leq 3.4eV$

Answer: D

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16. In the Sommerfeld's modification of Bohr's theory, the trajectory of an electron in a hydrogen atom is

A. A perfect ellipse

B. A closed ellipse like curve, narrower at the perihelion position and flatter at the aphelion position

C. A closed loop on a spherical surface

D. A rosette

Answer: D

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17. Which of the following orbitals will have zero probability of finding the electron in the yz plane ?

A. P_x

B. P_y

C. P_z

D. d_{yz}

Answer: A

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18. Which of the following electron transitions in a hydrogen atom will require the largest amount of energy?

A. From n=1 to n=2

B. From n=2 to n=3

C. From n=∞ to n=1

D. From n=3 to n=5

Answer: A

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19. As electron moves away from the nucleus, its potential energy

A. Increases

B. Decreases

C. Remains constant

D. None of these

Answer: A

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20. Which one of the following is not isoelectronic with neon atom?

A. F^{-}

B. oxygen atom

C. $._{12}Mg^{+}$

D. N^{-}

Answer: C

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21. Atom consist of electrons , protons and neutrons . If the mass attributed to neutron were halved and that attributed to the electrons were doubled , the atomic mass of $6C^{12}$ would be approximately :

A. Will remain approximately the same

B. Will become approximately two times

C. Will remain approximately half

D. Will be reduced by 25%

Answer: D

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22. The nucleus of an atom is spherical. The relation between radius of the nucleus and mass number A is given by $1.25 \times 10^{-13} \times A^{\frac{1}{3}} cm$. If radius of atom is oneÅ and the mass number is 64, then the fraction of the atomic volume that is occupied by the nucleus is $(x) \times 10^{-13}$. Calculate x

A. 1.0×10^{-3}

B. 5.0×10^{-5}

C. 2.5×10^{-2}

D. 1.25×10^{-13}

Answer: D

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JEE SECTION

1. The number of neutrons in dipositive zinc ion with mass number 70 is.

A. 34

B. 40

C. 36

D. 38

Answer: B

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2. The number of electrons in one molecule of CO_2 are

A. 22

B. 44

C. 66

D. 88

Answer: A

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3. Rutherford's α particle scattering experiment eventually led to the conclusion that

A. mass and energy are related

B. Electrons occupy space around the nucleus

C. Neutrons are buried deep in the nucleus

D. The point of impact with matter can be precisely determined.

Answer: B

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4. How many upaired electrons are present in Ni^{2+}?

A. 0

B. 2

C. 4

D. 6

Answer: B

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5. Who discovered neutron?

A. James Chadwick

B. William Crooks

C. J.J. Thomson

D. Rutherford

Answer: A

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6. CO has same electrons as of the ion that is isoelectronic with CO is.

A. N_2^+

B. CN^-

C. O_2^+

D. O_2^-

Answer: B

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7. A p-orbital can accommodate upto :

A. Four electrons

B. Six electrons

C. Two electrons with parallel spins

D. Two electrons with opposite spins

Answer: D

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8. The principal quantum number of an atom is related in the

A. Size of the orbit

B. Spin angular momentum

C. orbital angular momentum

D. Orientation of the orbital in space

Answer: A

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9. Which electronic level would allow the hydrogen atom to absorbs a photon but not to emit a photon

A. 3s

B. 2p

C. 2s

D. 1s

Answer: D

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10. The correct set of four quantum numbers for valence electrons of rubidium atom (Z=37) is

A. 5,0,0,$+\frac{1}{2}$

B. $5, 1, 0, +\frac{1}{2}$

C. $5, 1, 1, +\frac{1}{2}$

D. $6, 0, 0, +\frac{1}{2}$

Answer: A

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11. The increasing order (lowest first) for the values of e/m (charge//mass) for electron (e), proton (p), neutron (n), and alpha particle (α) is

A. e, p, n, α

B. n, p, e, α

C. n, p, α, e

D. n, α, p, e

Answer: D

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12. The radius of an atomic nucleus is of the order of

A. 10^{-10}cm

B. 10^{-13}cm

C. 10^{-15}cm

D. 10^{-8}cm

Answer: B

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13. Electromagnetic radiation with maximum wavelengths is :

A. Ultraviolet

B. Radiowave

C. X-ray

D. Infrared

Answer: B

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14. Bohr's model can explain

A. The spectrum of hydrogen atom only

B. Spectrum of atom or ion containing one electron only

C. The spectrum of hydrogen molecule

D. The solar spectrum

Answer: B

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15. Which one of the following sets of quantum numbers represents an impossible arrangement ?

A. $\begin{matrix} n & l & m_1 & m_s \\ 3 & 2 & -2 & 1/2 \end{matrix}$

B. $\begin{matrix} n & l & m_1 & m_s \\ 4 & 0 & 0 & 1/2 \end{matrix}$

C. $\begin{matrix} n & l & m_1 & m_s \\ 3 & 2 & -3 & 1/2 \end{matrix}$

D. $\begin{matrix} n & l & m_1 & m_s \\ 5 & 3 & 0 & -1/2 \end{matrix}$

Answer: C

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16. The ratio of the energy of a photon of 2000Å wavelength radiation to that of 4000Å radiation is

A. $1/4$

B. 4

C. $1/2$

D. 2

Answer: D

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17. The triad of nuclei that is isotonic is

A. $._6^{14}C, ._7^{15}N, ._9^{17}F$

B. $._6^{12}C, ._7^{14}N, ._9^{19}F$

C. $._6^{14}C, ._7^{14}N, ._9^{17}F$

D. $._6^{14}C, ._7^{14}N, ._9^{19}F$

Answer: A

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18. The wavelngth fo a spectrl line for an electronic transition is inversely related to :

A. The number of electrons undergoing the transition

B. The nuclear charge of the atom

C. The difference in the energy of the energy levels involved in the transition

D. The velocity of the electron undergoing the transition.

Answer: C

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19. The outermost electronic configuration of the most electronegative element is

A. ns^2np^3

B. ns^2np^4

C. ns^2np^5

D. ns^2np^6

Answer: C

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20. The orbital diagram in which the Aufbau's principle is violated

	$2s$	$2p_x$	$2p_y$	$2p_z$
(a)	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$	$\uparrow$
(b)	$\uparrow$	$\uparrow\downarrow$	$\uparrow$	$\uparrow$
(c)	$\uparrow\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
(d)	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$

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21. The correct ground state electronic configuration of chromium atom(Z=24) is :

A. $[Ar]3d^5 4s^1$

B. $[Ar]3d^4 4s^2$

C. $[Ar]3d^6 4s^0$

D. $[Ar]4d^5 4s^1$

Answer: A

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22. The correct set of quantum numbers for the unpaired electron of chlorine atom is

A. $\begin{matrix} n & l & M \\ 2 & 1 & 0 \end{matrix}$

B. $\begin{matrix} n & l & M \\ 2 & 1 & 1 \end{matrix}$

C. $\begin{matrix} n & l & M \\ 3 & 1 & 0 \end{matrix}$

D. $\begin{matrix} n & l & M \\ 3 & 0 & 0 \end{matrix}$

Answer: C

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23. Which of the following does not characterise X-rays?

A. The radiation can ionise gases

B. It cause ZnS to fluoresence

C. Deflected by electric and magnetic fields

D. Have wavelength shorter than ultraviolet rays

Answer: C

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24. Which of the following relates to photons both as wave motion and as a stream of particles?

A. Inference

B. $E = mc^2$

C. Diffraction

D. E=hv

Answer: D

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25. A 3p-orbital has :

A. Two non spherical nodes

B. Two spherical nodes

C. One spherical and one non spherical nodes

D. One spherical and two non spherical nodes

Answer: C

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26. The orbital angular momentum of an electron in $2s$-orbital is

A. $+\frac{1}{2}\cdot\frac{h}{2\pi}$

B. Zero

C. $\frac{h}{2\pi}$

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

Answer: B

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27. For d electron, the orbital angular momentum is

A. $\sqrt{6}(h/2\pi)$

B. $\sqrt{2}(h/2\pi)$

C. $(h/2\pi)$

D. $2(h/2\pi)$

Answer: A

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28. Nuclei tend to have more neutrons than protons at high mass numbers because

A. Neutrons have neutral particle

B. Neutrons have more mass than protons

C. more neutrons minimize the coulomb repulsion

D. Neutrons decrease the binding energy

Answer: C

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29. The energy of an electron in the first Bohr orbit of H atom is $-13.6eV$. The possible energy values (s) of the excited state (s) for electron in bohr orbits of hydrogen is (are)

A. $-3.4eV$

B. $-4.2eV$

C. $-6.8eV$

D. $+6.8eV$

Answer: A

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30. The energy of the electron in the first orbit of He^{+} is $-871.6 \times 10^{-20} J$. The energy of the electron in the first orbit of hydrogen would be.

A. $-871.6 \times 10^{-20} J$

B. $-435.8 \times 10^{-20} J$

C. $-217.9 \times 10^{-20} J$

D. -108.9×10^{-20} J

Answer: C

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31. The electrons identified by quantum numbers n and l :-

(a) n=4, l=1 (b) n=4, l=0 (c) n=3, l=2 (d) n=3, l=1

Can be placed in order of increasing energy as

A. (iv) lt (ii) lt (iii)lt (i)

B. (ii) lt (iv) lt (i) lt (iii)

C. (i) lt (iii) lt (ii) lt (iv)

D. (iii) lt (i) lt (iv) lt (ii)

Answer: A

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32. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

.This represents its

A. Excited state

B. Ground state

C. Cationic form

D. Anionic form

Answer: B

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33. The number of nodal planes in a p_x orbital is.

A. One

B. Two

C. Three

D. Zero

Answer: A

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34. The wavelength associated with a golf ball weighing $200g$ and moving at a speed of $5mh^{-1}$ is of the order

A. 10^{-10} m

B. 10^{-20} m

C. 10^{-30} m

D. 10^{-40} m

Answer: C

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35. The quantum number $+1/2$ and $-1/2$ for the electron spin represent

A. Rotation of the electron in clockwise and anticlockwise direction respectively

B. Rotation of the electron in anticlockwise and clockwise direction respectively

C. Magnetic moment of the electron pointing up and down respectively

D. Two quantum mechanical spin states which have no classical analogue

Answer: D

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36. Rutherfords experiments , which established the nuclear model of atom , used a beam of:-

A. β-particles which impinged on a metal foil and got absorbed

B. γ-rays which impinged on a metal foil and ejected electrons

C. helium atoms, which impinged on a metal foil and got scattered.

D. helium neclei , which impinged on a metal foil and got scattered

Answer: D

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37. If the nitrogen atom has electronic configuration $1s^7$, it would have energy lower than that of the normal ground state configuration $1s^2 2s^2 2p^3$ because the electrons would be closer to the nucleus. Yet $1s^7$ is not observed because it violates

A. Heisenberg uncertainly principle

B. Hund's Rule

C. pauli's exclusion principle

D. Bohr postulate of stationary orbits

Answer: C

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38. The number of radial nodes fo 3s and 2p orbitals are respectively:

A. 2,0

B. 0,2

C. 1,2

D. 2,1

Answer: A

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39. The kinetic energy of an electron in the second Bohr orbit of a hydrogen atom is [a_0 is Bohr radius] :

A. $\frac{h^2}{4\pi^2 m a_0^2}$

B. $\frac{h^2}{16\pi^2 m a_0^2}$

C. $\frac{h^2}{32\pi^2 m a_0^2}$

D. $\frac{h^2}{64\pi^2 m a_0^2}$

Answer: C

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40. Energy of an electron is givem by $E = -2.178 \times 10^{-18} J\left(\frac{Z^2}{n^2}\right)$. Wavelength of light required to excited an electron in an hydrogen atom from level $n = 1$ to $n = 2$ will be

$(h = 6.62 \times 10^{-34} Js$ and $c = 3.0 \times 10^8 ms^{-1})$.

A. $1.214 \times 10^{-7} m$

B. $2.816 \times 10^{-7} m$

C. $6.500 \times 10^{-7} m$

D. $8.500 \times 10^{-7} m$

Answer: A

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41. Which of the following is the energy of a possible excited state of hydrogen?

A. $+13.6eV$

B. $-6.8eV$

C. $-3.4eV$

D. $+6.8eV$

Answer: C

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42. A stream of electrons from a heated filament was passed between two charged plates kept at a potential difference V esu. If c and m are charge and mass of an electron repectively, then the value of h/λ (where λ is wavelength associated with electron wave) is given by :

A. 2meV

B. $\sqrt{meV}$

C. $\sqrt{2meV}$

D. meV

Answer: C

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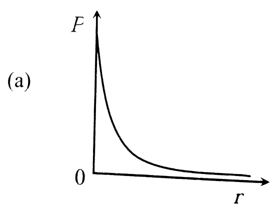
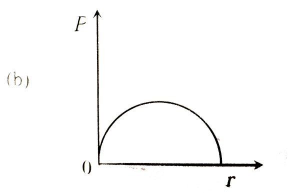
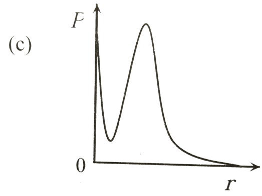
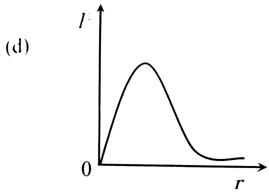
43. P is the probability of finding the Is electron of hydrogen atom in a spherical shell of infitesimal thickness, dr, at a distance r from the nucleus. The volume of this shell is $4\pi r^2 dr$. The qualitative sketch of the dependence of P on r is

A. 

B. 

C. 

D. 

Answer: D

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44. The radius of the second Bohr orbit for hydrogen atom is :

(Planck's constant, $h = 6.6262 \times 10^{-34} Js$, mass of electron = $9.1091 \times 10^{-31} kg$, charge of electron $e = 1.60210 \times 10^{-19} C$, permittivity of vaccum $\in_0 = 8.854185 \times 10^{-12} kg^{-1} m^{-3} A^2$)

A. 4.76 Å

B. 0.529 Å

C. 2.12 Å

D. 1.65 Å

Answer: C

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45. An isotone of $._{32}^{76}Ge$ is

A. $._{32}^{77}Ge$

B. $._{33}^{77}As$

C. $._{34}^{77}Se$

D. $._{36}^{78}Se$

Answer: B::D

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46. Many elements have non-integral atomic masses because

A. They have isotopes

B. Their isotopes have non-integral masses

C. Their isotopes have different masses

D. The constituents , neutrons , protons and electrons, combine to given fractional masses

Answer: A::C

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47. Pick out the isoelectronic structures from the following .

$ICH_3^+ (II) H_3O^+, (III) NH_3, (IV) CH_3^-$:

A. I and II

B. I and IV

C. I and III

D. II,III and IV

Answer: D

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48. Which of the following statement(s) is (are) correct

A. The electronic configuration of Cr is $[Ar]3d^5 4s^1$ (Atomic Number of Cr =24)

B. The magnetic quantum number may have a negative value

C. In silver atom, 23 electrons have a spin of one type and 24 of the opposite type . (Atomic Number of Ag=47)

D. The oxidation state of nitrogen in HN_3 is -3

Answer: A::B::C

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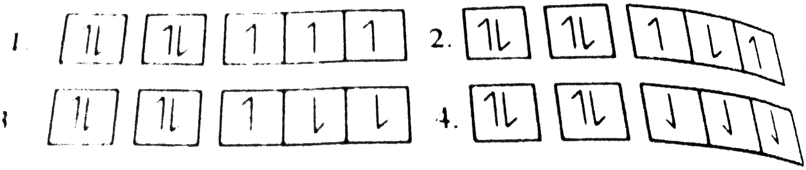
49. Ground state electronic configuration of nitrogen atom can be represented by:



A. (a) $\uparrow\downarrow$ | $\uparrow\downarrow$ $\uparrow$ | $\uparrow$ | $\uparrow$

B. (b) $\uparrow\downarrow$ | $\uparrow\downarrow$ $\uparrow$ | $\downarrow$ | $\uparrow$

C. (c) $\uparrow\downarrow$ | $\uparrow\downarrow$ $\uparrow$ | $\downarrow$ | $\downarrow$

D. (d) $\uparrow\downarrow$ | $\uparrow\downarrow$ $\downarrow$ | $\downarrow$ | $\downarrow$

Answer: A::D

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50. Which of the following have the same number of unpaired electrons in 'd' orbitals

A. Cr

B. Mn

C. Fe^{3+}

D. Co^{3+}

Answer: A::B::C

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51. The radial distribution functions $[P(r)]$ is used to determine the most probable radius, which is used to find the electron in a given orbital $\frac{dP(r)}{dr}$ for $1s$-orbital of hydrogen like atom having atomic number Z, is $\frac{dP}{dr} = \frac{4Z^3}{a_0^3}\left(2r - \frac{2Zr^2}{a_0}\right)e^{-2Zr/a_0}$:

A. At the point of maximum value of radial distribution function $\frac{\mathrm{dP(r)}}{\mathrm{dr}}$=0, one antinode is present

B. Most probable radius of Li^{2+} is $\frac{a_0}{3}$ pm

C. Most probable radius of He^{+} is $\frac{a_0}{2}$ pm

D. Most probable radius of hydrogen atom is a_0 pm

Answer: A::B::C::D

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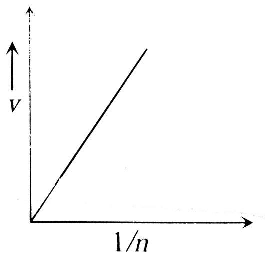
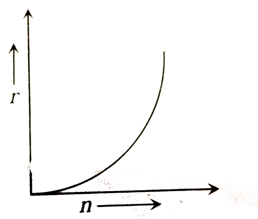
52. Select the correct cruve (s)

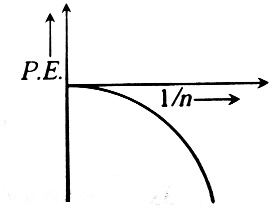
If V=velocity of electron in Bhor's orbit ltbr. R= Radius of electron im Bhor 's orbit

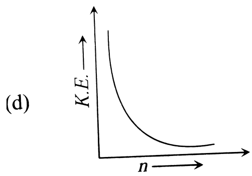
P.E= Potential energy of electron in Bhor 's orbit

K.E.=kinetic energy of electron in Bhor 's orbit.

A. 

B. 

C. 

D. 

Answer: A::B

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53. Statement: Nuclide $._{13}^{30}Al$ is less stable than $._{20}^{40}Ca$

Explanation: Nuclides having odd number of protons and neutrons are general unstable.

A. Statement 1 is true , statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true , statement 2 is true , statement 2 is not a correct explanation for statement 1

C. Statement 1 is true , statement 2 is false

D. Statement 1 is false , statement 2 is true

Answer: A

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54. Band gap in germanium is small.

The energy spread of each germanium atomic energy level is infinitesimally small.

A. Statement 1 is true , statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true , statement 2 is true , statement 2 is not a correct explanation for statement 1

C. Statement 1 is true , statement 2 is false

D. Statement 1 is false , statement 2 is true

Answer: C

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55. Statement : The plot of atomic number (y -axis) versus number of neutrons (x -axis) for stable nuclei shows a curvature towards x-axis fron the line of 45° slope as the atomic number is increased .

Explanation : proton -proton electrostatic repulsions begin to overcome attracive forces involving protons and neutrons in heavier nuclides.

A. Statement 1 is true , statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true , statement 2 is true , statement 2 is not a correct explanation for statement 1

C. Statement 1 is true , statement 2 is false

D. Statement 1 is false , statement 2 is true

Answer: C

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56. e/m ratio in case of anode ray experiment is different for different gases.

The ion of gases formed after the ejection of electron are different of gas is different.

A. Statement 1 is true , statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true , statement 2 is true , statement 2 is not a correct explanation for statement 1

C. Statement 1 is true , statement 2 is false

D. Statement 1 is false , statement 2 is true

Answer: A

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57. Statnment -I : Radial part of wave function for 2s & 2p is not same

Statement -II : Radial part of wave function depends upon is zero at nucleus for all p & d orbitals.

upon "l" and "m" only.

A. Statement 1 is true , statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true , statement 2 is true , statement 2 is not a correct explanation for statement 1

C. Statement 1 is true , statement 2 is false

D. Statement 1 is false , statement 2 is true

Answer: C

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58. The hydrogen -like species Li^{2+} is in a spherically symmetric state S_1 whth one radisal node . Upon absorbing light the ion undergoes transitoj ot a state S_2 has one radial node and its enrgy is equal to the groun sate energy of hhe hydrogen atom.

The orbital angular momentum quantum number of the state s_2 is :

A. 2

B. 1

C. 0

D. 3

Answer: B

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59. The hydrogen -like species Li^{2+} is in a spherically symmetric state S_1 with one node. Upon absorbing light , the ion undergoes transition to a state S_2. The state S_2 has one radial node and its energy is equal is to the ground state energy of the hydrogen atom.

Energy of the state S_1 in units of the hydrogen atom ground state energy is

A. 4.50

B. 1.50

C. 2.25

D. 0.75

Answer: C

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60. The hydrogen -like species Li^{2+} is in a spherically symmetric state S_1 with one node. Upon absorbing light , the ion undergoes transition to a state S_2. The state S_2 has one radial node and its energy is equal is to the ground state energy of the hydrogen atom.

The sate S_1 is

A. 2p

B. 2s

C. 1s

D. 3s

Answer: B

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61. Quantum number area assigned to get complete inforamtion of electrons regarding their energy engular momentum ,spectral lines etc. Four quantum number are known i.e pricipal quantum numbers which tell the diatence shell and its angular momentum .Azimuthal and of courase shape of orbital , Magnetic qunatum number deals with syudy of orientations or deganeracy of a subshell . spin quantum number defines te spin of electrons designaated as $+\frac{1}{2}$ or $-\frac{1}{2}$ respresented by 123 and 123 respectively .

Electrons are filled in oritals and Hun's rule of maximum multicity .

spin angular momentum for unpaires electron in sodium (Atomic No =11) is :

A. $-\frac{\sqrt{3}}{2}\frac{h}{2\pi}$

B. $0.866h/2\pi$

C. $\frac{\sqrt{3}}{2}$

D. None of these

Answer: B

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62. Quantum number area assigned to get complete inforamtion of electrons regarding their energy engular momentum ,spectral lines etc. Four quantum number are known i.e pricipal quantum numbers which tell the diatence shell and its angular momentum .Azimuthal and of courase shape of orbital , Magnetic qunatum number deals with syudy of orientations or deganeracy of a subshell . spin quantum number defines te spin of electrons designaated as $+\frac{1}{2}$ or $-\frac{1}{2}$ respresented by 123 and 123 respectively .

Electrons are filled in oritals and Hun's rule of maximum multicity .

Number of electrons having the quantum numbers n=4, l=0, $s = -\frac{1}{2} \in Zn^{+2}$ ion is /are :

A. 2

B. 0

C. 1

D. 5

Answer: B

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63. Quantum number area assigned to get complete information of electrons regarding their energy angular momentum ,spectral lines etc. Four quantum number are known i.e principal quantum numbers which tell the distinct shell and its angular momentum .Azimuthal tell about subshell and Magnetic quantum number deals with different orbitals in subshell. spin quantum number defines the spin of electrons designated as $+\frac{1}{2}$ or $-\frac{1}{2}$

Electrons are filled in orbitals according to Hund's rule of maximum multiplicity .

Two unpaired electrons present in carbon atom are different with respect to their :

A. Azimuthal quantum number

B. Principal quantum number

C. Magnetic quantum number

D. Spin quantum number

Answer: C

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64. The maximum number of electrons that can have principal quantum number, n = 3, and spin quantum number m_s = - 1 /2, is

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65. The work function (ϕ) of some metals is listed below . The number of metals which will show photoelectric effect when light of 300 nm wavelength falls on the metal is :

Metal	Li	Na	K	Mg	Cu	Ag	Fe	Pt	W
ϕ (eV)	2.4	2.3	2.2	3.7	4.8	4.3	4.7	6.3	4.75

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66. The atomic masses of He and Ne are 4 and 20 amu respectively . The value of the de Broglie wavelength of He gas at $-73.^\circ C$ is "M" times that of the de Broglie wavelength of Ne at $727.^\circ C$. M is

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67. In an atom, the total number of electrons having quantum numbers $n = 4, |m_l| = 1$ and $m_s = -\frac{1}{2}$ is

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68. Not considering the electronic spin, the degeneracy of the second excited state (n=3) of H atom is 9, while the degeneracy of the second excited state of H– is

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69. In the Bohr model of the hydrogen atom, the ratio of the kinetic energy to the total energy of the electron in a quantum state n is ....

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70. Electron falls from 7^{th} energy level and lower energy levels to produce bands in the Paschen series. The total number of bands obtained will be

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71. The highest excited state that an unexcited hydrogen atom can reach when they are bombarded with $12.2eV$ electron is :

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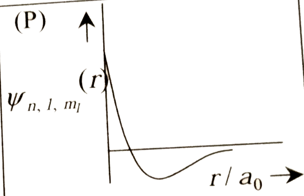
72. The wave function , $\Psi_{n,l,m}$ is a mathematical function whose value depends upon spherical polar coordinates (r, θ, ϕ) of the electron and characterized by the quantum number n, l and m_1 . Here r is distance from nucleus , θ is colatitude and ϕ is azimuth . In the mathmatical functions given in the table , Z is atomic number and a_0 is Bohr radius.

Column 1	Column 2	Column 3
(I) 1s orbital	(i) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{3}{2}} e^{-\left(\frac{Zr}{a_0}\right)}$	(P) 
(II) 2s orbital	(ii) One radial node	(Q) Probability density at nucleus $\propto \frac{1}{a_0^3}$
(III) $2p_z$ orbital	(iii) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{5}{2}} re^{-\left(\frac{Zr}{2a_0}\right)} \cos\theta$	(R) Probability density is maximum at nucleus
(IV) $3d_{z^2}$ orbital	(iv) xy-plane is a nodal plane	(S) Energy needed to excite electron from $n=2$ state to $n=4$ state is $\frac{27}{32}$ times the energy needed to excite electron from $n=2$ state to $n=6$ state

For He^+ ion , the only INCORRECT combination is

A. (I) (i) (S)

B. (II)(ii)(Q)

C. (I)(iii)(R)

D. (I)(i)(R)

Answer: C

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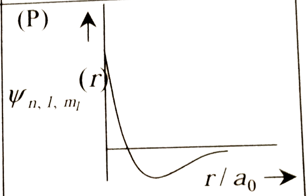
73. The wave function , $\Psi_{n,l,m}$ is a mathematical function whose value depends upon spherical polar coordinates (r, θ, ϕ) of the electron and characterized by the quantum number n, l and m_1 . Here r is distance from nucleus , θ is colatitude and ϕ is azimuth . In the mathmatical functions given in the table , Z is atomic number and a_0 is Bohr radius.

Column 1	Column 2	Column 3
(I) 1s orbital	(i) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{3}{2}} e^{-\left(\frac{Zr}{a_0}\right)}$	(P) 
(II) 2s orbital	(ii) One radial node	(Q) Probability density at nucleus $\propto \frac{1}{a_0^3}$
(III) $2p_Z$ orbital	(iii) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{5}{2}} re^{-\left(\frac{Zr}{2a_0}\right)} \cos\theta$	(R) Probability density is maximum at nucleus
(IV) $3d_Z{}^2$ orbital	(iv) xy-plane is a nodal plane	(S) Energy needed to excite electron from $n=2$ state to $n=4$ state is $\frac{27}{32}$ times the energy needed to excite electron from $n=2$ state to $n=6$ state

For the given orbital in Column I , the only CORRECT combination for any hydrogen-like species is

A. (II)(ii)(P)

B. (I)(ii)(S)

C. (IV)(iv)(R)

D. (III)(iii)(P)

Answer: A

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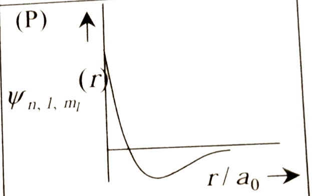
74. The wave function , $\Psi_{n,l,m}$ is a mathematical function whose value depends upon spherical polar coordinates (r, θ, ϕ) of the electron and characterized by the quantum number n, l and m_1 . Here r is distance from nucleus , θ is colatitude and ϕ is azimuth . In the mathmatical functions given in the table , Z is atomic number and a_0 is Bohr radius.

Column 1	Column 2	Column 3
(I) 1s orbital	(i) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{3}{2}} e^{-\left(\frac{Zr}{a_0}\right)}$	(P) 
(II) 2s orbital	(ii) One radial node	(Q) Probability density at nucleus $\propto \frac{1}{a_0^3}$
(III) $2p_z$ orbital	(iii) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{5}{2}} re^{-\left(\frac{Zr}{2a_0}\right)} \cos\theta$	(R) Probability density is maximum at nucleus
(IV) $3d_{z^2}$ orbital	(iv) xy-plane is a nodal plane	(S) Energy needed to excite electron from $n = 2$ state to $n = 4$ state is $\frac{27}{32}$ times the energy needed to excite electron from $n = 2$ state to $n = 6$ state

For hydrogen atom, the only CORRECT combination is

A. (I)(i)(P)

B. (I)(iv)(R)

C. (II)(i)(Q)

D. (I)(i)(S)

Answer: D

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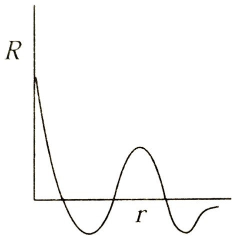
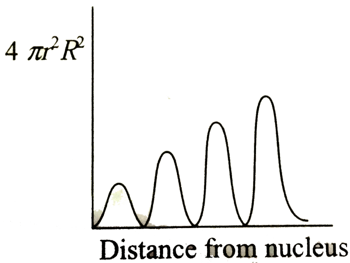
75. Match the entries listed in Column I with appropriate entries listed in Column II

	Column I		Column II
(A)	Angular probability is dependent on θ and ϕ	(p)	$3s$
(B)	Atleast one angular node is present	(q)	$6d_{xy}$
(C)		(r)	$4s$
(D)		(s)	$5p_y$

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JEE SECTION (Matrix Match Type Questions)

1. According to Bohr's theory, E_a=Total energy , K_a=Kinetic energy , V_n =Potential energy , r_n=Radius of n^{th} orbit

Match the following

	Column I		Column II
(A)	$V_n / K_a =$	(p)	0
(B)	If radius of n^{th} orbit α $E_n^x, x=$	(q)	-1
(C)	Angular momentum in lowest orbital	(r)	-2
(D)	$\frac{1}{r^a} \propto Z^y Q y=$	(s)	1

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