PRAADIS EDUCATION

CHEMISTRY XI

STRUCTURE OF ATOM

OBJECTIVE QUESTIONS

Discovery of Sub-Atomic Particles

1. Which of the following may be an incorrect statement regarding cathode ray discharge tube?
a) Presence of negative charge in cathode rays
b) The magnetic field deflects these rays
c) It needs high voltage
d) Protons are present in cathode rays

Answer: d
Explanation: Electric discharge in partially evacuated tubes in cathode ray discharge tube. Cathodes rays are made up of electrons. There is a presence of negative charge in cathode rays, magnetic field deflects these rays. Cathode ray discharge tube needs high voltage.

2. Pick out electron's charge to mass ratio's value from the options.
a) 1.758820×10^{11} C kg^{-1}
b) 1.758820×10^{11} C kg
c) 1.758823×10^{11} C kg
d) 1.708820×10^{11} C kg

Answer: a
Explanation: A British physicist J. J. Thomson carried out experiments and observed the deflections made by electrons in an electric or magnetic field. He finally calculated electron's charge to mass ratio as $e/me = 1.758820 \times 10^{11}$ C kg^{-1}. The units of charge and mass are in coulomb and kg respectively.

3. Which of the following condition is suitable for cathode ray discharge tube?
a) Low pressure, high voltage
b) Low pressure, low voltage
c) High pressure, low voltage
d) High pressure, high voltage

Answer: a
Explanation: The suitable conditions of cathode ray discharge tube are low pressure and high pressures. Pressure can be adjusted by evacuated tubes. High voltage is applied across electrodes and current starts flowing through the tube.

4. Who did the oil drop experiment?
a) R. A. Millikan
b) J. J. Thomson
c) Rutherford
d) Galileo

Answer: a
Explanation: R. A. Millikan conducted oil drop experiment to measure the mass of oil droplets. After observation of how the charge is transferred in the experiment he concluded that charge only appears in integral multiples of e i.e. $q = ne$; $n = \pm1, \pm2, \pm3$, etc.

5. Thomson discovered that every substance in this universe is made up of _____ from his experiments.
a) neutrons
b) protons
c) electrons
d) mass

Answer: c
Explanation: Through cathode rays discharge tube experiments, he concluded that every substance in this universe is made up of electrons

from his experiments. He observed how cathode rays move and the charge to mass ratio of it.

6. When cathode rays strike zinc sulfide coating, what did it create?
a) bright spot
b) blue light
c) uv rays
d) white light

Answer: a
Explanation: Zinc sulfide is a phosphorescent material, which has been coated on the anode. when cathode rays strike on the anode, electrons hit on the Zinc sulfide screen, hence creating a bright spot.

7. _____ is the lightest and smallest particles that's obtained from hydrogen(that is a positive ion).
a) Electron
b) Proton
c) Neutron
d) Particle

Answer: b
Explanation: In 1911, Rutherford discovered protons by performing experiments and also found out that positive charge is concentrated at centre and that it has most of the atomic mass. The name proton was first time given in the year 1920.

8. What's the mass of neutron in terms of electrons mass?
a) 1838 times of electron's mass
b) 1/1838 times of electron's mass
c) 1832 times of electron's mass
d) 1/1832 times of electron's mass

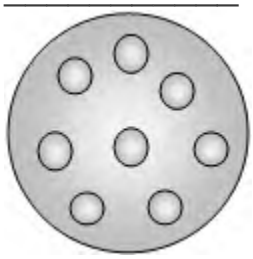
Answer: a
Explanation: The mass of an electron is 0.00054 u. The mass of a proton is 1.00727 u. The mass of a neutron is 1.00867 u. Then mass of neutron

by mass of an electron is 1.00867/0.00054 = 1838. Therefore the mass of neutron in terms of the electron is 1838 times.

9. Neutrally charged particles are protons.
a) True
b) False

Answer: b
Explanation: Neutrally charged particles are known as neutrons, whereas positively charged particles are protons. When Beryllium is bombarded by alpha particles, neutrons were discovered by Chadwick. Their mass is a bit greater than that of protons.

10. The below model of organization of electrons in atom is given by



a) R. A. Millikan
b) J. J. Thomson
c) Rutherford
d) Galileo

Answer: b
Explanation: Thomson proposed a model of the atom, in which electrons are embedded to make it as the stable electrostatic arrangement and such that positive charge is equally distributed around a sphere. Mass is assumed to be equally distributed. So. it has different names like plum pudding, watermelon and raisin pudding model.

Atomic Models

1. What is the absolute charge of a proton?
a) $+1.602176\times10^{-27}$
b) -1.602176×10^{-19}
c) $+1.602176\times10^{-19}$
d) -1.602176×10^{-27}

Answer: b
Explanation: According to the fundamental properties of particles, protons charge is $+1.602176\times10^{-19}$C. It is a subatomic particle. Rutherford discovered protons. Its elementary charge is 1. Proton's charge is positive.

2. Which of the following models are not the same as Thomson Model of Atom?
a) plum pudding model
b) watermelon model
c) raisin pudding model
d) nuclear model

Answer: d
Explanation: Thomson proposed a model of the atom, in which electrons are embedded to make it as the stable electrostatic arrangement and such that positive charge is equally distributed around a sphere. Mass is assumed to be equally distributed. So. it has different names like plum pudding, watermelon and raisin pudding model.

3. Elements do emit radiation on their own and this property is known as _____
a) Radioactivity
b) Refraction
c) Absorption
d) Adsorption

Answer: a
Explanation: Henri Becquerel discovered that elements emit radiation and termed this phenomenon as radioactivity. Later Curie on research

found out about α-rays, β-rays and γ-rays. Later Rutherford concluded that α particles are helium nuclei.

4. Which of the following statements you think is wrong regarding α particle scattering effect?
a) α particles mostly move through the gold foil having zero deflection
b) A small fraction are deflected
c) One in Twenty Thousand turns 180°
d) The thickness of the gold foil is about 100μm

Answer: d
Explanation: In this effect, a thin foil (thickness 100nm) made up of gold and coated with fluorescent ZnS screen which is circular around it. α particles mostly move through the gold foil having zero deflection, a small fraction is deflected and one in twenty thousand turns 180°.

5. If the number of protons and neutrons of an element is 13 and 14 respectively, then what's the atomic number(Z) and mass number(A)?
a) 13, 13
b) 13, 27
c) 14, 13
d) 27, 14

Answer: b
Explanation: For an element, Atomic number(Z) = number of protons in that atoms = numbers of electrons in that atom; Mass number = number of protons + number of neutrons. So Z = 13 and A = 13 + 14 = 27. Hence that element is Aluminium.

6. Which of the following is not an isotope of hydrogen?
a) protium
b) deuterium
c) tritium
d) helium

Answer: d
Explanation: Protium has only 1 proton, deuterium has one proton and 1 neutron whereas tritium has one proton and two neutrons. They are represented by $_1H^1$, $_1D^2$ and $_1T^3$. Helium has 2 protons and two neutrons, hence can't consider as an isotope. Isotope means having the same number of protons but differ in the number of neutrons.

7. Chemical properties of an atom are dependent on a number of electrons in that particular atom.
a) True
b) False

Answer: a
Explanation: Yes, chemical properties of an atom is dependent on a number of electrons in that particular atom, which in turn is decided by the number of protons present in that atom. The number of neutrons has only a small effect on this.

8. Find out the number of neutrons, protons, and electrons of $_{17}Cl^{37}$ respectively.
a) 20, 20, 17
b) 17, 17, 20
c) 20, 17, 17
d) 17, 17, 17

Answer: c
Explanation: An atom is written in the symbol ZXA. By comparing it to $_{17}Cl^{37}$, we get a number of protons as 17 and mass number as 37. Mass number – proton number = neutron number. Number of neutrons is 37 – 17 = 20. No. of protons = No. of electrons = 17.

9. Pick out the isobar of $_{18}Ar^{40}$.
a) $_{12}Mg^{24}$
b) $_{26}Fe^{58}$
c) $_{19}K^{40}$

d) $_{28}Ni^{64}$

Answer: c
Explanation: Isobar is a species of an element having the same mass number but a different atomic number. As per the above question, only $_{19}K^{40}$ satisfies the conditions of $_{18}Ar^{40}$ to be its isotope.

10. Gravitational force = Gm_1m_2/r^2.
a) True
b) False

Answer: a
Explanation: The formula of gravitational force is given by Gm_1m_2/r^2. Here G is the gravitational constant, while m_1 and m_2 are the masses and r is the distance between m_1 and m_2. This theory is formulated when classic mechanics is applied to it.

Developments Leading to the Bohr's Model of Atom

1. What's the wavelength for the visible region in electromagnetic radiation?
a) 400 – 750 nm
b) 400 – 750 mm
c) 400 – 750 μm
d) 400 – 750 pm

Answer: a
Explanation: Electromagnetic spectrum is made up of various electromagnetic radiation. They are radio waves, X-rays, gamma rays, UV rays, the visible region, IR waves, and microwaves. Visible rays are the only ones which a human eye can see. They range from 450 – 750 nm.

2. What is the wavenumber of violet color?
a) 25×10^3 mm^{-1}
b) 25×10^3 m^{-1}
c) 25×10^3 cm^{-1}
d) 25×10^3 nm^{-1}

Answer: c
Explanation: The wavenumber is the reciprocal or the inverse of wavelength. Wavenumber = 1/Wavelength. Its unit is cm^{-1}. The wavelength of violet color is 400nm as seen in the electromagnetic spectrum. So wavenumber = 1/400nm = 25×10^3 cm^{-1}.

3. Calculate the frequency of the wave whose wavelength is 10nm.
a) 2 Hz
b) 3 Hz
c) 1 Hz
d) 4 Hz

Answer: b
Explanation: The relation between wavelength(λ) and frequency(v) of a wave is given by $\lambda = c/v$ where c is the speed of light of the light. $v = c/\lambda$
Frequency of the given wave = $(3 \times 10^8 m/s)/(10 \times 10^{-9} m)$ = 3 Hz.

4. If Energy = 4.5 KJ; calculate the wavelength.
a) 4.42×10^{-29} m
b) 4.42×10^{-39} m
c) 4.42×10^{-25} m
d) 4.42×10^{-22} m

Answer: a
Explanation: We know E = hv through Planck's Quantum Theory, where E is energy, h is Planck's constant and v is the frequency. 4.5 KJ = $(6.626 \times 10^{-34}$ Js$)(3 \times 10^8 m/s)/($(wavelength). wavelength = 4.42×10^{-29} m.

5. _____ frequency, is the minimum frequency required to eject an electron when photons hit the metal surface.
a) Required
b) Activated
c) Threshold
d) Limiting

Answer: c
Explanation: In the photoelectric effect, when photons strike on a metal surface, it emits electrons. Thus for emitting an electron, it requires a minimum amount of energy. This is threshold energy acquired through threshold frequency.

6. A metal's work function is 3.8KJ. Photons strike metal's surface with an energy of 5.2 KJ. what's the kinetic energy of the emitted electrons?
a) 3.8 KJ
b) 5.2 KJ
c) 9 KJ
d) 1.4 KJ

Answer: d
Explanation: As per the formula of the photoelectric effect, we have E = K.E. + W_o. E is the energy of photons; K.E. is the kinetic energy with which electrons are emitted and W_o is the work function. K.E. = 5.2 KJ – 3.8 KJ = 1.4 KJ.

7. When an electron jumps from 3^{rd} orbit to 2^{nd} orbit, which series of spectral lines are obtained?
a) Balmer
b) Lyman
c) Paschen
d) Brackett

Answer: a
Explanation: As per the spectral lines of the hydrogen, when an electron

jumps from n_{th} orbit to 2^{nd} orbit, it's in Balmer series (provided that n = 3, 4, 5….). For Balmer series, the electron emits waves in visible region.

8. Find out the wavenumber, when an electron jumps from 2^{nd} orbit to 1^{st}.
a) 82357.75 cm^{-1}
b) 105,677 cm^{-1}
c) 82257.75 cm^{-1}
d) 109,677 cm^{-1}

Answer: c
Explanation: The Swedish spectroscopist, Johannes Rydberg gave a formula; Wavenumber = $R_H[(1/n_1)^2-(1/n_2)^2]$. Here R_H is the Rydberg constant and is equal to 109,677 cm^{-1}. Wavenumber = 109,677(3/4) = 82257.75 cm^{-1}.

9. The ultraviolet spectral region is obtained in Balmer series.
a) True
b) False

Answer: b
Explanation: When an electron jumps from n^{th} orbit to 1st orbit, provided that n = 1, 2, 3, etc, it emits radion in the ultraviolet region. As per the spectral lines of the hydrogen, when an electron jumps from n^{th} orbit to 2^{nd} orbit, it's in Balmer series (provided that n = 3, 4, 5….). For Balmer series, the electron emits waves in the visible region.

10. During the photoelectric effect, when photons strike with 5.1eV, electrons emitted from which metal have higher kinetic energy?

Metal	**Na**	**Ag**
Work function	2.3 eV	4.3 eV

a) Na
b) Ag
c) Equal

d) Neither

Answer: a
Explanation: As per the formula of the photoelectric effect, we have E = K.E. + W_o. E is the energy of photons; K.E. is the kinetic energy with which electrons are emitted and W_o is the work function. K.E. of Na and Ag are 2.8 eV and 0.8 eV.

Bohr's Model for Hydrogen Atom

1. Angular momentum of an electron is quantized.
a) True
b) False

Answer: a
Explanation: According to Bohr's postulate, angular momentum is quantized and this is given by the expression $m_evr = nh/2\pi$. (n =1, 2, 3….). m_evr is the angular momentum and h is the Planck's constant. Movement of an electron can only be possible in orbits whose angular momentum is the integral multiple of $h/2\pi$

2. The energy of 1st orbit in a hydrogen atom _____
a) 3.18×10^{-12} J
b) -2.18×10^{-18} J
c) -3.18×10^{-18} J
d) 2.18×10^{-18} J

Answer: b
Explanation: The energy of an nth orbit in a hydrogen atom is given by the formula $E_n = -R_H/n^2$, where is the energy of nth orbit and R_H is the Rydberg constant. The energy of 1st orbit in a hydrogen atom = -2.18×10^{-18} J/1 = -2.18×10^{-18} J.

3. What is the ratio of the atomic radius of the 5^{th} orbit in chlorine atom and 3^{rd} orbit in Helium atom?
a) 153:50
b) 50:153
c) 153:100
d) 100:153

Answer: b
Explanation: The atomic radius of an atom is given by the formula $r_n = 52.9n^2/Z$ pm, where r_n is the radius of nth orbit of an atom and Z is the atomic number of that atom. The ratio of the atomic radius of the 5^{th} orbit in chlorine atom and 3^{rd} orbit in Helium atom is 25/17:9/2 = 50:153.

4. What's the radius of 1^{st} orbit of He^+ atom?
a) 0.1058 nm
b) 0.2156 nm
c) 0.00529 nm
d) 0.02645 nm

Answer: d
Explanation: The atomic radius of an atom is given by the formula $r_n = 52.9n^2/Z$ pm, where r_n is the radius of nth orbit of an atom and Z is the atomic number of that atom. For He^+, n = 1 and Z =2. Radius = 52.9(1)/2 pm = 0.02645 nm.

5. Bohr's model couldn't explain Zeeman and stark effect.
a) False
b) True

Answer: b
Explanation: Yes, it's a limitation of Bohr's model that it could not the splitting of spectral lines in the magnetic field that is Zeeman effect and also in the electric field also known as a stark effect. so the above statement is true.

6. Bohr's model could not explain the ability of atoms to form molecules by _____
a) Attraction
b) Physical bonds
c) Chemical bonds
d) Polarity

Answer: c
Explanation: Though Bohr's postulates could explain angular momentum, radius, and energy of an orbit, line spectrum of the hydrogen atom, it also had some drawbacks. Among the drawbacks not able to explain the ability of atoms to form molecules by chemical bonds is also one.

7. Calculate the wavelength of a photon that traveled from 5^{th} orbit to 2^{nd} orbit.
a) 434 nm
b) 456 nm
c) 863 nm
d) 268 nm

Answer: a
Explanation: The energy of an nth orbit in a hydrogen atom is given by the formula $E_n = -R_H/n^2$, where is the energy of nth orbit and R_H is the Rydberg constant. $E_5 – E_2 = -4.58 \times 10^{-19}$J. λ(wavelength) = c(speed of light)h(Planck's constant)/E = 434nm.

8. The energy of a hydrogen atom is positive.
a) True
b) False

Answer: b
Explanation: The energy of a hydrogen atom is negative. It means the energy of a hydrogen atom is then that lower than that of a free electron that is at rest. This means the hydrogen atom has negative electronic energy.

9. Which of the following is the value for Rydberg constant?
a) 2.95×10^{-18} J
b) -2.95×10^{-18} J
c) -2.18×10^{-18} J
d) 2.18×10^{-18} J

Answer: c
Explanation: The energy of an nth orbit in a hydrogen atom is given by the formula $E_n = -R_H/n^2$, where is the energy of nth orbit and R_H is the Rydberg constant. When experiments were conducted, the product of the energy of nth orbit to the square of n is constant i.e. Rydberg constant.

10. $I\omega$ = _____
a) $m_e v^2 r$
b) $m_e v r^2$
c) $m_e r$
d) $m_e v r$

Answer: d
Explanation: We know that linear momentum is given by mv and that angular momentun in $I\omega$; m = mass, v = velocity, r = radius, I = inertia of momentum and w = angular velocity. $I = m_e r^2$ and $\omega = v/r$ and $I\omega = m_e r^2 v/r = m_e v r$.

Towards Quantum Mechanical Model of the Atom

1. Who found out about dual behavior of a matter?
a) De Broglie
b) Bohr
c) Rutherford
d) Thomson

Answer: a
Explanation: A French physicist named Louis de Broglie proposed that

matter exhibits both particle and wave like nature. This means that like photons, electrons also should have both momentum and wavelength.

2. A ball of mass 0.5kg is moving with velocity 6.626 m/s. What's the wavelength of that ball?
a) 1 x 10^{-34} m
b) 2 x 10^{-34} m
c) 2 x 10^{-32} m
d) 2 x 10^{-3} m

Answer: b
Explanation: Louis de Brogie gave the realation between momentum and wavelength as $\lambda = h/p$. Here h is Planck's constant, whose value is 6.626 x 10^{-34} J/s. Wavelength = h/mv = 2 x 10^{-34} m (momentum p = mass m x velocity v).

3. Mass of a photon is given by 3.313 x 10^{-34} kg. Find it's wavelength.
a) 0.67A°
b) 0.67nm
c) 0.37A°
d) 1.67A°

Answer: a
Explanation: Louis de Brogie gave the realation between momentum and wavelength as $\lambda = h/p$. Here h is Planck's constant, whose value is 6.626 x 10^{-34} J/s. Wavelength = h/mc = 6.626 x 10^{-34} Js/(3.313 x 10^{-34} kg x 3 x 10^{8} m/s) = 0.67A°.

4. Determining the exact position and velocity of an electron is impossible at a time.
a) True
b) False

Answer: a
Explanation: A German physicist, Werner Heisenberg stated Heisenberg's principle of uncertainty, that states that determining the

exact position and velocity of an electron is impossible at a time, as a result of dual nature of matter and radiation.

5. As per Heisenberg's principle of uncertainty, the relation between relative momentum and relative position is _____
a) independent
b) equal
c) directly proportional
d) inversely proportional
View Answer
Answer: d
Explanation: Heisenberg's principle of uncertainty states that the product of relative momentum and velocities is equal to greater than the $h/4\pi$, where is "h" is the Planck's constant and is equal to 6.626×10^{-34} Js.

6. The uncertainty of a ball is given by 0.5A°. Then calculate the uncertainty in momentum.
a) 2.055×10^{-24} kgm/s
b) 1.015×10^{-24} kgm/s
c) 1.055×10^{-24} kgm/s
d) 1.095×10^{-24} kgm/s

Answer: c
Explanation: Heisenberg's principle of uncertainty states that $\Delta x. \Delta p \geq h/4\pi$, x is position, p is momentum and "h" is the Planck's constant and is equal to 6.626×10^{-34} Js. Relative momentum $\Delta p = h/4\pi\Delta x = 1.055 \times 10^{-24}$ kgm/s.

7. If the uncertainties in position and momentum are equal, then the uncertainty in position is given by ____
a) $\sqrt{h/4\pi}$
b) $\sqrt{h4\pi}$
c) $\sqrt{h/4}$
d) $\sqrt{h/\pi}$

Answer: a
Explanation: As we know, Heisenberg's principle of uncertainty states that $\Delta x. \Delta p \geq h/4\pi$, x is position, p is momentum and "h" is the Planck's constant. $\Delta x = \Delta p$; $\Delta x. \Delta x = h/4\pi$; $\Delta x = \sqrt{h/4\pi}$

8. If the kinetic energy of an electron is 5J. Find out its wavelength.
a) 0.313×10^{15} m/s
b) 3.013×10^{15} m/s
c) 3.310×10^{15} m/s
d) 3.313×10^{15} m/s

Answer: d
Explanation: We know that the mass of an electron is 9.1×10^{-31} kg. Given that the kinetic energy of an electron is 5J. $K.E = mv^2/2$ and by substituting we get $v = \sqrt{1.098 \times 10^{31}}$ m/s $= 3.313 \times 10^{15}$m/s.

9. An object has a mass of 6 kg and velocity of 10 m/s. The speed is measured with 5% accuracy, then find out Δx in m.
a) 0.12676×10^{-34}
b) 0.1566×10^{-34}
c) 0.176×10^{-34}
d) 0.276×10^{-34}

Answer: c
Explanation: Speed's uncertainty is $10 \times 5/100 = 0.5$ m/s. We have Heisenberg's principle of uncertainty i.e. $\Delta x. \Delta p \geq h/4\pi$. $\Delta x = h/2m\pi$. Therefore uncertainty in position = 6.626×10^{-34} Js/$12 \times 3.1416 = 0.176 \times 10^{-34}$.

10. $\Delta x. \Delta p \geq h/4\pi$.
a) True
b) False

Answer: a
Explanation: Heisenberg's principle of uncertainty states that the product of relative momentum and velocities is equal to greater than the

$h/4\pi$, where is "h" is the Planck's constant and is equal to 6.626×10^{-34} Js. Hence the above statement is true

Quantum Mechanical Model of Atom

1. The principal quantum number describes ____
a) energy and size of the orbit
b) the shape of the orbital
c) spatial orientation of the orbital
d) the spin of the electron

Answer: a
Explanation: Among the four quantum numbers, the principal quantum number describes the size and energy of the orbit. It is represented by the symbol "n". For shells, K, L, M, N and O, n is given by 1, 2, 3, 4 and 5.

2. What is the shape the orbital, whose "l" is 1?
a) Spherical
b) Dumbbell
c) Double dumbbell
d) Complex

Answer: b
Explanation: The azimuthal quantum number is given by "l". When l = 0, 1, 2 and 3, they are s-orbital, p-orbital, d-orbital and f-orbital respectively. The shapes of s-orbital, p-orbital, d-orbital, and f-orbital are Spherical, Dumbbell, Double dumbbell and Complex respectively.

3. What is the magnetic quantum number of the orbital $2p_z$?
a) 1
b) ±1
c) -1

d) 0

Answer: d
Explanation: The magnetic quantum of an orbital range from -(l – 1) to l – 1. Its symbol is given by m. For 2p orbital, there are 3 magnetic quantum numbers namely -1, 0 and 1. For $2p_z$ orbital its 0, taken that z is the internuclear axis.

4. Total number of nodes for 3d orbital is _____
a) 3
b) 2
c) 1
d) 0

Answer: b
Explanation: Total number of nodes include angular and radial nodes. Angular nodes and radial nodes are given by the formula n – l -1 and l respectively. So the total number of nodes are n – l -1 + l = n – 1. For 3d orbit, "n" is 3, so total number nodes is 3 – 1 = 2.

5. Which of the following set of quantum numbers is not valid?
a) n = 5, l = 2, m = 0, s = 1/2
b) n = 1, l = 2, m = 0, s = 1/2
c) n = 5, l = 3, m = 2, s = 1/2
d) n = 5, l = 2, m = 0, s = -1/2

Answer: b
Explanation: The set of quantum number n = 1, l = 2, m = 0, s = 1/2, is not valid because the value of azimuthal quantum number should lie only in between 0 and n-1, where n is principal quantum number. So the above set of quantum numbers is not valid.

6. According to the Aufbau's principle, which of the following orbital should be filled first?
a) 5d
b) 4p

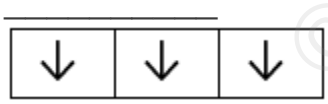
c) 3p
d) 2s

Answer: d
Explanation: As per the Aufbau's principle, the orbital or subshell with the lowest energy should be filled first. The ascending order of orbital's energy is given by 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 4f, 5d, 6p, 7s. So 2s orbital should be filled first.

7. No two electrons have the same set of all four quantum numbers.
a) True
b) False

Answer: a
Explanation: Yes, no two electrons have the same set of all four quantum numbers. This is explained by Pauli's exclusive principle. At most electrons can have all 3 quantum numbers the same as they are in the same orbital. But the spin quantum number's values are different.

8. The below process of filling electrons in an orbital follows



a) Aufbau principle
b) Hund's rule of maximum multiplicity
c) Pauli's exclusive principle
d) Electronic configuration

Answer: b
Explanation: According to Hund's rule of maximum multiplicity, the pairing of electrons cannot be started until each of the orbitals is singly occupied. The reason behind this is that the half-filled or fully filled orbitals are much more stable comparatively.

9. How many electrons can exist with the principal quantum number's value as 4?
a) 16

b) 4
c) 32
d) 12

Answer: c
Explanation: The number of orbitals within an orbit is n2. But as each orbital can accommodate 2 electrons, the number of electrons that can exist with the “n” as the principal quantum number is $2n^2$. So here $2n^2 = 2(4)^2 = 2(16) = 32$.

10. Write the values for l, n, and m for $\Psi_{3,1,0}$?
a) 1, 3, 0
b) 3, 1, 0
c) 0, 3, 1
d) 1, 0, 3

Answer: a
Explanation: The representation of the Schrodinger wave function is given by $\Psi_{n,l,m}$. Therefore by comparing $\Psi_{n,l,m}$ and $\Psi_{3,1,0}$ we get that n = 3, l = 1 and m = 0. Here n, l, and m are principal, azimuthal and magnetic quantum numbers respectively