CHEMISTRY

BOOKS - MTG CHEMISTRY (ENGLISH)

STRUCTURE OF ATOM

Mcq

1. The ratio of charge to mass of an electron in coulombs per gram was determined by J.J. Thomson. He determined this ratio by measuring the deflection

of cathode rays in electric and magnetic fields. What value did he find for this ratio?

A. -1.76×10^{8} coulombs/g

B. 1.76×10^{-8} coulombs/g

C. -1.76×10^{10} coulombs/g

D. -1.76×10^{-10} coulombs/g

Answer: A

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2. The number of electrons which will together weigh one gram is

A. 1.098×10^{27} electrons

B. 9.1096×10^{31} electrons

C. 1 electron

D. 1×10^{4} electrons

Answer: A

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3. How many number of electrons are present in a particle which carries a charge of $5.5 \times 10^{-16} C$?

A. 3432

B. 1560

C. 8240

D. 2432

Answer: A

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4. Which experiment is responsible for finding out the charge on an electron?

A. Millikam's oil drop experiment

B. Cathode ray discharge tube experiment

C. Rutherford's α-rays scattering experiment

D. Photoelectric experiment

Answer: A

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5. Which of the following conclusions regarding the structure of atom is based on Rutherford's α-particle scattering experiment?

A. The positive charge is concentrated in a very small volume of the atom.

B. The positive charge is scattered with the electrons throughout the atom.

C. The volume occupied by the nucleus is half of the volume of atom.

D. Most of the space in the atom is occupied by the neutrons.

Answer: A

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6. Which of the following observations was not correct during Rutherford's scattering experiment?

A. Most of the α-particles passed through the gold foil undeflected.

B. A small fraction of the α-particles was deflected by small angles.

C. A large number of the α-particles were bounced back.

D. A very few α-particles (~1 in 20,000) were bounced back.

Answer: C

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7. How many neutrons are there in $_{38}^{88}Sr$?

A. 38

B. 50

C. 126

D. 88

Answer: B

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8. An element with mass number 81 contains 31.7% more neutrons as compared to protons. Find the symbol of the element.

A. $^{81}_{34}Se$

B. $^{81}_{35}Br$

C. $^{81}_{36}Kr$

D. $^{81}_{37}Rb$

Answer: B

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9. Which of the following species is isoelectronic with CO?

A. HF

B. N_2

C. N_2^+

D. O_2^-

Answer: B

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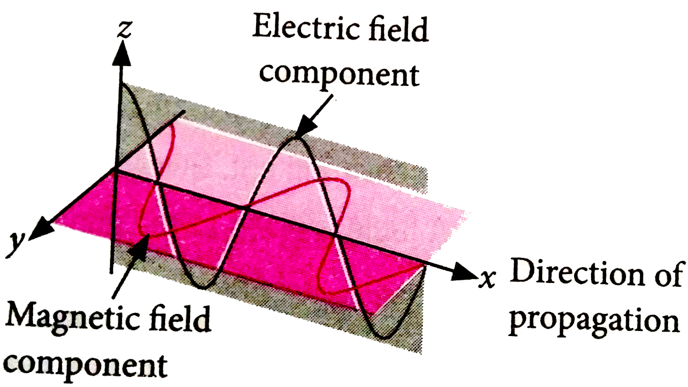
10. Consider the figure of electromagnetic wave,



and choose the correct information related to it.

A. These components have same wavelength and speed.

B. They vibrate in two mutually perpendicular planes.

C. Electromagnetic waves do not require medium and can move in vacuum.

D. All of these.

Answer: D

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11. What will be the wavenumber of yellow radiation having wavelength 240 nm?

A. $1.724 \times 10^4 cm^{-1}$

B. $4.16 \times 10^6 m^{-1}$

C. $4 \times 10^{14} Hz$

D. $219.3 \times 10^3 cm^{-1}$

Answer: B

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12. The wavelength of visible light is

A. 200 nm - 370 nm

B. 780 nm - 890 nm

C. 380 nm - 760 nm

D. 900 nm - 2000 nm

Answer: C

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13. Calculate the energy of one mole of photons of radiation whose frequency is $5 \times 10^{14} Hz$.

A. 199.51 kJ

B. $3.3 \times 10^{-19} J$

C. $6.626 \times 10^{-34} J$

D. $2.31 \times 10^{5} J$

Answer: B

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14. The energy of a photon is given as $3.03 \times 10^{-19} J$.

The wavelength of the photon is

A. 6.56 nm

B. 65.6 nm

C. 0.656 nm

D. 656 nm

Answer: D

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15. What will be the energy of a photon which corresponds to the wavelength of 0.50 Å?

A. $3.98 \times 10^{-15} J$

B. $3 \times 10^{15} J$

C. $3.9 \times 10^{8} J$

D. $3 \times 10^{-34} J$

Answer: A

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16. Compare the energies of two radiations E_1 with wavelength 800 nm and E_2 with wavelength 400 nm.

A. $E_1 = 2E_2$

B. $E_1 = E_2$

C. $E_2 = 2E_1$

D. $E_2 = -\frac{1}{2}E_1$

Answer: C

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17. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom . Calculate the ionisation energy of sodium in kJ mol^{-1}.

A. 494 KJ

B. 8169.5 KJ

C. 5.85 KJ

D. 8.214 KJ

Answer: D

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18. The energy difference between ground state of an atom and its excited state is $3 \times 10^{-19} J$. What is the wavelength of photom required for this radiation ?

A. 6.6×10^{-34}m

B. 3×10^{-8}m

C. 1.8×10^{-7}m

D. 6.6×10^{-7}m

Answer: D

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19. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.

A. $3 \times 10^{20} s^{-1}$

B. $2 \times 10^{-20} s^{-1}$

C. $2 \times 10^{20} s^{-1}$

D. $1 \times 10^{-20} s^{-1}$

Answer: C

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20. Mark the incorect statement regarding the photoelectric effect.

A. There is no time lag between the striking of light beam and the ejection of electrons from the metal surface.

B. The number of electrons ejected is inversely proportional to the intensity of light.

C. Photoelectric effect is not observed below threshold frequency.

D. The kinetic energy of the electrons increases with increase in frequency of light used.

Answer: B

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21. A certain metal when irradiated to light $(v = 3.2 \times 10^{16} Hz)$ emits photoelectrons with twice kinetic energy as did photoelectrons when the same metal is irradiation by light $\left(v = 2.0 \times 10^{16} Hz\right)$. The v_0 Threshold frequency) of the metal is

A. 1.2×10^{14}Hz

B. 8×10^{15} Hz

C. 1.2×10^{16} Hz

D. 4×10^{12} Hz

Answer: B

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22. The spectrum of while light ranging from red to violet is called a continuous spectrum because

A. different colours are seen as different bands in the spectrum

B. the colours continuously absorb energy to form a spectrum

C. the violet colour merges into blue, blue into green, green into yellow and so on

D. it is a continuous band of coloured and white light separating them.

Answer: C

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23. 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 $n_1 = 1, 2, 3, \ldots.$ and $n_2 = 2, 3, 4, \ldots$ 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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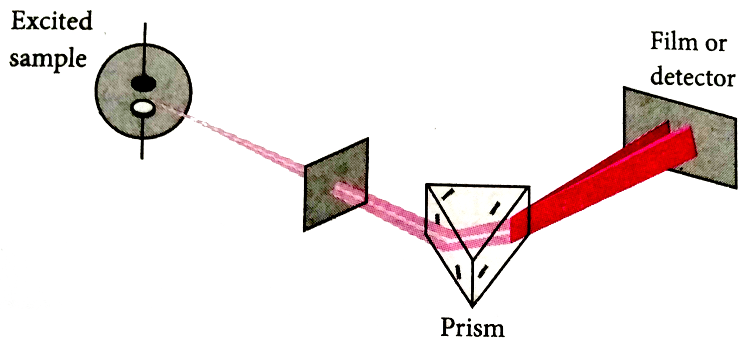
24. Which of the following types of spectrum is best depicted by the given figure?



A. Atomic absorption spectra

B. Atomic emission spectra

C. Continuous spectra

D. None of these

Answer: B

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25. The electron in Bohr's model of hydrogen atom is pictured as revolving around the nucleus in order for it to

A. emit protons

B. keep from being pulled into the nucleus

C. keep from being repelled by the nucleus

D. possess energy.

Answer: D

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26. What is the maximum number of emission lines when the excited electron of a H atom in $n = 6$ drop to the ground state?

A. 6

B. 15

C. 30

D. 10

Answer: B

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

A. 12

B. 15

C. 21

D. 10

Answer: D

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28. What is the colour corresponding to the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from n = 4 to n = 2?

A. Blue

B. Red

C. Yellow

D. Green

Answer: A

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29. Which one of the series of hydrogen spectrum is in the visible region ?

A. Lyman

B. Balmer

C. Paschen

D. Brackett

Answer: B

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30. An electron in excited hydrogen atom falls from fifth energy level to second energy level. In which of the following regions, the spectral line will be observed and is part of which series of the atomic spectrum?

A. Visible, Balmer

B. Ultraviolet, Lyman

C. Infrared, Paschen

D. Infrared, Brackett

Answer: A

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31. The third line of the Balmer series, in the emission spectrum of the hydrogen atom, is due to the transition from the

A. fourth Bohr orbit to the first Bohr orbit

B. fifth Bohr orbit to the second Bohr orbit

C. sixth Bohr orbit to the third Bohr orbit

D. seventh Bohr orbit to the third Bohr orbit.

Answer: B

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32. The frequency of radiation absorbed or emitted when transition occurs between two stationary states with energies E_1 (lower) and E_2 (higher) is given by

A. $v = \frac{E_1 + E_2}{h}$

B. $v = \frac{E_1 - E_2}{h}$

C. $v = \frac{E_1 \times E_2}{h}$

D. $v = \frac{E_2 - E_1}{h}$

Answer: D

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33. The angular momentum of an electron in a given stationary state can be expressed as $m_e vr = n\frac{h}{2\pi}$. Based on this expression an electron can move only in those orbits for which its angular momentum is

A. equal to n

B. integral multiple of $\frac{h}{2\pi}$

C. multiple of n

D. equal to $\frac{h}{2\pi}$ only.

Answer: B

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

A. $\frac{10h}{\pi}$

B. $\frac{25h}{\pi}$

C. $\frac{1.5h}{\pi}$

D. $\frac{2.5h}{\pi}$

Answer: D

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35. The radius of the stationary state which is also called Bohr radius is given by the expression $r_n = n^2 a_0$ where the value of a_0 is

A. 52.9 pm

B. 5.29 pm

C. 529 pm

D. 0.529 pm

Answer: A

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36. If the radius of first Bohr orbit be a_0, then the radius of the third orbit would be-

A. $(3 \times x)$ pm

B. $(6 \times x)$ pm

C. $\left(\frac{1}{2} \times x\right)$ pm

D. $(9 \times x)$ pm

Answer: D

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37. What does the negative electronic energy (negative sign for all values of energy) for hydrogen atom means?

A. The energy of an electron in the atom is lower than the energy of a free electron at rest which is taken as zero.

B. When the electron is free from the influence of nucleus it has a negative value which becomes more negative.

C. When the electron is atteracted by the nucleus the energy is obsorbed which means a negative value.

D. Energy is released by hydrogen atom in ground state.

Answer: A

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38. The energy of the electron in a hydrogen atom has a negative sign for all possible orbits because

A. when the electron is attracted by the nucleus and is present in orbit n, the energy is emitted and its energy is lowered.

B. when the electron is attracted by the nucleus and is present in orbit n, the energy is absorbed and its energy is increased.

C. when the electron is repelled by the nucleus, the energy is released and its energy is lowered.

D. none of these.

Answer: A

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39. If the ionization energy for the hydrogen atom is 13.6 eV , the energy required to excite it from the ground state to the next higher state is nearly

A. 3.4 eV

B. 10.2 eV

C. 17.2 eV

D. 13.6 eV

Answer: A

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40. Bohr's theory can also be applied to the ions like

A. (a) He^{+}

B. (b) Li^{2+}

C. (c) Be^{3+}

D. (d) all of these.

Answer: D

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41. According to Bohr's theory, the electronic energy of H-atom in Bohr's orbit is given by

A. $E_n = -\dfrac{2.18 \times 10^{-19} \times Z}{2n^2} J$

B. $E_n = -\frac{2.179 \times 10^{-18} \times Z^2}{n^2} J$

C. $E_n = -\frac{21.79 \times 10^{-18} \times Z}{2n^2} J$

D. $E_n = -\frac{21.8 \times 10^{-21} \times Z^2}{n^2} J$

Answer: B

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42. The Bohr's energy of a stationary state of hydrogen atom is given as $E_n = \frac{-2\pi^2 me^4}{n^2h^2}$. Putting the values of m and e for n^{th} energy level which is not the correct value?

A. $E_n = \frac{-21.8 \times 10^{-19}}{n^2} Ja \to m^{-1}$

B. $E_n = \frac{-13.6}{n^2} eVa \rightarrow m^{-1}$

C. $E_n = \frac{-1312}{n^2} kJmol^{-1}$

D. $E_n = \frac{-12.8 \times 10^{-19}}{n^2} erga \rightarrow m^{-1}$

Answer: D

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43. Which of the following is not correctly matched?

A. Energy associated with Bohr's orbit,

$$E = \frac{-2.18 \times 10^{-18} J \times Z^2}{n^2}$$

B. Energy gap between two orbits,

$$\Delta E = R_H\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

C. Kinetic energy of the ejected electron,

$$hv = hv_0 + \frac{1}{2}mv^2$$

D. Energy of one mole of photons, $E = N_0\frac{h\lambda}{c}$

Answer: D

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44. What is the trend of energy of Bohr's orbits?

A. Energy of the orbit increases as we move away from the nucleus.

B. Energy of the orbit decreases as we move away from the nucleus.

C. Energy remains same as we move away from the nucleus.

D. Energy of Bohr's orbit cannot be calculated.

Answer: A

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45. The radius of hydrogen atom in the ground state 0.53Å. The radius of Li^{2+} ion (Atomic number = 3) in a similar state is

A. (a) 1.06 Å

B. (b) 0.265 Å

C. (c) 0.17 Å

D. (d) 0.53 Å

Answer: C

46. Calculate the velocity of an electron in the first Bohr orbit of a hydrogen atom

A. (a) 2.18×10^{5} m/s

B. (b) 2.18×10^{6} m/s

C. (c) 2.18×10^{-18} m/s

D. (d) 2.18×10^{-9} m/s

Answer: B

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

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

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

C. (c) $\frac{2\pi mr}{n^2h^2}$

D. (d) $\frac{h}{2\pi mr}$

Answer: A

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48. Which one is not in agreement with Bohr's model of the atom?

A. (a) Line spectra of hydrogen atom

B. (b) Pauli's exclusion principle

C. (c) Planck's theory

D. (d) Heisenberg's uncertainty principle

Answer: D

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

A. (a) Stark effect

B. (b) Zeeman effect

C. (c) photoelectric effect

D. (d) screening effect

Answer: B

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50. The de Broglie wavelength associated with a ball of mass 200 g and moving at a speed of 5 metres/hour, is of the order of ($h = 6.625 \times 10^{-34}$ J s) is

A. (a) 10^{-15}m

B. (b) 10^{-20}m

C. (c) 10^{-25}m

D. (d) 10^{-30}m

Answer: D

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51. A body of mass $10mg$ is moving with a velocity of $100ms^{-1}$. The wavelength of the de Broglie wave associated with it would be

A. 6.626×10^{-7}m

B. 6.626×10^{-34}m

C. 6.626×10^{-4}m

D. 6.626×10^{-35}m

Answer: B

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52. The wavelength of an electron moving with velocity of $10^7 ms^{-1}$ is

A. 7.27×10^{-11}m

B. 3.55×10^{-11}m

C. 8.25×10^{-4}m

D. 1.05×10^{-16}m

Answer: A

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53. What will be the wavelength of an electron moving with 1/10th of velocity of light?

A. 2.43×10^{-11}m

B. 243×10^{-11}m

C. 0.243 m

D. 2.43×10^{-4}m

Answer: A

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54. If the velocity of the electron in Bohr's first orbit is $2.19 \times 10^6 ms^{-1}$, calculate the de Broglie wavelength associated with it.

A. 2.19×10^{-6}m

B. 4.38×10^{-6}m

C. 3.32×10^{-10}m

D. 3.32×10^{10}m

Answer: C

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55. If uncertainty principle is applied to an object of mass 1 miligram, the product of uncertainly in velocity and position will be:

A. $0.2 \times 10^{-4} m^2 s^{-1}$

B. $0.52 \times 10^{6} m^2 s^{-1}$

C. $0.52 \times 10^{-28} m^2 s^{-1}$

D. $2 \times 10^{-34} m^2 s^{-1}$

Answer: C

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56. What will be the uncertainty in velocity of a bullet with a mass of 10 g whose position is known with $\pm 0.01 mm$?

A. $5.275 \times 10^{-33} ms^{-1}$

B. $5.275 \times 10^{-25} ms^{-1}$

C. $5.275 \times 10^{-5} ms^{-1}$

D. $5.275 \times 10^{-28} ms^{-1}$

Answer: D

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57. What will be the mass of a particle if uncertainty in its position is 10^{-8} m and velocity is $5.26 \times 10^{-25} ms^{-1}$?

A. 0.01 kg

B. 0.1 kg

C. 1 kg

D. 10 kg

Answer: A

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58. What will be the uncertainty in velocity of an electron when the uncertainty in its position is 1000 Å?

A. $5.79 \times 10^{2} ms^{-1}$

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

C. $5.79 \times 10^{4} ms^{-1}$

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

Answer: A

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59. The region where probability density function reduces to zero is called

A. probability density region

B. nodal surfaces

C. orientation surfaces

D. wave function.

Answer: B

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60. The probability of finding out an electron at a point within an atom is proportional to the

A. square of the orbital wave function i.e., Ψ^2

B. orbital wave function i.e., Ψ

C. Hamiltonian operator i.e., H

D. principal quantum number i.e., n

Answer: A

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61. Two electrons present in M 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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62. What is the lowest value of n that allows g orbitals to exist?

A. 6

B. 7

C. 4

D. 5

Answer: D

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63. How many subshells and electrons are associated with n = 4?

A. (a) 32, 64

B. (b) 16, 32

C. (c) 4, 16

D. (d) 8, 16

Answer: B

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64. An electron is in one of the $3d$ orbitals. Give the possible values of n, l, and m for this electron.

A. n = 3, l = 0, m_1 = 0

B. n = 3, l = 1, m_1 = -1, 0, +1

C. n = 3, l = 2, m_1 = -2, -1, 0, +1, +2

D. n = 3, l = 3, m_1 = -3, -2, -1, 0, +1, +2, +3

Answer: C

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65. What are the possible values of l and m_1 for an atomic orbital 4f?

A. n = 4, l = 0, 1, 2, 3, m_1= -2, -1, 0, +1, +2

B. n = 4, l = 3, m_1= -3, -2, -1, 0, +1, +2, +3

C. n = 4, l = 2, m_1= -2, -1, 0, +1, +2, +3

D. n = 4, l = 0, 1, m_1= -1, 0, +1

Answer: B

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66. Describe the orbital with following quantum numbers:

(i) $n=3, l=2$

(ii) $n=4, l=3$

A. (i) 3p, (ii) 4f

B. (i) 3d, (ii) 4d

C. (i) 3f, (ii) 4f

D. (i) 3d, (ii) 4f

Answer: D

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67. How many electrons in an atom have the following quantum numbers?

n=4, $m_s = -1/2$

A. 32

B. 18

C. 8

D. 16

Answer: D

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68. In how many elements the last electron will have the following set of quantum numbers, n = 3 and l = 1?

A. 2

B. 8

C. 6

D. 10

Answer: C

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69. An orbital is described with the help of a wave function. Since many wave functions are possible for an electron, there are many atomic orbitals. When atom is placed in a magnetic field the possible number of orientations for an orbital of azimuthal quantum number 3 is

A. three

B. two

C. five

D. seven

Answer: D

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70. The orbital angular momentum of an electron in $2s$-orbital is

A. (a) Zero

B. (b) One

C. (c) Two

D. (d) Three

Answer: A

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71. Two values of spin quantum number i.e., +1/2 and -1/2 represent

A. (a) up and down spin of the electrons respectively

B. (b) two quantum mechanical spin states which refer to the orientation of spin of the electron

C. (c) clockwise and anti-clockwise spin of the electrons respectively

D. (d) anti-clockwise and clockwise spin of the electrons respectively.

Answer: B

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72. Though the five d-orbitals are degenerate, the first four d-orbitals are similar to each other in shape whereas the fifth d-orbital is different from others. What is the name of the fifth orbital?

A. (a) $d_{x^2-y^2}$

B. (b) d_{z^2}

C. (c) d_{xz}

D. (d) d_{xy}

Answer: B

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73. The 3d-orbitals having electron density in all the three axes is

A. (a) $3d_{xy}$

B. (b) $3d_{z^2}$

C. (c) $3d_{yz}$

D. (d) $3d_{zx}$

Answer: B

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74. The number of radial nodes and angular nodes for d-orbital can be represented as

A. (a) (n - 2) radial nodes + 1 angular node = (n - 1) total nodes

B. (b) (n - 1) radial nodes + 1 angular node = (n - 1) total nodes

C. (c) (n - 3) radial nodes + 2 angular node = (n - l - 1) total nodes

D. (d) (n - 3) radial nodes + 2 angular node = (n - 1) total nodes

Answer: D

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75. Few statements are given regarding nodes in the orbitals. Mark the statement which is not correct.

A. In case of p_z-orbital, xy plane is a nodal plane.

B. ns - orbital has (n + 1) nodes.

C. The number of angular nodes is given by l.

D. The total number of nodes is given by (n - 1) i.e. sum of l angular nodes and (n - l - 1) radial nodes.

Answer: B

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76. Which of the following is not a correct statement regarding the energies of orbitals?

A. The lower the value of (n + l) for an orbital, lower is its energy.

B. Electron in the same subshell have equal energy.

C. Energy of s-orbital is lower than the p-orbital and that of p-orbital is lower than the d-orbital.

D. If two orbitals have same value for (n + l), the orbital with higher value of n will have lower energy.

Answer: D

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77. The electrons identified by the following quantum numbers n and l: $(i) n = 4, l = 1$, $(ii) n = 4, l = 0$, $(iii) n = 3, l = 2$, and (iv) $n = 3, l = 1$ can be placed in the order of increasing enegry from the lowest to the highest as

A. (iv) < (ii) < (iii) < (i)

B. (ii) < (iv) < (i) < (iii)

C. (i) < (iii) < (ii) < (iv)

D. (iii) < (i) < (iv) < (ii)

Answer: A

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78. A new electron enters the orbital when:

A. value of n is minimum

B. value of l is minimum

C. value of (n + l) is minimum

D. value of (n + m) is minimum

Answer: C

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79. How many orbitals in total are associated with 4^{th} energy level?

A. 4

B. 9

C. 16

D. 7

Answer: C

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80. Effective nuclear charge (Z_{eff}) for a nucleus of an atom is defined as

A. (a) shielding of the outermost shell electrons from the nucleus by the innermost shell electrons

B. (b) the net positive charge experienced by electron from the nucleus

C. (c) the attractive force experienced by the nucleus from electron

D. (d) screening of positive charge on nucleus by innermost shell electrons.

Answer: B

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81. The orbital diagram in which the Aufbau principle is violated is

A. $\underset{2s}{\boxed{\uparrow\downarrow}}\quad \underset{2p}{\boxed{\uparrow}\boxed{\uparrow}\boxed{}}$

B. $\underset{2s}{\boxed{\uparrow\downarrow}}\quad \underset{2p}{\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}}$

C. $\underset{2s}{\boxed{\uparrow}}\quad \underset{2p}{\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}}$

D. $\underset{2s}{\boxed{\uparrow\downarrow}}\quad \underset{2p}{\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}}$

Answer: C

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82. Which of the sequences given below shows the correct increasing order of energy?

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

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

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

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

Answer: C

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83. Which of the following configurations does not follow Hund's rule of maximum multiplicity?

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

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

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

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

Answer: D

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84. Read the following statements and mark the incorrect statement.

A. No two electrons in an atom can have all the four quantum number same.

B. All the orbitals in a subshell are first occupied singly with parallel spins.

C. The outer electronic configuration of chromium atom is $3d^4 4s^2$.

D. Lyman series of hydrogen spectrum lies in ultraviolet region.

Answer: C

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85. What is the electronic configuration of O^{2-} ion?

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

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

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

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

Answer: A

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86. Which atom (X) is indicated by the following configuration?

$X \rightarrow [Ne]3s^2 3p^3$

A. Nitrogen

B. Chlorine

C. Phosphorus

D. Sulphur

Answer: C

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87. Which of the following configurations represents the most electronegative element?

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

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

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

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

Answer: B

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88. Which one of the following configurations represents a noble gas?

A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4f^{14} 5s^2$

C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^3$

Answer: C

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89. An element has 13 electrons in its M shell and 1 electron in N shell in ground state. Identify the element.

A. Chromium

B. Iron

C. Manganese

D. Copper

Answer: A

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90. Which of the following quantum numbers are correct for the outermost electorn of sodium atom?

A. $n = 4, l = 0, m = 0, s = \ +1/2$

B. $n = 3, l = 0, m = 0, s = \ +1/2$

C. $n = 3, l = 1, m = \ +1, s = \ +1/2$

D. $n = 3, l = 2, m = \ -1, s = \ -1/2$

Answer: B

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91. The configuration of the valence orbital of an element with atomic number 22 is

A. $3d^5 4s^1$

B. $4s^2 3d^2$

C. $4s^1 4p^1$

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

Answer: B

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92. Three elements 'X', 'Y' and 'Z' have atomic numbers 18, 19 and 20 respectively. How many electrons are present in the M shell of these elements?

A. $8, 9, 10$

B. $8, 10, 13$

C. $8, 8, 8$

D. $8, 9, 12$

Answer: C

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93. What is the atomic number of the element which has $3d^6$ as its outermost configuration?

A. 12

B. 32

C. 26

D. 24

Answer: C

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Higher Order Thinking Skills

1. An ion with mass number 56 contains 3 units of positive charge and 30.4% more neutrons then electrons. Assign the symbol to this ion.

A. ${}^{56}_{26}Fe^{3+}$

B. ${}^{56}_{26}Fe^{2+}$

C. ${}^{56}_{27}Co^{2+}$

D. ${}^{58}_{27}Co^{3+}$

Answer: A

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2. An element E loses one α and two β-particles in three successive stages. The resulting element will be

A. an isobar of E

B. an isotone of E

C. an isotope of E

D. E itself

Answer: C

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3. What would be the wavelength and name of series respectively for the emission transition for H-atom if it starts from the orbit having radius 1.3225 nm and ends at 211.6 pm?

A. 434 nm, Balmer

B. 434 pm, Paschen

C. 545 pm, Pfund

D. 600 nm, Lyman

Answer: A

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4. The velocity of an electron in a certain Bohr orbit of H-atom bears the ratio 1 : 275 to the velocity of light. The quantum number (n) of the orbit is

A. 3

B. 2

C. 1

D. 4

Answer: B

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5. The longest wavelength doublet absorption is observed at 589 and $589.6nm$. Caiculate the frequency of each transition and energy difference between two excited states.

A. $3.31 \times 10^{-22} kJ$

B. $3.31 \times 10^{-22} J$

C. $2.98 \times 10^{-21} J$

D. $3.0 \times 10^{-21} kJ$

Answer: B

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

A. 1.46×10^{-33}

B. 1.527×10^{-34}

C. 1.5×10^{-34}

D. None of these

Answer: B

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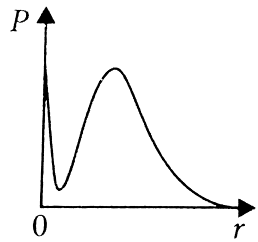
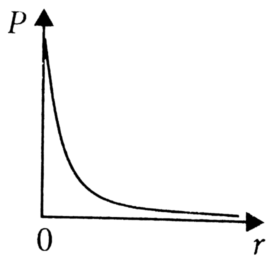
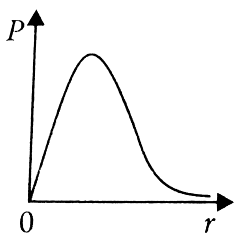
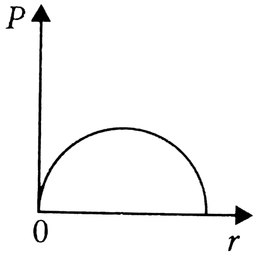
7. P is the probability of finding the Is electron of hydrogen atom in a spherical shell of infitesimal thickness, dr, at a distance r from the nucleus. The volume of this shell is $4\pi r^2 dr$. The qualitative sketch of the dependence of P on r is

A. 

B. 

C. 

D. 

Answer: C

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8. In all, how many nodal planes are there in the atomic orbitals for the principal quantum number $n = 3$?

A. 10

B. 9

C. 11

D. 2

Answer: C

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9. The state S_1 is

A. 1s

B. 2s

C. 2p

D. 3s

Answer: B

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10. The energy of state s_1 in units of the hydrogen atom ground state energy in

A. 0.75

B. 1.5

C. 2.25

D. 4.5

Answer: C

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11. The orbital angular momentum quantum number of the state S_2 is

A. 0

B. 1

C. 2

D. 3

Answer: B

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1. Which of the following conclusions could not be derived from Rutherford's α-particle scattering experiment?

A. Most of the space in the atom is empty.

B. The radius of the atom is about 10^{-10}m while that of nucleus is 10^{-15}m.

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

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

Answer: C

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

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

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

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

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

Answer: B

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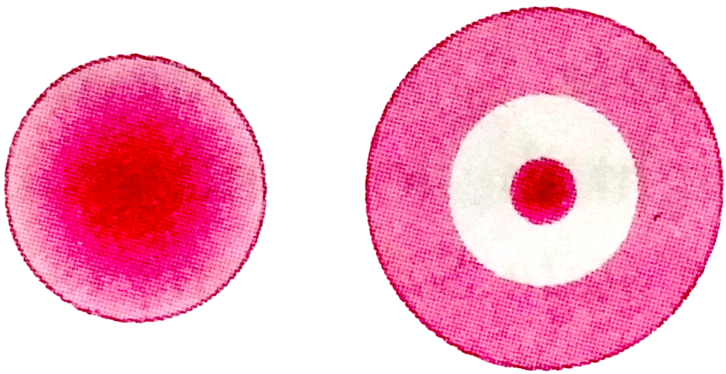
3. The probability density plots of 1s and 2s atomic orbitals are given in figures.



1s 2s

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

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

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

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

D. The probability density of electron for 2s orbital decreases uniformly as distance from the nucleus increases.

Answer: D

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

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

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

C. Characteristics of cathode rays do not depend upon the material of electrodes in cathode ray tube.

D. Characteristics of cathode rays depend upon the nature of gas present in the cathode ray tube.

Answer: D

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

A. It is a negatively charged particle.

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

C. It is a basic constituent of all atoms.

D. It is a constituent of cathode rays.

Answer: B

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

A. Overall neutrality of atom.

B. Spectra of hydrogen atom.

C. Position of electrons, protons and neutrons in atom.

D. Stability of atom.

Answer: A

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7. Two atoms are said to be isobars is

A. they have same atomic number but different mass number

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

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

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

Answer: D

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

A. 3

B. 4

C. 2

D. 1

Answer: D

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

A. 4

B. 3

C. 2

D. 1

Answer: C

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

A. Pauli's exclusion principle

B. Heisenberg's uncertainty principle

C. Hund's rule of maximum multiplicity

D. Aufbau principle

Answer: B

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

A. 2

B. 4

C. 9

D. 3

Answer: C

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12. Orbital angular momentum depends on ....

A. l

B. n and l

C. n and m

D. m and s

Answer: A

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13. Chlorine exists in two isotopic forms $Cl-37$ and Cl-35 but its atomic mass is 35.5. this indicates the ratio of Cl-37 and Cl-35 is appromimately

A. $1:2$

B. $1:1$

C. $1:3$

D. $3:1$

Answer: C

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14. The pair of ions having same electronic configuration is__________.

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

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

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

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

Answer: B

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

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

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

C. Z_{eff} for an electron in 1s orbital is the same as Z_{eff} for an electron in a 2s orbital.

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

Answer: D

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

A. Electron

B. Alpha particle $\left(He^{2+}\right)$

C. Neutron

D. Proton

Answer: B

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Assertion Reason

1. Assertion : The characteristics of cathode rays do not depend upon the material of electrodes and the nature of the gas present in the cathode ray tube.

Reason : Cathode rays consist of negatively charged particles, called electrons.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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2. Assertion : X-rays are used to study the interior of objects .

Reason : X-rays have very short wavelengths and possess electromagnetic character.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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3. Assertion : In Rutherford's α-particle scattering experiment, most of the α-particles were deflected by nearly 180°.

Reason : The positive charge of the atom is spread throughout the atom that repelled and deflected the positively charged α-particles.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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4. Assertion : All the isotopes of a given element show same chemical behaviour.

Reason : Isotopes have different number of neutrons present in the nucleus.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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5. Assertion : In electromagnetic spectrum, the small portion around 10^{15}Hz is called visible light.

Reason :Visible region is only a small part of the entire spectrum which our eyes can see.

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

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

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: A

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6. Assertion : When an iron rod is heated in a furnace, the radiation emitted goes from a lower frequency to a higher frequency as the temperature increases.

Reason : The energy of a quantum of radiation is proportional to its frequency.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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7. Assertion : The number of electrons ejected from a metal surface depend upon the frequency of light.

Reason : There is a time lag between the striking of light beam and the ejection of electrons from the metal surface.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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8. Assertion : Elements like Rb, Cs, Tl, In, Ga and Sc were discovered when their minerals were analysed by spectroscopic methods.

Reason : The characteristic lines in atomic spectra can be used in chemical analysis to identify unknown atoms.

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

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

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: A

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9. Assertion : In hydrogen and hydrogen like species, orbital energy depends only on the quantum number n whereas in multi-electron atoms it depends on quantum numbers n and l.

Reason : The principle quantum number determines the size and the energy of the orbital.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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10. Assertion : According to de Broglie, the wavelengths associated with electrons and other subatomic particles can be detected experimentally.

Reason : The wavelength associated with any material particle is directly proportional to its mass,

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

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

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: C

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11. Assertion : For l = 2, m_l can be -2, -1, 0, +1 and +2.

Reason : For a given value of l, (2l + 1) values of m_l are possible.

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

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

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: A

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12. Assertion : Orbit and orbital are synonymous.

Reason : A circular path around the nucleus in which an electron moves is called orbit or orbital.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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13. Assertion : $3d_{z^2}$ orbital is spherically symmetrical.

Reason : The shapes of all five d-orbitals are similar to each other.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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14. Assertion : The maximum number of electrons in the shell with principle quantum number n is equal to $2n^2$.

Reason : Two electrons can have the same value of three quantum numbers n, l and m_l, but must have the opposite spin quantum number.

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

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

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: A

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15. Assertion : The outer electronic configuration of Cr and Cu are $3d^5 4s^1$ and $3d^{10} 4s^1$ respectively .

Reason : Electrons are filled in orbitals in order of increasing energies given by (n+l) rule.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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Discovery Of Sub Atomic Particles

1. The ratio of charge to mass of an electron in coulombs per gram was determined by J.J. Thomson. He determined this ratio by measuring the deflection of cathode rays in electric and magnetic fields. What value did he find for this ratio?

A. -1.76×10^{8} coulombs/g

B. 1.76×10^{-8} coulombs/g

C. -1.76×10^{10} coulombs/g

D. -1.76×10^{-10} coulombs/g

Answer: A

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2. The number of electrons which will together weigh one gram is

A. 1.098×10^{27} electrons

B. 9.1096×10^{31} electrons

C. 1 electron

D. 1×10^{4} electrons

Answer: A

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3. How many number of electrons are present in a particle which carries a charge of $5.5 \times 10^{-16} C$?

A. 3432

B. 1560

C. 8240

D. 2432

Answer: A

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4. Which experiment is responsible for finding out the charge on an electron?

A. Millikam's oil drop experiment

B. Cathode ray discharge tube experiment

C. Rutherford's α-rays scattering experiment

D. Photoelectric experiment

Answer: A

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5. Match the values of column II with column I and mark the appropriate choice.

Column I		Column II	
(A)	Mass of electron	(i)	1.673×10^{-27} kg
(B)	Mass of proton	(ii)	-1.602×10^{-19} C
(C)	Charge of electron	(iii)	9.1×10^{-31} kg
(D)	e/m for an electron	(iv)	1.76×10^{8} C/g

A.

$$(A) \rightarrow (i), (B) \rightarrow (ii), (C) \rightarrow (iv), (D) \rightarrow (iii)$$

B.

$$(A) \rightarrow (iii), (B) \rightarrow (i), (C) \rightarrow (ii), (D) \rightarrow (iv)$$

C.

$$(A) \rightarrow (ii), (B) \rightarrow (iii), (C) \rightarrow (iv), (D) \rightarrow (i)$$

D.

$$(A) \rightarrow (i), (B) \rightarrow (iii), (C) \rightarrow (ii), (D) \rightarrow (iv)$$

Answer: B

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Atomic Models

1. Which of the following conclusions regarding the structure of atom is based on Rutherford's α-particle scattering experiment?

A. The positive charge is concentrated in a very small volume of the atom.

B. The positive charge is scattered with the electrons throughout the atom.

C. The volume occupied by the nucleus is half of the volume of atom.

D. Most of the space in the atom is occupied by the neutrons.

Answer: A

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2. Which of the following observations was not correct during Rutherford's scattering experiment?

A. Most of the α-particles passed through the gold foil undeflected.

B. A small fraction of the α-particles was deflected by small angles.

C. A large number of the α-particles were bounced back.

D. A very few α-particles (~1 in 20,000) were bounced back.

Answer: C

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3. How many neutrons are there in $_{38}^{88}Sr$?

A. 38

B. 50

C. 126

D. 88

Answer: B

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4. An element with mass number 81 contains 31.7% more neutrons as compared to protons. Find the symbol of the element.

A. ${}^{81}_{34}Se$

B. ${}^{81}_{35}Br$

C. ${}^{81}_{36}Kr$

D. ${}^{81}_{37}Rb$

Answer: B

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5. Which of the following species is isoelectronic with CO?

A. HF

B. N_2

C. N_2^+

D. O_2^-

Answer: B

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Towards Quantum Mechanical Model Of The Town

1. The de Broglie wavelength associated with a ball of mass 200 g and moving at a speed of 5 metres/hour, is of the order of ($h = 6.625 \times 10^{-34}$ J s) is

A. 10^{-15} m

B. 10^{-20} m

C. 10^{-25} m

D. 10^{-30} m

Answer: D

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2. A body of mass $10mg$ is moving with a velocity of $100ms^{-1}$. The wavelength of the de Broglie wave associated with it would be

A. 6.626×10^{-7}m

B. 6.626×10^{-34}m

C. 6.626×10^{-4}m

D. 6.626×10^{-35}m

Answer: B

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3. The wavelength of an electron moving with velocity of $10^7 ms^{-1}$ is

A. 7.27×10^{-11}m

B. 3.55×10^{-11}m

C. 8.25×10^{-4}m

D. 1.05×10^{-16}m

Answer: A

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4. What will be the wavelength of an electron moving with 1/10th of velocity of light?

A. 2.43×10^{-11} m

B. 243×10^{-11} m

C. 0.243 m

D. 2.43×10^{-4} m

Answer: A

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5. If the velocity of the electron in Bohr's first orbit is $2.19 \times 10^6 ms^{-1}$, calculate the de Broglie wavelength associated with it.

A. 2.19×10^{-6}m

B. 4.38×10^{-6}m

C. 3.32×10^{-10}m

D. 3.32×10^{10}m

Answer: C

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6. Match the column I with column II and mark the appropriate choice.

	Column I		Column II
(A)	Uncertainty of an object	(i)	$\frac{5.29\times n^2}{Z}$
(B)	Bohr's radius of an orbit	(ii)	$\frac{h}{4\pi m}$
(C)	Angular momentum of an electron	(iii)	$\frac{h}{mv}$
(D)	de Broglie wavelength	(iv)	$n\cdot\frac{h}{2\pi}$

A.

$$(A) \rightarrow (iii), (B) \rightarrow (iv), (C) \rightarrow (i), (D) \rightarrow (ii)$$

B.

$$(A) \rightarrow (ii), (B) \rightarrow (i), (C) \rightarrow (iv), (D) \rightarrow (iii)$$

C.

$$(A) \rightarrow (iv), (B) \rightarrow (iii), (C) \rightarrow (i), (D) \rightarrow (ii)$$

D.

$$(A) \rightarrow (i), (B) \rightarrow (ii), (C) \rightarrow (iv), (D) \rightarrow (iii)$$

Answer: B

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7. If uncertainty principle is applied to an object of mass 1 miligram, the product of uncertainly in velocity and position will be:

A. $0.2 \times 10^{-4} m^2 s^{-1}$

B. $0.52 \times 10^{6} m^{2} s^{-1}$

C. $0.52 \times 10^{-28} m^{2} s^{-1}$

D. $2 \times 10^{-34} m^{2} s^{-1}$

Answer: C

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8. What will be the uncertainty in velocity of a bullet with a mass of 10 g whose position is known with $\pm 0.01 mm$?

A. $5.275 \times 10^{-33} ms^{-1}$

B. $5.275 \times 10^{-25} ms^{-1}$

C. $5.275 \times 10^{-5} ms^{-1}$

D. $5.275 \times 10^{-28} ms^{-1}$

Answer: D

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9. What will be the mass of a particle if uncertainty in its position is 10^{-8} m and velocity is $5.26 \times 10^{-25} ms^{-1}$?

A. 0.01 kg

B. 0.1 kg

C. 1 kg

D. 10 kg

Answer: A

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10. What will be the uncertainty in velocity of an electron when the uncertainty in its position is 1000 Å?

A. $5.79 \times 10^{2} ms^{-1}$

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

C. $5.79 \times 10^{4} ms^{-1}$

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

Answer: A

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Quantum Mechanical Model Of Atom

1. The region where probability density function reduces to zero is called

A. probability density region

B. nodal surfaces

C. orientation surfaces

D. wave function.

Answer: B

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2. The probability of finding out an electron at a point within an atom is proportional to the

A. square of the orbital wave function i.e., Ψ^2

B. orbital wave function i.e., Ψ

C. Hamiltonian operator i.e., H

D. principal quantum number i.e., n

Answer: A

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3. Two electrons present in M 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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4. What is the lowest value of n that allows g orbitals to exist?

A. 6

B. 7

C. 4

D. 5

Answer: D

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5. How many subshells and electrons are associated with $n = 4$?

A. 32, 64

B. 16, 32

C. 4, 16

D. 8, 16

Answer: B

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6. An electron is in one of the $3d$ orbitals. Give the possible values of n, l, and m for this electron.

A. n = 3, l = 0, m_1 = 0

B. n = 3, l = 1, m_1 = -1, 0, +1

C. n = 3, l = 2, m_1 = -2, -1, 0, +1, +2

D. n = 3, l = 3, m_1 = -3, -2, -1, 0, +1, +2, +3

Answer: C

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7. What are the possible values of l and m_1 for an atomic orbital 4f?

A. n = 4, l = 0, 1, 2, 3, m_1= -2, -1, 0, +1, +2

B. n = 4, l = 3, m_1= -3, -2, -1, 0, +1, +2, +3

C. n = 4, l = 2, m_1= -2, -1, 0, +1, +2, +3

D. n = 4, l = 0, 1, m_1= -1, 0, +1

Answer: B

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8. Describe the orbital with following quantum numbers:

(i) n=3, l=2

(ii) n=4, l=3

A. (i) 3p, (ii) 4f

B. (i) 3d, (ii) 4d

C. (i) 3f, (ii) 4f

D. (i) 3d, (ii) 4f

Answer: D

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9. How many electrons in an atom have the following quantum numbers?

n=4, $m_s = -1/2$

A. 32

B. 18

C. 8

D. 16

Answer: D

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10. In how many elements the last electron will have the following set of quantum numbers, $n = 3$ and $l = 1$?

A. 2

B. 8

C. 6

D. 10

Answer: C

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11. An orbital is described with the help of a wave function. Since many wave functions are possible for an electron, there are many atomic orbitals. When atom is placed in a magnetic field the possible number of orientations for an orbital of azimuthal quantum number 3 is

A. three

B. two

C. five

D. seven

Answer: D

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12. The orbital angular momentum of an electron in $2s$-orbital is

A. Zero

B. One

C. Two

D. Three

Answer: A

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13. Two values of spin quantum number i.e., +1/2 and -1/2 represent

A. up and down spin of the electrons respectively

B. two quantum mechanical spin states which refer to the orientation of spin of the electron

C. clockwise and anti-clockwise spin of the electrons respectively

D. anti-clockwise and clockwise spin of the electrons respectively.

Answer: B

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14. Though the five d-orbitals are degenerate, the first four d-orbitals are similar to each other in shape whereas the fifth d-orbital is different from others. What is the name of the fifth orbital?

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

B. d_{z^2}

C. d_{xz}

D. d_{xy}

Answer: B

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15. The 3d-orbitals having electron density in all the three axes is

A. $3d_{xy}$

B. $3d_{z^2}$

C. $3d_{yz}$

D. $3d_{zx}$

Answer: B

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16. The number of radial nodes and angular nodes for d-orbital can be represented as

A. (n - 2) radial nodes + 1 angular node = (n - 1) total nodes

B. (n - 1) radial nodes + 1 angular node = (n - 1) total nodes

C. (n - 3) radial nodes + 2 angular node = (n - l - 1) total nodes

D. (n - 3) radial nodes + 2 angular node = (n - 1) total nodes

Answer: D

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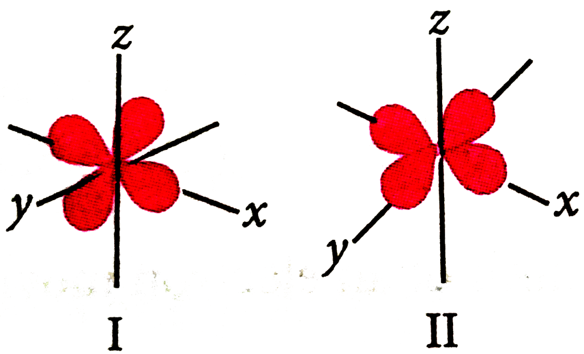
17. Observe the given boundary surface diagrams of two orbitals I and II and choose the correct option.



A. $I - d_{x^2 - y^2}, II - d_{yz}$

B. $I - d_{yz}, II - d_{x^2 - y^2}$

C. $I - d_{xz}, II - d_{z^2}$

D. $I - d_{xy}, II - d_{xz}$

Answer: B

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18. Few statements are given regarding nodes in the orbitals. Mark the statement which is not correct.

A. In case of p_z-orbital, xy plane is a nodal plane.

B. ns - orbital has (n + 1) nodes.

C. The number of angular nodes is given by l.

D. The total number of nodes is given by (n - 1) i.e. sum of l angular nodes and (n - l - 1) radial nodes.

Answer: B

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19. Which of the following is not a correct statement regarding the energies of orbitals?

A. The lower the value of (n + 1) for an orbital, lower is its energy.

B. Electron in the same subshell have equal energy.

C. Energy of s-orbital is lower than the p-orbital and that of p-orbital is lower than the d-orbital.

D. If two orbitals have same value for (n + 1), the orbital with higher value of n will have lower energy.

Answer: D

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20. The electrons identified by the following quantum numbers n and l: $(i) n = 4, l = 1$, $(ii) n = 4, l = 0$, $(iii) n = 3, l = 2$, and (iv) $n = 3, l = 1$ can be placed in the order of increasing enegry from the lowest to the highest 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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21. A new electron enters the orbital when:

A. value of n is minimum

B. value of l is minimum

C. value of (n + l) is minimum

D. value of (n + m) is minimum

Answer: C

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22. How many orbitals in total are associated with 4^{th} energy level?

A. 4

B. 9

C. 16

D. 7

Answer: C

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23. Effective nuclear charge (Z_{eff}) for a nucleus of an atom is defined as

A. shielding of the outermost shell electrons from the nucleus by the innermost shell electrons

B. the net positive charge experienced by electron from the nucleus

C. the attractive force experienced by the nucleus from electron

D. screening of positive charge on nucleus by innermost shell electrons.

Answer: B

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24. The orbital diagram in which the Aufbau principle is violated is

A. $2s$ $\boxed{\uparrow\downarrow}$ $2p$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{}$

B. $2s$ $\boxed{\uparrow\downarrow}$ $2p$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

C. $2s$ $\boxed{\uparrow}$ $2p$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

D. $2s$ $\boxed{\uparrow\downarrow}$ $2p$ $\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}$

Answer: C

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25. Which of the sequences given below shows the correct increasing order of energy?

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

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

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

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

Answer: C

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26. Which of the following configurations does not follow Hund's rule of maximum multiplicity?

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

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

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

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

Answer: D

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27. Read the following statements and mark the incorrect statement.

A. No two electrons in an atom can have all the four quantum number same.

B. All the orbitals in a subshell are first occupied singly with parallel spins.

C. The outer electronic configuration of chromium atom is $3d^4 4s^2$.

D. Lyman series of hydrogen spectrum lies in ultraviolet region.

Answer: C

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28. What is the electronic configuration of O^{2-} ion?

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

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

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

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

Answer: A

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29. Which atom (X) is indicated by the following configuration?

$X \rightarrow [Ne]3s^2 3p^3$

A. Nitrogen

B. Chlorine

C. Phosphorus

D. Sulphur

Answer: C

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30. Which of the following configurations represents the most electronegative element?

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

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

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

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

Answer: B

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31. Which one of the following configurations represents a noble gas?

A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4f^{14} 5s^2$

C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^3$

Answer: C

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32. An element has 13 electrons in its M shell and 1 electron in N shell in ground state. Identify the element.

A. Chromium

B. Iron

C. Manganese

D. Copper

Answer: A

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33. Match the column I with column II and mark the appropriate choice.

Column I (Atom)		Column II (No. of unpaired electrons)	
(A)	$_{15}P$	(i)	6 unpaired electrons
(B)	$_{24}Cr$	(ii)	2 unpaired electrons
(C)	$_{26}Fe$	(iii)	3 unpaired electrons
(D)	$_{14}Si$	(iv)	4 unpaired electrons

A.

$$(A) \rightarrow (ii), (B) \rightarrow (i), (C) \rightarrow (iii), (D) \rightarrow (iv)$$

B.

$$(A) \rightarrow (i), (B) \rightarrow (iii), (C) \rightarrow (ii), (D) \rightarrow (iv)$$

C.

$$(A) \rightarrow (iii), (B) \rightarrow (i), (C) \rightarrow (iv), (D) \rightarrow (ii)$$

D.

$$(A) \rightarrow (iv), (B) \rightarrow (ii), (C) \rightarrow (i), (D) \rightarrow (iii)$$

Answer: C

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34. Which of the following quantum numbers are correct for the outermost electorn of sodium atom?

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

B. $n = 3, l = 0, m = 0, s = -1/2$

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

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

Answer: B

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35. The configuration of the valence orbital of an element with atomic number 22 is

A. $3d^5 4s^1$

B. $4s^2 3d^2$

C. $4s^1 4p^1$

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

Answer: B

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36. Three elements 'X', 'Y' and 'Z' have atomic numbers 18, 19 and 20 respectively. How many electrons are present in the M shell of these elements?

A. $8, 9, 10$

B. $8, 10, 13$

C. $8, 8, 8$

D. $8, 9, 12$

Answer: C

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37. What is the atomic number of the element which has $3d^6$ as its outermost configuration?

A. 12

B. 32

C. 26

D. 24

Answer: C

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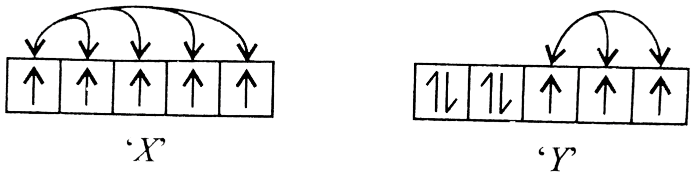
38. Study the orbital diagrams of two atoms 'X and Y'.

Which subshell will be more stable and why?



A. X, exchange energy is maximum, so is stability.

B. Y, exchange energy is maximum, so is stability.

C. X, exchange energy is minimum, so stability is maximum.

D. Y, exchange energy is minimum, so stability is maximum.

Answer: A

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Ncert Exemplar

1. Which of the following conclusions could not be derived from Rutherford's α-particle scattering experiment?

A. Most of the space in the atom is empty.

B. The radius of the atom is about 10^{-10}m while that of nucleus is 10^{-15}m.

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

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

Answer: C

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

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

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

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

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

Answer: B

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3. Which of the following statement is not correct about the characterstics of cathode rays

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

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

C. Characteristics of cathode rays do not depend upon the material of electrodes in cathode ray tube.

D. Characteristics of cathode rays depend upon the nature of gas present in the cathode ray tube.

Answer: D

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

A. It is a negatively charged particle.

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

C. It is a basic constituent of all atoms.

D. It is a constituent of cathode rays.

Answer: B

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

A. Overall neutrality of atom.

B. Spectra of hydrogen atom.

C. Position of electrons, protons and neutrons in atom.

D. Stability of atom.

Answer: A

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6. Two atoms are said to be isobars is

A. they have same atomic number but different mass number

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

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

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

Answer: D

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

A. 3

B. 4

C. 2

D. 1

Answer: D

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

A. 4

B. 3

C. 2

D. 1

Answer: C

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

A. Pauli's exclusion principle

B. Heisenberg's uncertainty principle

C. Hund's rule of maximum multiplicity

D. Aufbau principle

Answer: B

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

A. 2

B. 4

C. 9

D. 3

Answer: C

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11. Orbital angular momentum depends on ....

A. l

B. n and l

C. n and m

D. m and s

Answer: A

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12. Chlorine exists in two isotopic forms $Cl-37$ and Cl-35 but its atomic mass is 35.5. this indicates the ratio of Cl-37 and Cl-35 is appromimately

A. $1:2$

B. $1:1$

C. $1:3$

D. $3:1$

Answer: C

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13. The pair of ions having same electronic configuration is________.

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

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

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

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

Answer: B

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

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

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

C. Z_{eff} for an electron in 1s orbital is the same as Z_{eff} for an electron in a 2s orbital.

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

Answer: D

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

A. Electron

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

C. Neutron

D. Proton

Answer: B

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Assertion And Reason

1. Assertion : The characteristics of cathode rays do not depend upon the material of electrodes and the nature of the gas present in the cathode ray tube.

Reason : Cathode rays consist of negatively charged particles, called electrons.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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2. Assertion : X-rays are used to study the interior of objects .

Reason : X-rays have very short wavelengths and possess electromagnetic character.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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3. Assertion : In Rutherford's α-particle scattering experiment, most of the α-particles were deflected by nearly 180°.

Reason : The positive charge of the atom is spread throughout the atom that repelled and deflected the positively charged α-particles.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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4. Assertion : All the isotopes of a given element show same chemical behaviour.

Reason : Isotopes have different number of neutrons present in the nucleus.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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5. Assertion : In electromagnetic spectrum, the small portion around 10^{15}Hz is called visible light.

Reason :Visible region is only a small part of the entire spectrum which our eyes can see.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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6. Assertion : When an iron rod is heated in a furnace, the radiation emitted goes from a lower frequency to a higher frequency as the temperature increases.

Reason : The energy of a quantum of radiation is proportional to its frequency.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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7. Assertion : The number of electrons ejected from a metal surface depend upon the frequency of light.

Reason : There is a time lag between the striking of light beam and the ejection of electrons from the metal surface.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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8. Assertion : Elements like Rb, Cs, Tl, In, Ga and Sc were discovered when their minerals were analysed by spectroscopic methods.

Reason : The characteristic lines in atomic spectra can be used in chemical analysis to identify unknown atoms.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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9. Assertion : In hydrogen and hydrogen like species, orbital energy depends only on the quantum number n whereas in multi-electron atoms it depends on quantum numbers n and l.

Reason : The principle quantum number determines the size and the energy of the orbital.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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10. Assertion : According to de Broglie, the wavelengths associated with electrons and other subatomic particles can be detected experimentally.

Reason : The wavelength associated with any material particle is directly proportional to its mass,

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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11. Assertion : For l = 2, m_l can be -2, -1, 0, +1 and +2.

Reason : For a given value of l, (2l + 1) values of m_l are possible.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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12. Assertion : Orbit and orbital are synonymous.

Reason : A circular path around the nucleus in which an electron moves is called orbit or orbital.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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13. Assertion : $3d_{z^2}$ orbital is spherically symmetrical.

Reason : The shapes of all five d-orbitals are similar to each other.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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14. Assertion : The maximum number of electrons in the shell with principle quantum number n is equal to $2n^2$.

Reason : Two electrons can have the same value of three quantum numbers n, l and m_l, but must have the opposite spin quantum number.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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15. Assertion : The outer electronic configuration of Cr and Cu are $3d^5 4s^1$ and $3d^{10} 4s^1$ respectively .

Reason : Electrons are filled in orbitals in order of increasing energies given by (n+l) rule.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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Others

1. What will be the wavenumber of yellow radiation having wavelength 240 nm?

A. $1.724 \times 10^4 cm^{-1}$

B. $4.16 \times 10^6 m^{-1}$

C. $4 \times 10^{14} Hz$

D. $219.3 \times 10^3 cm^{-1}$

Answer: B

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2. The wavelength of visible light is

A. 200 nm - 370 nm

B. 780 nm - 890 nm

C. 380 nm - 760 nm

D. 900 nm - 2000 nm

Answer: C

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3. Calculate the energy of one mole of photons of radiation whose frequency is $5 \times 10^{14} Hz$.

A. 199.51 kJ

B. $3.3 \times 10^{-19} J$

C. $6.626 \times 10^{-34} J$

D. $2.31 \times 10^{5} J$

Answer: B

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4. The energy of a photon is given as $3.03 \times 10^{-19} J$.

The wavelength of the photon is

A. 6.56 nm

B. 65.6 nm

C. 0.656 nm

D. 656 nm

Answer: D

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5. What will be the energy of a photon which corresponds to the wavelength of 0.50 Å?

A. $3.98 \times 10^{-15} J$

B. $3 \times 10^{15} J$

C. $3.9 \times 10^{8} J$

D. $3 \times 10^{-34} J$

Answer: A

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6. Compare the energies of two radiations E_1 with wavelength 800 nm and E_2 with wavelength 400 nm.

A. $E_1 = 2E_2$

B. $E_1 = E_2$

C. $E_2 = 2E_1$

D. $E_2 = -\frac{1}{2}E_1$

Answer: C

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7. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom . Calculate the ionisation energy of sodium in kJ mol^{-1}.

A. 494.5×10^{-6} J/atom

B. 8169.5×10^{-10} J/atom

C. 5.85×10^{-15} J/atom

D. 8.214×10^{-19} J/atom

Answer: D

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8. The energy difference between ground state of an atom and its excited state is $3 \times 10^{-19} J$. What is the wavelength of photom required for this radiation ?

A. 6.6×10^{-34}m

B. 3×10^{-8}m

C. 1.8×10^{-7}m

D. 6.6×10^{-7}m

Answer: D

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9. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.

A. $3 \times 10^{20} s^{-1}$

B. $2 \times 10^{-20} s^{-1}$

C. $2 \times 10^{20} s^{-1}$

D. $1 \times 10^{-20} s^{-1}$

Answer: C

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10. Mark the incorect statement regarding the photoelectric effect.

A. There is no time lag between the striking of light beam and the ejection of electrons from the metal surface.

B. The number of electrons ejected is inversely proportional to the intensity of light.

C. Photoelectric effect is not observed below threshold frequency.

D. The kinetic energy of the electrons increases with increase in frequency of light used.

Answer: B

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11. A certain metal when irradiated to light $(v = 3.2 \times 10^{16} Hz)$ emits photoelectrons with twice kinetic energy as did photoelectrons when the same metal is irradiation by light $(v = 2.0 \times 10^{16} Hz)$. The v_0 Threshold frequency) of the metal is

A. 1.2×10^{14}Hz

B. 8×10^{15} Hz

C. 1.2×10^{16} Hz

D. 4×10^{12} Hz

Answer: B

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12. The spectrum of while light ranging from red to violet is called a continuous spectrum because

A. different colours are seen as different bands in the spectrum

B. the colours continuously absorb energy to form a spectrum

C. the violet colour merges into blue, blue into green, green into yellow and so on

D. it is a continuous band of coloured and white light separating them.

Answer: C

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13. 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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14. Match the constants given in column I with their values given in column II and mark the appropriate choice.

Column I		Column II	
(A)	Rydberg constant	(i)	6.626×10^{-34} J s
(B)	Planck's constant	(ii)	3.00×10^{8} m s^{-1}
(C)	Velocity of light	(iii)	750×10^{-9} m
(D)	Wavelength of red light	(iv)	109,677 cm^{-1}

A.

$$(A) \rightarrow (iii), (B) \rightarrow (ii), (C) \rightarrow (i), (D) \rightarrow (iv)$$

B.

$$(A) \rightarrow (ii), (B) \rightarrow (iv), (C) \rightarrow (i), (D) \rightarrow (iii)$$

C.

$$(A) \rightarrow (i), (B) \rightarrow (iii), (C) \rightarrow (iv), (D) \rightarrow (ii)$$

D.

$$(A) \rightarrow (iv), (B) \rightarrow (i), (C) \rightarrow (ii), (D) \rightarrow (iii)$$

Answer: D

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15. The electron in Bohr's model of hydrogen atom is pictured as revolving around the nucleus in order for it to

A. emit protons

B. keep from being pulled into the nucleus

C. keep from being repelled by the nucleus

D. possess energy.

Answer: D

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16. Given below are the spectral lines for an atom of hydrogen. Mark the lines which are not correctly matched with the value of n_1 and n_2?

	Series	n_1	n_2	Region
(i)	Lyman	1	2, 3, ...	Ultraviolet
(ii)	Balmer	2	3, 4, ...	Infrared
(iii)	Paschen	3	4, 5, ...	Infrared
(iv)	Pfund	4	5, 6, ...	Infrared

A. (i) and (ii)

B. (i) and (iii)

C. (ii) and (iv)

D. (i) and (iv)

Answer: C

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17. What is the maximum number of emission lines when the excited electron of a H atom in $n = 6$ drop to the ground state?

A. 6

B. 15

C. 30

D. 10

Answer: B

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

A. 12

B. 15

C. 21

D. 10

Answer: D

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19. What is the colour corresponding to the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from n = 4 to n = 2?

A. Blue

B. Red

C. Yellow

D. Green

Answer: A

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20. Which one of the series of hydrogen spectrum is in the visible region ?

A. Lyman

B. Balmer

C. Paschen

D. Brackett

Answer: B

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21. An electron in excited hydrogen atom falls from fifth energy level to second energy level. In which of the following regions, the spectral line will be observed and is part of which series of the atomic spectrum?

A. Visible, Balmer

B. Ultraviolet, Lyman

C. Infrared, Paschen

D. Infrared, Brackett

Answer: A

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22. The third line of the Balmer series, in the emission spectrum of the hydrogen atom, is due to the transition from the

A. fourth Bohr orbit to the first Bohr orbit

B. fifth Bohr orbit to the second Bohr orbit

C. sixth Bohr orbit to the third Bohr orbit

D. seventh Bohr orbit to the third Bohr orbit.

Answer: B

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23. The frequency of radiation absorbed or emitted when transition occurs between two stationary states with energies E_1 (lower) and E_2 (higher) is given by

A. $v = \frac{E_1 + E_2}{h}$

B. $v = \frac{E_1 - E_2}{h}$

C. $v = \frac{E_1 \times E_2}{h}$

D. $v = \frac{E_2 - E_1}{h}$

Answer: D

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24. The angular momentum of an electron in a given stationary state can be expressed as $m_e vr = n\frac{h}{2\pi}$.

Based on this expression an electron can move only in those orbits for which its angular momentum is

A. equal to n

B. integral multiple of $\frac{h}{2\pi}$

C. multiple of n

D. equal to $\frac{h}{2\pi}$ only.

Answer: B

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

A. $\frac{10h}{\pi}$

B. $\frac{25h}{\pi}$

C. $\frac{1.5h}{\pi}$

D. $\frac{2.5h}{\pi}$

Answer: D

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26. The radius of the stationary state which is also called Bohr radius is given by the expression $r_n = n^2 a_0$ where the value of a_0 is

A. 52.9 pm

B. 5.29 pm

C. 529 pm

D. 0.529 pm

Answer: A

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27. If the radius of first Bohr orbit be a_0, then the radius of the third orbit would be-

A. $(3 \times x)$ pm

B. $(6 \times x)$ pm

C. $\left(\frac{1}{2} \times x\right)$ pm

D. $(9 \times x)$ pm

Answer: D

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28. What does the negative electronic energy (negative sign for all values of energy) for hydrogen atom means?

A. The energy of an electron in the atom is lower than the energy of a free electron at rest which is taken as zero.

B. When the electron is free from the influence of nucleus it has a negative value which becomes more negative.

C. When the electron is atteracted by the nucleus the energy is obsorbed which means a negative value.

D. Energy is released by hydrogen atom in ground state.

Answer: A

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29. The energy of the electron in a hydrogen atom has a negative sign for all possible orbits because

A. when the electron is attracted by the nucleus and is present in orbit n, the energy is emitted and its energy is lowered.

B. when the electron is attracted by the nucleus and is present in orbit n, the energy is absorbed and its energy is increased.

C. when the electron is repelled by the nucleus, the energy is released and its energy is lowered.

D. none of these.

Answer: A

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30. If the ionization energy for the hydrogen atom is 13.6 eV , the energy required to excite it from the ground state to the next higher state is nearly

A. 3.4 eV

B. 10.2 eV

C. 17.2 eV

D. 13.6 eV

Answer: A

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31. Bohr's theory can also be applied to the ions like

A. He^{+}

B. Li^{2+}

C. Be^{3+}

D. all of these.

Answer: D

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32. According to Bohr's theory, the electronic energy of H-atom in Bohr's orbit is given by

A. $E_n = -\dfrac{2.18 \times 10^{-19} \times Z}{2n^2} J$

B. $E_n = -\dfrac{2.179 \times 10^{-18} \times Z^2}{n^2} J$

C. $E_n = -\dfrac{21.79 \times 10^{-18} \times Z}{2n^2} J$

D. $E_n = -\dfrac{21.8 \times 10^{-21} \times Z^2}{n^2} J$

Answer: B

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33. The Bohr's energy of a stationary state of hydrogen atom is given as $E_n = \dfrac{-2\pi^2 me^4}{n^2 h^2}$. Putting the values of m and e for n^{th} energy level which is not the correct value?

A. $E_n = \dfrac{-21.8 \times 10^{-19}}{n^2} Ja \rightarrow m^{-1}$

B. $E_n = \frac{-13.6}{n^2} eVa \rightarrow m^{-1}$

C. $E_n = \frac{-1312}{n^2} kJmol^{-1}$

D. $E_n = \frac{-12.8 \times 10^{-19}}{n^2} erga \rightarrow m^{-1}$

Answer: D

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34. Which of the following is not correctly matched?

A. Energy associated with Bohr's orbit,

$$E = \frac{-2.18 \times 10^{-18} J \times Z^2}{n^2}$$

B. Energy gap between two orbits,

$$\Delta E = R_H\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

C. Kinetic energy of the ejected electron,

$$hv = hv_0 + \frac{1}{2}mv^2$$

D. Energy of one mole of photons, $E = N_0\frac{h\lambda}{c}$

Answer: D

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35. What is the trend of energy of Bohr's orbits?

A. Energy of the orbit increases as we move away from the nucleus.

B. Energy of the orbit decreases as we move away from the nucleus.

C. Energy remains same as we move away from the nucleus.

D. Energy of Bohr's orbit cannot be calculated.

Answer: A

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36. The radius of hydrogen atom in the ground state 0.53Å. The radius of Li^{2+} ion (Atomic number = 3) in a similar state is

A. 1.06 Å

B. 0.265 Å

C. 0.17 Å

D. 0.53 Å

Answer: C

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37. Calculate the velocity of an electron in the first Bohr orbit of a hydrogen atom

A. 2.18×10^5 m/s

B. 2.18×10^6 m/s

C. 2.18×10^{-18} m/s

D. 2.18×10^{-9} m/s

Answer: B

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

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

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

C. $\dfrac{2\pi mr}{n^2 h^2}$

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

Answer: A

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39. Which one is not in agreement with Bohr's model of the atom?

A. Line spectra of hydrogen atom

B. Pauli's exclusion principle

C. Planck's theory

D. Heisenberg's uncertainty principle

Answer: D

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

A. Stark effect

B. Zeeman effect

C. photoelectric effect

D. screening effect

Answer: B

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