PHYSICS

AAKASH INSTITUTE ENGLISH

ATOMS

Example

1. The mass of an $\alpha-$ particle is.

2. Very thin foil of gold was used in scattering experiment. Why ?

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3. Most of the α-particles passed through the foil undeviated . What can be concluded from this observation ?

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4. According to Rutherford, which force was responsible for centripetal acceleration of an electron revolving around the nucleus?

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5. What should be the effect of impact parameter upon the deviation of α-particle.

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6. Which of the following can be the angular momentum of an electron orbiting in a hydrogen atom ? (a) $\frac{4h}{\pi}$, (b) $\frac{3h}{2\pi}$, (c) $\frac{3h}{4\pi}$, (d) $\frac{h}{\pi}$

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7. What should be the velocity of an electron in third stable orbit of Hydrogen atom ? (in terms of speed of light)

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8. What would be the charge in radius of n^{th} orbit, if the mass of electron reduces to half of its original value ?

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9. Total energy of an electron in an atom is negative. What does it signify?

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10. What would be the ratio of product of velocity and time period of electron orbiting in 2^{nd} and 3^{rd} stable orbits ?

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11. What is the energy required to remove an electron from second orbit of hydrogen atom ?

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12. with the help of Rydberg formula find the wavelength of first line of Pfund series .

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13. Which of the following is/are possible values of radius of stable orbit of hydrogen atom ?

(a) $\frac{\lambda}{2\pi}$, (b) $\frac{3\lambda}{4\pi}$, (c) $\frac{\lambda}{\pi}$, (d) $\frac{5\lambda}{4\pi}$

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14. An electron revolves around a proton in a hydrogen atom in an orbit of radius r. Considering the wave nature of electron and assuming that electron is present in the form of a stationary wave. Show that the angular momentum of the electron is quantized.

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15. Determine the wavelength of the first Lymanline,the transition from $n = 2 \text{ to } n = 1$

.In what region of the electromagnetic spectrum does this line lie ?

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16. Determine the wavelengh of light emitted when a hydrogen atom makes a transition from the n=6 to the n=2 energy level according to the Bohr model

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17. Suggest two comouds (fuel) other than hydrogen that can be used as fuels in fuel cells

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18. (a)Use the Bohr model to determine the ionization energy of the He^{+} ion, which has a single electron. (b)Also calculate the maximum wavelength a photon can have to cause ionization.

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19. When $CaCO_3$ is heated to a high temperature, it undergoes decomposition into CaO and CO_2 whereas it is quite stable at room temperature. The most likely explanation of its is

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20. A hydrogen like atom of atomic number Z is in an excited state of quantum number 2n. It can emit a maximum energy photon of 204 eV.

If it makes a transition to quantum state n, a photon of energy 40.8 eV is emitted. Find n, Z and the ground state energy (in eV) of this atom. Also calculate the minimum energy(eV) that can be emitted by this atom during de - excitation. Ground state energy of hydrogen atom is -13.6 eV

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21. An isolated hydrogen atom emits a photon of $10.2eV$.

(i) Determine the momentum of photon emitted (ii) Calculate the recoil momentum of the atom

(iii) Find the kinetic energy of the recoil atom

[Mass of proton $= m_p = 1.67 \times 10^{-27} kg$]

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22. A hydrogen atom in a state of binding energy 0.85 eV makes a transition to a state of excitation energy of 10.2 eV . Find the energy and wavelength of photon emitted.

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23. How much (in %) the binding energy of electron differs in hydrogen atom when mass of nucleus is taken into account of infinite value (i.e., nucleus is motionless) and of infinite value.

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24. Find the maximum frequency, the X-ray emitted by an X-ray tube operating at $30kV$

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25. An X-ray tube, operated at a potential difference of 40 kV, produce heat at the rate of 720 W.Assuming 0.5% of the energy of incident electrons is converted into X-rays , calculate

(i)The number of electron per second striking the target

(ii)The velocity of the incident electrons .

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26. The wavelength of k_{α} line in the X-ray spectrum for tungsten (Z=74) is 200 Å. What would be the wavelength of same line for platinum Z =78 ?

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27. Different forms of a gene located at the same locus of chromosomes are called

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28. A particle of mass is confined to a narrow tube of length L.

(a) Find the wavelengths of the de-Brogile wave which will resonate in the tube.

(b) Calculate the corresponding particle moments. and

(c) Calculate the corresponding energies.

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41. Which of the following is/are possible values of radius of stable orbit of hydrogen atom ?

(a) $\frac{\lambda}{2\pi}$, (b) $\frac{3\lambda}{4\pi}$, (c) $\frac{\lambda}{\pi}$, (d) $\frac{5\lambda}{4\pi}$

A. $\lambda = 2\pi$

B. $3\frac{\lambda}{4}\pi$

C. $\dfrac{\lambda}{\pi}$

D. $5\dfrac{\lambda}{4}\pi$

Answer:

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42. If the K_{α} radiation of $Mo(Z=42)$ has a wevelength of 0.71Å, calculate wevelength of the corresponding radiation of $Cu, i.e., k_{\alpha}f$ or $Cu(Z=29)$ assuming b = 1.

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43. Find the cut off wavelength for the continuous X - rays coming from an X-ray tube operating at 40 kV.

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Try Yourself

1. What is the ratio of mass of a gold atom and an α-particle ?

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2. What is the ratio of mass af an α particle and a proton?

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3. Why did Rutherford select a gold foil in his α-ray scattering experiment ?

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4. Alpha particle would go undiviated when it collides with an electron of gold foil . Why ?

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5. What was the fraction of $\alpha - partic \leq s$ in which deflection of more than 90° was observed?

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6. What was the fraction of α-particles in which deflection of more than 1° was observed ?

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7. Find the expression of radius of an orbit of electron in terms of nucleus charge Q_2, tangential velocity v and mass of electron m_e ?

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8. What would be the change in tangential velocity of an electron, if it remains in same orbit and electronic charge is doubled ?

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9. What should be the angle of deviation for

(i) $b = 0$

(ii) a large value of b

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10. The minimum orbital angular momentum of the electron in a hydrogen atom is

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11. When an electron makes transition from its stable orbit to another stable orbit of lower energy , where does the remaining energy go ?

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12. Find the ratio of velocities of electron in 2^{nd} and 4^{th} orbit of hydrogen atom

Hint : $V \propto \dfrac{1}{n}$

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13. What should be the maximum velocity of an electron orbiting around a hydrogen nucleus

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14. What is the ratio of radii of 3^{rd} and 2^{nd} orbit of hydrogen atom ?

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15. Find the area enclosed by the circular path of an electron in first orbit of hydrogen atom.

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16. What is the ratio of magnitude of potential energy to the kinetic energy for an electron in hydrogen atom ?

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17. If total energy of the same electron is E, then what would be its kinetic energy and potential energy .

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18. Choose correct option out of the following with increase in n.

(a)T increases and v decreases

(b)T and V both increase

(c)T decreases and v increase

(d)T and V both decrease

where T is time period and v is velocity of an electron

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19. What is the value of n for which time period is 8 times the time period of electron is first orbit of hydrogen atom ?

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20. What is the energy emitted when an electron jumps froms second orbit to first orbit in a hydrogen atom ?

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21. With increase in n, ionisation energy will increase or decrease ?

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22. Find the ratio of wavelengths of first line of Lyman series and second line of Balmer series

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23. Find the minimum wavelength emitted by a hydrogen atom due to electronic transition.

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24. de Broglie explained the Bohr's postulate of quantization by particle nature of electron(True/False)

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25. What is the ratio of mass of a gold atom and an α-particle ?

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33. What should be the angle of deviation for (i)b=0 , (ii)a large value of b

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34. Rutherford's a particle experiment showed that the atoms have

A. Electrons

B. Neutrons

C. Nucleus

D. Protons

Answer:

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35. According to classical theory, Rutherford atom was

A. Parabole

B. Hyperbolic

C. Circular

D. Elliptical

Answer:

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36. What should be the minimum value of angular momentum for an electron orbiting in a hydrogen atom ?

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where T is time period and v is velocity of an electron.

A. T increases and v decreases

B. T and v decreases

C. T decreases and v increases

D. T and v both decrease

Answer:

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Watch Video Solution

50. De-Broglie explained the Bohr's postulate of quantization by particle nature of electron. (True /False)

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51. If the intensity of an X-ray becomes $\frac{I_0}{3}$ from I_0 after travelling 3.5cm inside a target then its intensity after travelling next 7 cm will be

A. $\frac{I_0}{6}$

B. $\frac{I_0}{12}$

C. $\frac{I_0}{9}$

D. $\frac{I_0}{27}$

Answer:

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52. The intensity distribution of X-rays from two Coolidge tubes operated at different voltages V_1 and V_2 and using different target materials of atomic numbers Z_1 and Z_2 is shown in the figure which one of the following inequalities is true?

A. $V_1 > V_2, Z_1 < Z_2$

B. $V_1 > V_2, Z_1 > Z_2$

C. $V_1 < V_2, Z_1 > Z_2$

D. $V_1 = V_2, Z_1 < Z_2$

Answer:

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53. In the Coolidge tube experiment when the target material is changed then

A. Only continuous spectra changes

B. Only characteristic spectra changes

C. Both the spectra change

D. Neither continuous nor characteristic spectra change

Answer:

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Assignment Section A Objective One Option Is Correct

1. Thickness of the foil of gold used in α-particle scattering experiment is

A. 2.1×10^{-7} m

B. 3.5×10^{-5} m

C. 2.1×10^{-9} m

D. 3.5×10^{-6} m

Answer: A

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2. In Rutherford's alpha-rays scattering experiment, the alpha particles are detected using a screen coated with

A. Copper sulphide

B. Zinc sulphide

C. Graphite

D. Gold

Answer: B

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3. In Rutherford's experiment , scattering of more than 1° was observed in

A. 14% of the incident α-particle

B. about 0.14% of the incident α-particles

C. about 1.4% of the incident α-particles

D. about 0.014% of the incident α-particles

Answer: B

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4. In scattering experiment , α -particles were deflected by

A. Repulsive force of electrons

B. Repulsive force of gold nucleus

C. Attractive force of electrons

D. Attractive force of gold nucleus

Answer: B

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5. Energy of the beam of α-particles used by Geiger and Marsden in scattering experiment is

A. 2.2 MeV

B. 4.2 MeV

C. 5.1 MeV

D. 5.5 MeV

Answer: D

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6. Source of α-particles used in scattering experiment was

A. $._{82}Bi^{216}$

B. $._{81}Bi^{216}$

C. $._{81}Bi^{214}$

D. $._{83}^{214}Bi$

Answer: D

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7. What is the distance of closest approach to the nucleus for an α-particle of energy 5 MeV which undergoes scattering in the Gieger-Marsden experiment.

A. 3.2×10^{-16} m

B. 3.8×10^{-14} m

C. 4.6×10^{-15} m

D. 3.2×10^{-15} m

Answer: B

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8. An α-particle colliding with one of the electrons in a gold atom looses

A. Most of its momentum

B. About $\frac{1}{3}$rd of its momentum

C. Little of its energy

D. Most of its energy

Answer: C

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9. The angular momentum of an electron in a hydrogen atom is proportional to (where n is principle quantum number)

A. n

B. n^2

C. n^3

D. $\sqrt{n}$

Answer: A

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10. When an electron in hydrogen atom is taken from fourth excited state to ground state

A. Both kinetic energy and potential energy

B. Both kinetic energy and potential energy decreases

C. Kinetic energy will increase while potential energy will decrease

D. Kinetic energy will decrease while potential energy will increase

Answer: C

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11. What is the angular momentum of an electron in Bohr's hydrogen atom whose energy is $-0.544eV$?

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

B. $\frac{3h}{2\pi}$

C. $\frac{5h}{2\pi}$

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

Answer: C

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12. The ground state energy of H-atom is 13.6 eV. The energy needed to ionise H-atom form its second excited state

A. 1.51 eV

B. 3.4 eV

C. 13.6 eV

D. 12.1 eV

Answer: A

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13. The energies of three conservative energy levels L_3, L_2 and L_1 of hydrogen atom are E_0. $\frac{4E_0}{9}$ and $\frac{E_0}{4}$ respectively. A photon of wavelength λ is emitted for a transition L_3 to L_1 .What will be the wavelength of emission for transition L_2 to L_1 ?

A. $\dfrac{16\lambda}{31}$

B. $\dfrac{27\lambda}{7}$

C. $\dfrac{19}{20}\lambda$

D. λ

Answer: B

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14. The product of angular speed and tangential speed of electron in n^{th} orbit of hydrogen atom is

A. Directly proportional to n^2

B. Directly proportional to n^3

C. Inversely proportional to n^4

D. independent of n

Answer: C

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15. The speed of an electron in the 4^{th} orbit of hydrogen atom is

A. c

B. $\frac{c}{137}$

C. $\frac{c}{2192}$

D. $\frac{c}{548}$

Answer: D

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16. What should be the ratio of minimum to maximum wavelength of radiation emitted by transition of an electron to ground state of Bohr's hydrogen atom ?

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

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{3}{8}$

Answer: A

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17. The ratio of energies of hydrogen atom in its first excited state to third excited state is

A. $\frac{1}{4}$

B. $\frac{4}{1}$

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

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

Answer: B

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18. How many spectral lines are emitted by atomic hydrogen excited to the $n-th$ energy level?

A. n

B. 2n

C. $\dfrac{n^2-n}{2}$

D. $\dfrac{n^2+n}{2}$

Answer: C

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19. The energy of hydrogen atom in its ground state is -13.6 eV , the energy of the level corresponding to n=7 is

A. -0.544 eV

B. -5.40 eV

C. -0.85 eV

D. -0.28 eV

Answer: D

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20. In which transition of a hydrogen atom, photons of lowest frequency are emitted ?

A. n=4 to n=3

B. n=4 to n=2

C. n=2 to n=1

D. n=3 to n=1

Answer: A

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21. Total energy of an electron in the hydrogen atom in the ground state is -13.6 eV. The potential energy of this electron is

A. 13.6 eV

B. 0

C. -27.2 eV

D. -13.6 eV

Answer: C

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22. Using Bohr's formula for energy quantization, the ionisation potential of first excited state of hydrogen atom is

A. 10.2V

B. 3.4 V

C. 2.6 V

D. 1.54 V

Answer: B

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23. Which of the following cannot be the value of ionisation energy for a hydrogen atom ?

A. 0.85 eV

B. 3.4 eV

C. 1.51 eV

D. 0.27 eV

Answer: D

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24. Name the spectral series of hydrogen atom, which be in infrared region.

A. Lyman

B. Balmer

C. Brackett, Paschen and Pfund

D. All of these

Answer: C

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25. The energies of three conservative energy levels L_3, L_2 and L_1 of hydrogen atom are E_0, $\frac{4E_0}{9}$ and $\frac{E_0}{4}$ respectively. A photon of wavelength λ is emitted for a transition L_3 to L_1 .What will be the wavelength of emission for transition L_2 to L_1 ?

A. $\lambda_3 = \lambda_1 + \lambda_2$

B. $\lambda_1 = \dfrac{\lambda_2 \lambda_3}{\lambda_2 + \lambda_3}$

C. $\lambda_1 = \lambda_2 + \lambda_3$

D. $\lambda_3 = \dfrac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

Answer: B

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26. if the wavelength of first member of Lyman series is λ then calculate the wavelength of first member of Pfund series

A. $\frac{675}{11}\lambda$

B. $\frac{245}{11}\lambda$

C. $\frac{322}{13}\lambda$

D. $\frac{289}{11}\lambda$

Answer: A

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27. In Bohr's model of the hydrogen atom, the ratio between the period of revolution of an electron in the orbit of $n = 1$ to the period of revolution of the electron in the orbit $n = 2$ is

A. $2 : 1$

B. $1 : 2$

C. $1 : 4$

D. $1:8$

Answer: D

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28. How many time does the electron go round the first bohr orbit of hydrogen atoms in $1s$?

A. 2.3×10^{12}

B. 3.2×10^{14}

C. 8.3×10^{14}

D. 6.2×10^{14}

Answer: C

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29. If an electron in hydrogen atom jumps from third orbit to second orbit, the frequency of the emitted radiation is given by (c is speed of light)

A. $\frac{3Rc}{29}$

B. $\frac{5Rc}{36}$

C. $\frac{7Rc}{36}$

D. $\frac{8Rc}{31}$

Answer: B

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30. If radius of first orbit of hydrogen atom is $5.29 * 10^{-11} m$, the radius of fourth orbit will be

A. 8.46 Å

B. 10.23 Å

C. 9.22 Å

D. 9.48 Å

Answer: A

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31. Bohr's atomic model is applicable for

A. Hydrogen atom only

B. Unielectron atomic system only

C. All atoms

D. All isotopes of hydrogen only

Answer: B

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32. Let F_1 be the frequency of second line of Lyman series and F_2 be the frequency of first line of Lyman series is given by

A. $F_1 - F_2$

B. $F_1 + F_2$

C. $F_2 - F_1$

D. $\dfrac{F_1 F_2}{F_1 + F_2}$

Answer: A

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33. The differnce between nth and $(n+1)$ the Bohr radius of B atom is equal to be its $(n-1)$ th Bohr radius .The value of n is

A. 4

B. 3

C. 2

D. 1

Answer: A

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34. The lines in Balmer series have their wavelengths lying between

A. 1266 Å to 3647 Å

B. 642 Å to 3000 Å

C. 3647 Å to 6563 Å

D. Zero to infinity

Answer: C

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35. Identify the incorrect relationship

A. Number of waves in an orbit, $n = \frac{2\pi r}{\lambda}$

B. Number of revolutions of an electron per second in n^{th} orbit $= \frac{V_n}{2\pi r_n}$

C. Wavelength of an electron $= \frac{h}{p}$

D. Speed of a (de-Broglie wavelength) particle accelerated by potential difference V is $v = \frac{2\text{eV}}{m}$

Answer: D

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Assignment Section B Objective One Option Is Correct

1. Magnetic moment of an electron in hydrogen atom due to revolution around nuclons is $\frac{hS}{2\pi}$. Here h is Planck's constant and S is specific charge of electron . Kinetic energy of this electron is

A. a.4.53 eV

B. b.1.51 eV

C. c.3.4 eV

D. d.6.8 eV

Answer: C

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2. If He^{+} ion undergoes transition n=2 $\rightarrow$ 1 the ratio of final to initial magnetic field due to motion of electron at the nucleus will

A. a.$32 : 1$

B. b.$1 : 32$

C. $c16:1$

D. $d.1:16$

Answer: A

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3. If longest wavelength of Balmer series of H atom is λ then shortest wavelength of Lyman series will be

A. $\frac{5}{36}\lambda$

B. $\frac{5}{9}\lambda$

C. $\frac{36}{5}\lambda$

D. $\frac{5}{9}\lambda$

Answer: A

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4. An electron in a hydrogen atom makes a transition such that its kinetic energy increases, then

A. The electron may have excited form n=2 to n=3

B. Potential energy of the electron increases

C. Potential energy of the electron decreases

D. Total energy of the electron increases

Answer: C

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5. A hydrogen atom and a Li^{2+} ion are both in the second excited state. If l_H and l_{Li} are their respective electronic angular momenta, and E_H and E_{Li} their respective energies, then

(a) $l_H > l_{Li}$ and $|E_H| > |E_{Li}|$

(b) $l_H = l_{Li}$ and $|E_H| < |E_{Li}|$

(C) $l_H = l_{Li}$ and $|E_H| > |E_{Li}|$

(d) $l_H < l_{Li}$ and $|E_H| < |E_{Li}|$

A. $L_H > L_{\mathrm{Li}}$ and $|E_H| > |E_{\mathrm{Li}}|$

B. $L_H = L_{\mathrm{Li}}$ and $|E_H| < |E_{\mathrm{Li}}|$

C. $L_H = L_{\text{Li}}$ and $|E_H| > |E_{\text{Li}}|$

D. $L_H < L_{\text{Li}}$ and $|E_H| < |E_{\text{Li}}|$

Answer: B

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6. Imagine an atom made up of a proton and a hypothetical particle of dounle the masss of the electron but having the same charge as the electron . Apply the Bohr atomic model and consider all possible transitions of this hypothetical particle to the first excited level. The longest wavelength of photon in the Balmer series has wavelength λ (given in terms of the Rydberg constant R for hydrogen atom) equal to

A. $\frac{9}{5\mathrm{R}}$

B. $\frac{36}{5\mathrm{R}}$

C. $\frac{18}{5\mathrm{R}}$

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

Answer: C

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7. When ultraviolet radiation is incident on a surface, no photoelectrons are emitted. If another beam causes photoelectrons to be emitted from the surface, it may consist of

(i) radio waves

(ii) infrared rays

(iii) X-rays

(iv) gamma rays

A. infra-red light

B. Visible light

C. X-rays

D. Micro-waves

Answer: C

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8. The magnetic fieold at the centre of a hydrogen atom due to the motion of the electron in the first Bohr orbit is B . The magnetic field at the centre due to the motion of the electron in the second Bohr orbit will be

$\frac{B}{2^x}$ Find value of x.

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

B. $\frac{B}{8}$

C. $\frac{B}{32}$

D. $\frac{B}{64}$

Answer: C

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9. The energy of a photon of characteristic X-ray from a Coolidge tube comes from

A. The kinetic energy of the strinking electron

B. The kinetic energy of the free electrons of target

C. The kinetic energy of the ions of the target

D. On atomic transition in the target

Answer: D

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10. A hydrogen atom in ground state absorbs 12.09 eV of energy . The orbital angular momentum of the electron

A. Is doubles

B. Is halved

C. Remains same

D. Becomes three times

Answer: D

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11. An excited hydrogen atom emits a photon of wavelength λ in returning to the ground state. If 'R' is the Rydberg's constant, then the quantum number 'n' of the excited state is:

A. $\sqrt{\lambda R(\lambda R - 1)}$

B. $\sqrt{\dfrac{\lambda R}{\lambda R - 1}}$

C. $\sqrt{\dfrac{\lambda R - 1}{\lambda R}}$

D. $\sqrt{\dfrac{1}{\lambda R(\lambda R-1)}}$

Answer: B

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12. An electron in a hydrogen atom makes a transition $n_1 \to n_2$ where n_1 and n_2 are principle quantum numbers of the states . Assume the Bohr's model to be valid , the frequency of revolution in initial state is eight times that of final state. The ratio n$\dfrac{n_1}{n_2}$ is

A. $8:1$

B. $4:1$

C. $2:1$

D. $1:2$

Answer: D

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Assignment Section C Objective More Than One Option Is Correct

1. For a doubly ionised Li-atom

A. Angular momentum of an electron in 3rd

orbit is $\frac{3h}{2\pi}$

B. Energy of electron in 2nd excited state is

-13.6 eV

C. Speed of electron in 3rd orbit is $\frac{c}{137}$,

where c is speed of light

D. Kinetic energy of electron is 2nd excited

state is half of the magnitude of the

potential energy

Answer: A::B::C::D

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2. Choose the correct alternatives

A. Ratio to maximum of minimum wavelength obtained in Balmer series of hydrogen spectrum is 1.8

B. For transition of electron from orbit with n=8 to orbit with n=3 , ultraviolet radiations are emitted

C. Lyman series corresponds to ultraviolet region of radiation

D. Spectrum of hydrogen is continuous

Answer: A::C

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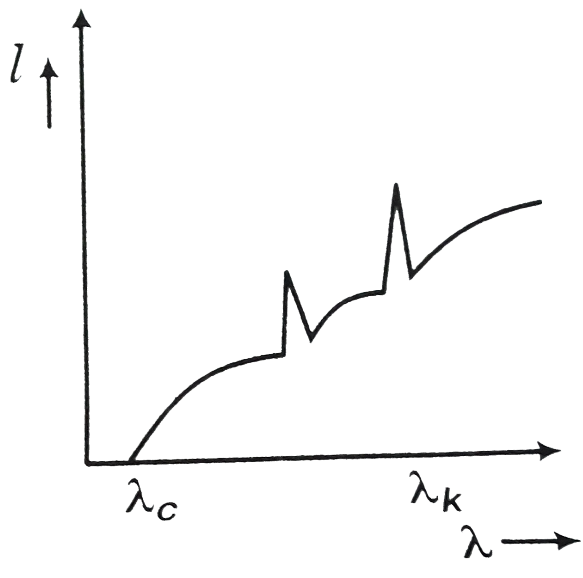
3. The intensity of X-rays from a coolidge tube is plotted against wavelength as shown in the figure . The minimum wavelegth found is λ_c and the wavelength of the K_α line is λ_k. As the accelerating voltage is increased



A. $\lambda_k - \lambda_c$ increases

B. λ_k increases

C. λ_c decreases

D. $\lambda_k - \lambda_c$ decreases

Answer: A::C

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4. When an electron revolving in the ground state of a hydrogen atom jumps to its 2^{nd} excited state.

A. It frequency of revolution becomes $(3)^{2/3}$ times

B. It frequency of revolution becomes $(3)^{-3}$ times

C. Its speed becomes $\left(\frac{1}{3}\right)$ times

D. Its speed becomes $\left(\frac{1}{9}\right)$ times

Answer: B::C

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5. Electrons of energy 12.1 eV are fired at hydrogen atoms in a discharge tube. If the ionization potential of hydrogen is 13.6 eV, then

A. Hydrogen atom may emit a wavelength 1028 Å

B. Hydrogen atom may emit a wavelength 6581 Å

C. Hydrogen atom may emit a wavelength 970 Å

D. Hydrogen atom may emit a wavelength

1217 Å

Answer: A::B::D

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6. The electron in a hydrogen atom jumps back from an excited state to ground state, by emitting a photon of wavelength $\lambda_0 = \frac{16}{15R}$, where R is Rydbergs's constant. In place of emitting one photon, the electron could come back to ground state by

A. a.Emitting 3 photons of wavelengths λ_1, λ_2 and λ_3 such that $\frac{1}{\lambda_1} + \frac{1}{\lambda_2} + \frac{1}{\lambda_3} = \frac{15R}{16}$

B. b.Emitting 2 photons of wavelengths λ_1 and λ_2 such that $\frac{1}{\lambda_1} + \frac{1}{\lambda_2} = \frac{15R}{16}$

C. c.Emitting 2 photons of wavelengths λ_1 and λ_2 such that $\lambda_1 + \lambda_2 = \frac{15R}{16}$

D. d.Emitting 3 photons of wavelengths λ_1, λ_2 and λ_3 such that $\lambda_1 + \lambda_2 + \lambda_3 = \frac{16}{15R}$

Answer: A::B

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Assignment Section D Linked Comprehension

1. In a sample of hydrogen atoms, all the atoms exist in two energy levels A and B. A is the ground level and B is some higher energy level. These atoms absorb photons of energy 2.7 eV and attain a higher energy level C.After this, these atoms emit photons of six different energies. Some of these photon energies are higher than 2.7 eV, some equal to 2.7 eV and some are loss than 2.7 eV.

The principal quantum number corresponding to energy level C is

A. 1

B. 2

C. 3

D. 4

Answer: D

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2. In a sample of hydrogen atoms, all the atoms exist in two energy levels A and B. A is the ground level and B is some higher energy level. These atoms absorb photons of energy 2.7 eV and attain a higher energy level C.After this, these atoms emit photons of six different energies. Some of these photon energies are higher than 2.7 eV, some equal to 2.7 eV and some are loss than 2.7 eV.

The principal quantum number corresponding to energy level B is

A. 1

B. 2

C. 3

D. 4

Answer: B

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3. In a sample of hydrogen atoms, all the atoms exist in two energy levels A and B. A is the ground level and B is some higher energy level. These atoms absorb photons of energy 2.7 eV and attain a higher energy level C.After this, these atoms emit photons of six different energies. Some of these photon energies are higher than 2.7 eV, some equal to 2.7 eV and some are loss than 2.7 eV.

The atomic number of these atoms is

A. 1

B. 2

C. 3

D. 4

Answer: A

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4. In a sample of hydrogen atoms, all the atoms exist in two energy levels A and B. A is the ground level and B is some higher energy level. These atoms absorb photons of energy 2.7 eV and attain a higher energy level C.After this, these atoms emit photons of six different energies. Some of these photon energies are higher than 2.7 eV, some equal to 2.7 eV and some are loss than 2.7 eV.

The longest wavelength emitted in the radiation spectrum observed is

A. a.18761 Å

B. b.1216 Å

C. c.6500 Å

D. d.5752 Å

Answer: A

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Assignment Section E Assertion Reason

1. Statement-1 : In X-rays diffraction, the wavelength of the scattered X-ray is same as that of the incident wavelength .

Statement-2 : The compton wavelength for scattering of X-rays by bound atoms is very small

A. Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True , Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: D

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2. Statement-1 : The Bohr model of the hydrogen atom does not explain the fine structure of spectral lines.

and

Statement-2 : The Bohr model does not take into account the spin of the electron

A. Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True , Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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Assignment Section F Matrix Match

1. When we write expression for energy of electron in n^{th} orbit of hydrogen atom we take zero potential energy at $n = \infty$, But potential energy depends on point in reference. If we take total energy of electron in n=1 orbit as zero then , match the following :

Column-I	Column-II
(A) Negative of potential energy of electron in $n = 1$	(p) 13.6 eV
(B) Ionisation energy from ground state	(q) 10.2 eV
(C) Total energy of electron in $n = 2$	(r) Depends on reference level
(D) Excitation energy for $n = 1$ to $n = 2$	(s) Does not depend on reference level

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2. Column-II give some quantities associated with electron of hydrogen like atom. The quantities are proportional to entries given in column-I . Match the column appropriately

Column-I	Column-II
(A) $\frac{Z^2}{n^2}$	(p) Total energy
(B) $\frac{Z}{n}$	(q) Potential energy
(C) $\frac{n^2}{Z}$	(r) Radius
(D) $\frac{n^3}{Z^2}$	(s) Velocity
	(t) Time period

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3. In column-I name of the spectral series are given and column-II gives wavelength formula corresponding to series and region of series.

Column-I	Column-II
(A) Lyman series	(p) $\frac{1}{\lambda}=R\left(\frac{1}{3^2}-\frac{1}{n^2}\right)$ $n=4,5,6$
(B) Paschen series	(q) $\frac{1}{\lambda}=R\left(\frac{1}{4^2}-\frac{1}{n^2}\right)$ $n=5,6,7$
(C) Brackett series	(r) $\frac{1}{\lambda}=R\left(\frac{1}{5^2}-\frac{1}{n^2}\right)$, $n=6,7,8$
(D) Pfund series	(s) Ultraviolet
	(t) Infrared region

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4. Regarding the spectrum of hydrogen, match the entries in column-I with all the entries in column-II. Match the following :

Column-I	Column-II
(A) 912 Å	(p) Maximum wavelength corresponding to Balmer series
(B) 6466 Å	(q) Minimum wavelength corresponding to Lyman series
(C) 550 nm	(r) Reciprocal of rydberg constant
(D) 200 nm	(s) Ultraviolet light
	(t) Visible light

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Assignment Section G Integer

1. A gas of hydrogen - like ion is perpendicular in such a way that ions are only in the ground state and the first excite state. A monochromatic light of wavelength $1216 Å$ is absorbed by the ions. The ions are lifted to higher excited state and emit emit radiation of six wavelength , some higher and some lower than the incident wavelength. Find the principal quantum number of the excited state identify the nuclear charge on the ions . Calculate the values of the maximum and minimum wavelengths.

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2. An X-ray tube operates at the voltage of 40 kV.Find the ratio of the shortest wavelength of X-ray produced to the de-Broglie wavelength of the incident electron. The specific charge of electron is 1.8×10^{11} C/kg

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3. Consider a hydrogen-like atom whose energy in nth excited state is given by

$$E_n = -\frac{13.6Z^2}{n^2}$$

When this excited makes a transition from excited state to ground state , most energetic photons have energy

$E_{\max} = 52.224 eV$. and least energetic photons have energy

$E_{\min} = 1.224 eV$

Find the atomic number of atom and the initial state or excitation.

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Assignment Section H Multiple True False

1. STATEMENT-1:Continuous X-rays depends only on the accelerating voltage V.

STATEMENT-2:Characteristic X-ray depends on filament and cathode.

STATEMENT-3:In coolidge tube kinetic energy of a moving electron is converted into a X-ray photon.

A. TTF

B. TFT

C. TTT

D. FTF

Answer: B

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2. STATEMENT-1:Intensity of X-rays is dependent upon filament current.

STATEMENT-2:Penetrating power depends upon accelerating voltage.

STATEMENT-3:The value of energy of X-ray photon is generally in keV

A. TTF

B. TFT

C. FTF

D. TTT

Answer: D

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Assignment Section I Subjective

1. An imaginary particle has a charge equal to that of an electron and mass 100 times the mass of the electron. It moves in a circular orbit around a nucleus of charge + $4e$. Take the mass of the nucleus to be infinite. Assuming that the Bhor model is applicable to this system. (a)Derive an expression for the radius of n^{th} Bhor orbit. (b) Find the wavelength of the radiation emitted when the particle jumps from fourth orbit to the second orbit.

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2. The wavelength interval between k_{α} line and $\lambda_{\min}$ of continuous X-ray spectrum of metal becomes 2 times when operating voltage is charged from 10 kV to x kV. Find x. What will happen to wavelength interval between k_{α} line and k_{β} line in this case ? (Z=28)

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3. Which of the following disorder is seen in human female only ?

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4. A hydrogen atom in state $n = 6$ makes two successive transition and reaches the ground state in the first transition a photon of $1.13 eV$ is emitted (a) Find the energy of the photon emitted in the second transition (b) what is the value of n in the intermediate state?

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Assignment Section J Aakash Challengers

1. (a)Suppose an unknown element has an absorption spectrum with lines at 2.5,4.7 and 5.1 eV above its ground state and an ionization energy of 11.5 eV . Draw an energy level diagram for this element.

(b)If a 5.1 eV photon is absorbed by an atom of this substance, in which state was the atom before absorbing the photon ? What will be the energies of the photons that can subsequently be emitted by this atom ?

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2. By what fraction does the mass of an H atom decreases when it makes an n=3 to n=1 transition ?

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3. A neutron of kinetic energy 65 eV collides inelastically with a singly ionised helium atom at rest. It is scattered at an angle 90° with respect to original direction. If the energy of scattered neutron is 6.36 eV, find the frequency of emitted radiation from the helium atom after suffering collision.

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4. When a photon is emitted from an atom , the atom recoils.The kinetic energy of recoil and the energy of the photon come from the difference in energy between the state involved in the transition. Suppose a hydrogen atom change its state from $n = 3 \rightarrow n = 2$ .Calculate the fractional change in the wavelength of light emitted , due to the recoil.

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5. Assume that the de-Broglie were associated with an electron can form a standing wave between the atoms arranged in a one dimensional array with nodes at each of the atomic sites. It is found that one such standing wave is formed if the distance d between the atoms of the array is 2Å. A similar standing wave is again formed if d is increased to 2.5Å but not for any intermediate value of d. Find the energy of the electron in eV and the least value of d for which the standing wave of the type described above can form.

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Exercise

1. In scattering experiment, find the distance of closest approach, if a $6MeV\alpha - partic \leq$ is used

A. $3.2 \times 10^{-16}m$

B. $2 \times 10^{-14} m$

C. $4.6 \times 10^{-15} m$

D. 3.2×10^{-15} m

Answer: B

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2. The angular momentum of an electron in a hydrogen atom is proportional to

A. n

B. n^2

C. n^3

D. $\sqrt{n}$

Answer: A

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3. What is the angular momentum of an electron in Bohr's hydrogen atom whose energy is -0.544eV?

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

B. $3\frac{h}{2}\pi$

C. $5\frac{h}{2}\pi$

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

Answer: C

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4. The energies of three conservative energy levels L_3, L_2 and L_1 of hydrogen atom are E_0, $\frac{4E_0}{9}$ and $\frac{E_0}{4}$ respectively. A photon of wavelength λ is emitted for a transition L_3 to L_1 .What will be the wavelength of emission for transition L_2 to L_1 ?

A. $16\frac{\lambda}{31}$

B. $27\frac{\lambda}{7}$

C. $\frac{19}{20}\lambda$

D. λ

Answer: B

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5. In Bohr's model of the hydrogen atom the ratio between the period of revolution of an electron in the orbit of $n=1$ to the period of the revolution of the electron in the orbit $n=2$ is :-

(a). $1:2$

(b). $2:1$

(c). $1:4$

(d). $1:8$

A. $2:1$

B. $1:2$

C. $1:4$

D. $1:8$

Answer: D

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6. When an electron is excited to n^{th} energy state in hydrogen, the possible number of spectral lines emitted are

A. n

B. $2n$

C. $\frac{n^2 - n}{2}$

D. $\frac{n^2 + n}{2}$

Answer: C

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7. In which transition of a hydrogen atom, photons of lowest frequency are emitted ?

A. $n = 4 \rightarrow n = 3$

B. $n = 4 \rightarrow n = 2$

C. $n = 2 \rightarrow n = 1$

D. $n = 3 \rightarrow n = 1$

Answer: A

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8. The speed of an electron in the 4^{th} orbit of hydrogen atom is

A. c

B. $\frac{c}{137}$

C. $\frac{c}{2192}$

D. $\frac{c}{548}$

Answer: D

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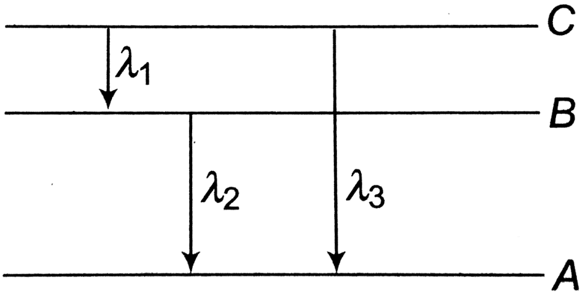
9. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of radiations correspnding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct?



A. $\lambda_3 = \lambda_1 + \lambda_2$

B. $\lambda_1 = \dfrac{\lambda_2\lambda_3}{\lambda_2 + \lambda_3}$

C. $\lambda_1 = \lambda_2 + \lambda_3$

D. $\lambda_3 = \dfrac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

Answer: B

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10. Using Bohr's formula for energy quantization, the ionisation potential of first excited state of hydrogen atom is

A. $13.6V$

B. $3.4V$

C. $2.6V$

D. $1.51V$

Answer: B

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Assignment Objective Section A Objective Type Questions

1. An α-particle colliding with one of the electrons in a gold atom looses

A. Most of its momentum

B. About $\frac{1}{3}rd$ of its momentum

C. Little of its energy

D. Most of its energy

Answer: C

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2. According to classical theory, Rutherfor'd atom model is

A. Electrostatically stable

B. Electrostatically unstable

C. semi stable

D. Stable

Answer: A

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3. The angular momentum of an electron in a hydrogen atom is proportional to

A. $1\sqrt{r}$

B. $\frac{1}{r}$

C. $\sqrt{r}$

D. r^2

Answer: C

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4. When a hydrogen atom is raised the ground state to third state

A. Both kinetic energy and potential energy increase.

B. Both kinetic energy and potential energy decrease.

C. Both kinetic energy and potential energy decrease.

D. Potential energy increases and kinetic energy decreases

Answer: C

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5. What is the angular momentem of an electron in Bohr's hydrogen atom whose energy is $-3.5eV$?

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

B. $2\frac{h}{\pi}$

C. $\frac{h}{2}\pi$

D. $\frac{1}{4}$

Answer: A

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6. The energy of a I,II and III energy levels of a certain atom are E, $\frac{4E}{3}$ and 2F repectively. A photon of wavelength λ is emitted during a transition from III to I. What will be the wavelength of emission for transition II to I?

A. $\frac{\lambda}{3}$

B. 3λ

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

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

Answer: B

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7. The ground state energy of H-atom is 13.6 eV. The energy needed to ionise H-atom form its second excited state

A. 1.51 eV

B. 3.4 eV

C. 13.6 eV

D. 12.1 eV

Answer: A

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8. If electron with principal quantum number $n > 4$ were not allowed in nature , the number of possible element would be

A. 60

B. 32

C. 4

D. 64

Answer: A

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9. The angular speed of electron in the nth orbit of hydrogen atom is

A. Directly proportional to n^2

B. Directly proportional to n

C. Inversely proportional to n^3

D. Inversely proportional to n

Answer: C

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10. Of the various series of the hydrogen spectrum, the one which lies completely in the ultraviolet region is

A. Lyman series

B. Balmer series

C. Paschen series

D. Brackett series

Answer: A

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11. As the n (number of orbit) increases, the difference of energy between the consecutive energy levels

A. Remain the same

B. Increases

C. Decreases

D. Sometimes increases and sometimes decreases

Answer: C

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12. The magnetic field induction produced at the centre of orbit due to an electron revolving in n^{th} orbit of hydrogen atom is proportional to

A. n^{-3}

B. n^{-5}

C. n^{5}

D. n^3

Answer: B

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13. The speed of an electron in the orbit of hydrogen atom in the ground state is

A. c

B. $\frac{c}{10}$

C. $\frac{c}{2}$

D. $\frac{c}{137}$

Answer: D

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14. If the radius of inner most electronic orbit of a hydrogen atom is 5.3×10^{-11} m, then the radii of $n=2$ orbit is

A. 21.16×10^{-11} metre

B. 15.87×10^{-11} metre

C. 10.58×10^{-11} metre

D. 2.64×10^{-11} metre

Answer: A

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15. What should be the ratio of minimum to maximum wavelength of radiation emitted by transition of an electron to ground state of Bohr's hydrogen atom?

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

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{3}{8}$

Answer: A

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16. In Bohr's model of the hydrogen atom, the ratio between the period of revolution of an electron in the orbit of $n = 1$ to the period of revolution of the electron in the orbit $n = 2$ is

A. $1:2$

B. $2:1$

C. $1:4$

D. $1:8$

Answer: D

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17. Calculate the velocity of electron in Bohr's first orbit of hydrogen atom. How many times does the electron go in Bohr's first orbit in one second ?

A. 6.57×10^{5}

B. 6.57×10^{10}

C. 6.57×10^{13}

D. 6.57×10^{15}

Answer: D

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18. The ratio of the energies of the hydrogen atom in its first to second excited state is

A. $\frac{1}{4}$

B. $\frac{4}{9}$

C. $\frac{9}{4}$

D. 4

Answer: C

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19. in which of the following Bohr's orbit (n) a hydrogen atom emits the photons of lowest frequency ?

A. $n = 2 \rightarrow n = 1$

B. $n = 4 \rightarrow n = 2$

C. $n = 4 \rightarrow n = 3$

D. $n = 3 \rightarrow n = 1$

Answer: C

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

A. $-0.544 eV$

B. $-5.40 eV$

C. $-0.85 eV$

D. $-2.72 eV$

Answer: A

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21. If an electron in hydrogen atom jumps from third orbit to second orbit, the Wavelength of the emitted radiation is given by (c is speed of light)

A. $\lambda = \frac{36}{5}R$

B. $\lambda = \frac{5R}{36}$

C. $\lambda = \frac{5}{R}$

D. $\lambda = \frac{R}{6}$

Answer: A

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22. When an electron is excited to n^{th} energy state in hydrogen, the possible number of spectral lines emitted are

A. n

B. 2n

C. $\dfrac{n^2 - n}{2}$

D. $\dfrac{n^2 + n}{2}$

Answer: C

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23. Which series of H_2 atom lie in infrared region?

A. Lyman

B. Balmer

C. Brackett, Paschen and Pfund

D. All of these

Answer: C

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24. The ionisation energy of Li^{2+} atom in ground state is,

A. 122 V

B. 13.6 V

C. 3.4 V

D. 10.2 V

Answer: A

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25. The energy of the electron in the ground state of hydrogen atom is $-13.6eV$. Find the kinetic energy of electron in this state.

A. 13.6 eV

B. 0

C. $-13.6eV$

D. $6.8eV$

Answer: A

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26. The Wavelength of first member of Balmer series in hydrogen spectrum is λ . Calculate the wavelength of first member of Lymen series in the same spectrum

A. $\left(\frac{5}{27}\right)\lambda$

B. $\left(\frac{4}{27}\right)\lambda$

C. $\left(\frac{27}{5}\right)\lambda$

D. $\left(\frac{27}{4}\right)\lambda$

Answer: A

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27. Which state of the triply ionized Beryllium (Be^{3+}) has the same orbit radius as that of the ground state of hydrogen atom?

A. 1

B. 2

C. 3

D. 4

Answer: B

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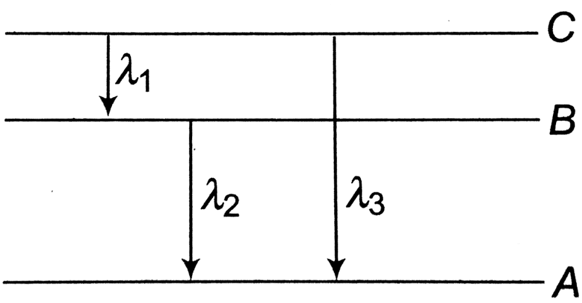
28. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of radiations correspnding to the transitions C to B, B to A and C to A

respectively, which o fthe following statements is correct?



A. $\lambda_3 = \lambda_1 + \lambda_2$

B. $\lambda_3 = \dfrac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

C. $\lambda_1 = \lambda_2 \dfrac{\lambda_3}{\lambda_2} + \lambda_3$

D. $\dfrac{\lambda_3^2}{\lambda_1^2} + \lambda_2^2$

Answer: B

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29. The minimum wavelength of the X- rays produced at accelerationg potential V is λ. If the accelerating potential is changed to 2V, then the minimum wavelength would become

A. 4λ

B. 2λ

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

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

Answer: C

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30. X-rays are used to irradiate sodium and copper surfaces in two separate experiments and stopping potential are determined. The stopping potential is

A. Equal in both cases

B. Greater for sodium

C. Greater for copper

D. Infinite in both cases

Answer: B

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31. An X-rays tube has a short wavelength end at $0.45A$. The voltage of tube is

A. 450000 V

B. 9600 V

C. 27500 V

D. 60600 V

Answer: C

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32. The frequency of X -rays, , Gamma rays and visible light wave rays are a, b and c respectively , then

A. $a < b, b < c$

B. $a < b, b > c$

C. $a > b, b > c$

D. $a > b, b < c$

Answer: B

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33. The wavelength of K_{α} line for an element of atomic number $43 \text{is} \lambda$. Then the wavelength fo K_{α} line for an element of atomic number 29 is

A. $\left(\frac{43}{29}\right)\lambda$

B. $\left(\frac{42}{28}\right)\lambda$

C. $\left(\frac{9}{4}\right)\lambda$

D. $\left(\frac{4}{9}\right)\lambda$

Answer: C

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34. X-ray incident on a material

(i) exerts a force on it

(ii) transfers energy to it

(iii) transfers momentum to it

(iv) transfer impulse to it

A. Will exert a force on it

B. Will transfer energy to it

C. May cause emission of electrons

D. All of these

Answer: D

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35. The penetration power of X-ray increases with the increases in its:

A. Accelerating potential

B. Wavelength

C. Mass number of the target material

D. Filament current

Answer: A

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36. If the potential difference V applied to the coolidge tube is doubled, then the cut off wavelength

A. Is doubled

B. Is halved

C. Remains unchanged

D. Is quadrupled

Answer: B

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37. Laser is/ are

A. Highly coherent

B. Highly monochromatic

C. Highly directional

D. All of these

Answer: D

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38. A situation of population inversion is related to

A. Matter wave

B. $\gamma - ray$

C. X-rays

D. LASER

Answer: D

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39. In He-Ne laser, metastable state exists in

A. He

B. Ne

C. Both (1) & (2)

D. Neither He nor Ne

Answer: B

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40. If the emitted radiation falls in the microwave region, the device is termed as

A. LASER

B. MASER

C. Both (1) & (2)

D. None of these

Answer: B

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Assignment Objective Section B Objective Type Questions

1. The wavelength of radiation emitted is λ_0 when an electron jumps from the third to second orbit of hydrogen atom. For the electron jumping from the fourth to the second orbit of the hydrogen atom, the wavelength of radiation emitted will be

A. $\frac{16}{25}\lambda_0$

B. $\frac{20}{27}\lambda_0$

C. $\dfrac{27}{20}\lambda_0$

D. $\dfrac{25}{16}\lambda_0$

Answer: B

Watch Video Solution

2. The electron in a hydrogen atom makes a transition from $n = n_1$ to $n = n_2$ state. The time period of the electron in the initial state (n_1) is eight times that in the final state (n_2). The possible values of n_1 and n_2 are

A. $n_1 = 3n_2$

B. $n_1 = 4n_2$

C. $n_1 = 2n_2$

D. $n_1 = 5n_2$

Answer: C

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3. A hydrogen atom in ground state absorbs 12.09 eV of energy . The orbital angular momentum of the electron

A. $\dfrac{3h}{\pi}$

B. $\dfrac{2h}{\pi}$

C. $\dfrac{h}{\pi}$

D. $\dfrac{4h}{\pi}$

Answer: C

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4. if the frequency of K_a X-ray emitted from the element with atomic number 31 is f, then the frequency of K_a x-ray emitted from the element with atomic number 51 would be

A. $\frac{5}{3}v$

B. $\frac{51}{31}v$

C. $\frac{25}{9}v$

D. $\frac{9}{25}v$

Answer: C

Watch Video Solution

5. A hydrogen atom is in ground state. In order to get six lines in its emission spectrum, wavelength of incident radiation should be

A. 800 A

B. 825 A

C. 970 A

D. 1025 A

Answer: C

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6. The X-rays beam coming from an X-ray tube will be

A. Monochromatic

B. Dichromatic

C. Having all wavelengths greater than a certain minimum wavelength

D. Having all wavelengths between a minimum and maximum wavelengths

Answer: C

Watch Video Solution

7. If the energy in the first excited state in hydrogen atom is $23.8 eV$ then the potential energy of a hydrogen atom in the ground state can be assumed to be

A. $10 eV$

B. $23.3 eV$

C. $-13.6 eV$

D. Zero

Answer: D

Watch Video Solution

8. If energy required to remove one of the two electrons from He atom is $29.5eV$, then what is the value of energy required to convert a helium atom into α-particle?

A. $54.4eV$

B. $83.9eV$

C. $29.5eV$

D. $24.9eV$

Answer: B

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9. The maximum wavelength that a sample of hydrogen atoms can absorb is

A. 912 A

B. 1216 A

C. 1028 A

D. Infinite

Answer: B

Watch Video Solution

10. The lines in Balmer series have their wavelengths lying between

A. 1266 A to 3647 A

B. 642 A to 3000 A

C. 3647 A to 6563 A

D. Zero to infinity

Answer: C

Watch Video Solution

11. If an electron in hydrogen atom jumps from third orbit to second orbit, the Wavelength of the emitted radiation is given by (c is speed of light)

A. $\frac{3Rc}{29}$

B. $\frac{5Rc}{36}$

C. $\frac{7Rc}{36}$

D. $\frac{8Rc}{31}$

Answer: B

Watch Video Solution

12. Let F_1 be the frequency of second line of Lyman series and F_2 be the frequency of first line of Balmer series then frequency of first line of Lyman series is given by

A. $F_1 - F_2$

B. $F_1 + F_2$

C. $F_2 - F_1$

D. $\frac{F_1 F_2}{F_1 + F_2}$

Answer: A

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13. Identify the incorrect relationship

A. Number of waves in an orbit, n = $\frac{2\pi r}{\lambda}$

B. Number of revolutions of an electron per second in n^{th} orbit = $\frac{v_n}{2}\pi r_n$

C. Wavelength of an electron = $\frac{h}{p}$

D. Speed of a (de- Broglie wavelength) particle accelerated by a potential difference V is $v = \frac{2eV}{m}$

Answer: D

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14. Difference between n^{th} and $(n+1)^{th}$ Bohr's radius of H atom is equal to it's $(n-1)^{th}$ Bohr's radius. The value of n is

A. 4

B. 3

C. 2

D. 1

Answer: A

Watch Video Solution

15. If radius of first orbit of hydrogen atom is $5.29 * 10^{-11} m$, the radius of fourth orbit will be

A. 8.46 A

B. 10.23 A

C. 9.22 A

D. 9.48 A

Answer: A

Watch Video Solution

16. The ratio of magnetic dipole moment to angular momentum of electron is

A. $\frac{e}{m}$

B. $\frac{2e}{m}$

C. $\frac{e}{2m}$

D. $\frac{e}{4}m$

Answer: C

Watch Video Solution

17. The ratio of energies of hydrogen atom in its first excited state to third excited state is

A. $\frac{1}{4}$

B. $\frac{4}{1}$

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

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

Answer: B

Watch Video Solution

18. What should be the ratio of minimum to maximum wavelength of radiation emitted by transition of an electron to ground state of Bohr's hydrogen atom ?

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

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{3}{8}$

Answer: A

Watch Video Solution

Watch Video Solution

19. The product of angular speed and tangential speed of electron in n^{th} orbit of hydrogen atom is

A. Directly proportional to n^2

B. Directly proportional to n^3

C. Inversely proportional to n^4

D. Independent of n

Answer: C

Watch Video Solution

20. The ground state energy of H-atom is 13.6 eV. The energy needed to ionise H-atom form its second excited state

A. $1.51eV$

B. $3.4eV$

C. $13.6eV$

D. $12.1eV$

Answer: A

Watch Video Solution

21. The energy of hydrogen atom in its ground state is -13.6 eV , the energy of the level corresponding to n=7 is

A. $-0.544eV$

B. $-5.40eV$

C. $-0.85eV$

D. $-0.28eV$

Answer: D

Watch Video Solution

22. Which series of hydrogen atom lie in infra red region?

A. Lyman

B. Balmer

C. Brackett, Paschen and Pfund

D. All of these

Answer: C

Watch Video Solution

23. Total energy of an electron in the hydrogen atom in the ground state is -13.6 eV. The potential energy of this electron is

A. $13.6eV$

B. Zero

C. $-27.2eV$

D. $-13.6eV$

Answer: C

Watch Video Solution

24. If potential energy of an electron in a hydrogen atom in first excited state is taken to be zero kinetic energy (in eV) of an electron in ground state will be

A. $20.4eV$

B. $10.2eV$

C. $3.4eV$

D. $5.1eV$

Answer: A

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25. Time period of revolution of an electron in n^{th} orbit in a hydrogen like atom is given by $T = \frac{T_0 n_a}{Z^b}$, $Z =$ atomic number

A. $T_0 = 1.5 \times 10^{-16} s, a = 3$

B. $T_0 = 6.6 \times 10^{15} s, a = 3$

C. $T_0 = 1.51 \times 10^{-16} s, b = 3$

D. $T_0 = 6.6 \times 10^{15} s, b = 3$

Answer: A

Watch Video Solution

26. What is the maximum wavelength of line of Balmer series of hydrogen spectrum $(R = 1.09 \times 10^7 m^{-1})$-

A. 912 A

B. 3645 A

C. 6561 A

D. 8201 A

Answer: C

Watch Video Solution

27. In Rutherford's experiment, number of particles scattered at 90° angel are x per second. Number particles scattered per second at angle 60° is

A. x

B. 4x

C. 8x

D. 16x

Answer: B

Watch Video Solution

28. Compton effect shows that

A. X-rays are transverse waves

B. X-rays have high frequency compared to visible light

C. X-rays can easily penetrate matter

D. Photons have momentum

Answer: D

Watch Video Solution

29. Which is the correct relation between de-Brogile wavelength of an electron in the n^{th} Bohr orbit and radius of the orbit R?

A. $\lambda = n2\pi R$

B. $\lambda = \dfrac{2\pi R}{n}$

C. $\lambda = \frac{4\pi R}{n}$

D. $\lambda = \frac{2\pi R}{n} h$

Answer: B

Watch Video Solution

30. Atomic number of anti cathode material in an X- ray tube is 41. Wavelength of K_a X-ray produced in the tube is

A. 0.66 A

B. 0.76 A

C. 0.82 A

D. 0.88 A

Answer: B

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31. Hydrogen atoms are excited from ground state to the principal quantum number 5. Number of spectral lines observed will be

A. 5

B. 4

C. 10

D. 8

Answer: C

Watch Video Solution

32. If in Bohr's atomic model, it is assumed that force between electron and proton varies inversely as r^4 , energy of the system will be proportional to

A. n^2

B. n^4

C. n^6

D. n^8

Answer: C

Watch Video Solution

33. Which of the following may be representing graph between number of scattered particles detected (N) and scattering angle(θ) in Rutherford's experiment?

A.

B.

C.

D.

Answer: B

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Assignment Objective Section C Previous Years Questions

1. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is

A. 2

B. 1

C. 4

D. 0.5

Answer: C

Watch Video Solution

2. If an electron in a hydrogen atom jumps from the 3rd orbit to the 2nd orbit, it emits a photon of wavelength λ. When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be

A. $\frac{16}{25}\lambda$

B. $\frac{9}{16}\lambda$

C. $\frac{20}{7}\lambda$

D. $\frac{20}{13}\lambda$

Answer: C

Watch Video Solution

3. When an $\alpha-$ particle of mass 'm' moving with velocity 'v' bombards on a heavy nucleus of charge 'Ze' its distance of closest approach from the nucleus depends on m as :

A. m

B. $\frac{1}{m}$

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

D. $\frac{1}{m^2}$

Answer: B

Watch Video Solution

4. Given the value of Rydberg constant is $10^7 m^{-1}$, the waves number of the lest line of the Balmer series in hydrogen spectrum will be:

A. $2.5 \times 10^7 m^{-1}$

B. $0.025 \times 10^4 m^{-1}$

C. $0.5 \times 10^7 m^{-1}$

D. $0.25 \times 10^7 m^{-1}$

Answer: D

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5. Consider 3^{rd} orbit of He^{+} (Helium), using non-relativistic approach, the speed of electron in this orbit will be (given $K = 9 \times 10^{9}$ constant, Z=2 and h (Planck's constant) $= 6.6 \times 10^{-34} J - s$)

A. $3.0 \times 10^{8} \frac{m}{s}$

B. $2.92 \times 10^{6} \frac{m}{s}$

C. $1.46 \times 10^{6} \frac{m}{s}$

D. $0.73 \times 10^{6} \frac{m}{s}$

Answer: C

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6. Hydrogen atom in ground state is excited by a monochromatic radiation of $\lambda = 975\text{Å}$. Number of spectral lines in the results spectrum emitted will be

A. 3

B. 2

C. 6

D. 10

Answer: C

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7. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is

A. $\frac{3}{23}$

B. $\frac{7}{29}$

C. $\frac{9}{31}$

D. $\frac{5}{27}$

Answer: D

Watch Video Solution

8. Electron in hydrogen atom first jumps from third excited state to second excited state and then form second excited state to first excited state. The ratio of wavelength $\lambda_1 : \lambda_2$ emitted in two cases is

A. $\frac{27}{5}$

B. $\frac{20}{7}$

C. $\frac{7}{5}$

D. $\frac{27}{20}$

Answer: B

Watch Video Solution

9. An electron of a stationary hydrogen atom passes from the fifth energy level to the ground level. The velocity of hydrogen atom aciquired as a result of photon emission will be

A. $\frac{25m}{24hR}$

B. $\frac{24m}{25hR}$

C. $\frac{24hR}{25m}$

D. $\frac{25hR}{24m}$

Answer: C

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10. the transition from the state $n = 3$ to $n = 1$ in a hydrogen like atom results in ultravoilet radiation. Infrared radiation will be obtained in the transition form

A. $2 \rightarrow 1$

B. $3 \rightarrow 2$

C. $5 \rightarrow 2$

D. $4 \rightarrow 2$

Answer: D

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11. The wavelength of the first line of Lyman series for hydrogen atom is equal to of the second line of Balmer series for a hydrogen like ion. The atomic number Z of hydrogen like ion is

A. 2

B. 3

C. 4

D. 1

Answer: A

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12. An electron in the hydrogen atom jumps from excited state n to the ground state. The wavelength so emitted illuminates a photosensitive material having work function 2.75eV. If the stopping potential of the photoelectron is 10V, then the value of n is :

A. 5

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

13. Out of the following which one is not a possible energy for a photon to be emitted by hydrogen atom according to bohr's atomic model ?

A. $13.6eV$

B. $0.65eV$

C. $1.9eV$

D. $11.1eV$

Answer: D

Watch Video Solution

14. The energy of a hydrogen atom in the ground state is $-13.6eV$. The eneergy of a He^{+} ion in the first excited state will be

A. $-6.8eV$

B. $-13.6eV$

C. $-27.2eV$

D. $-54.4eV$

Answer: B

Watch Video Solution

15. An alpha nucleus of energy $\frac{1}{2}m\nu^2$ bombards a heavy nucleus of charge Ze. Then the distance of closed approach for the alpha nucleus will be proportional to

A. $\frac{1}{Z}e$

B. v^2

C. $\frac{1}{m}$

D. $\frac{1}{v^4}$

Answer: C

Watch Video Solution

16. The electron in the hydrogen atom jumps from excited state (n=3) to its ground state (n=1) and the photons thus emitted irradiate a photosensitive material. If the work function of the material is 5.1eV, the stopping potential is estimated to be: (The energy of the electron in nth state is $E_n = -13.6/n^2 eV$)

A. $5.1V$

B. $12.1V$

C. $17.2V$

D. $7V$

Answer: D

Watch Video Solution

17. The ionsation energy of the electron in the hydrogen atom in its ground states is 13.6 eV . The atoms are excited to higher energy leveles to emits radiation of 6 wavelenght . Maximum wavelength of emitted radiation corresponds to the transition between

A. $n = 3 \rightarrow n = 1 states$

B. $n = 2 \rightarrow n = 1 states$

C. $n = 4 \rightarrow n = 3 states$

D. $n = 3 \rightarrow n = 2 states$

Answer: C

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18. In the phonomenon of electric discharge through gases at low pressure, the cloured glow in the tube appears as a result of

A. Collision between different electrons of the atoms of the gas

B. Excitation of electrons in the atoms

C. Collision between the atoms of the gas

D. Collisions between the charged particles emitted from the cathode and he atoms of the ggas

Answer: B

Watch Video Solution

19. The energy of ground electronic state of hydrogen atom is -13.6 eV. The energy of the first excited state will be

A. Zero

B. $3.4 eV$

C. $6.8 eV$

D. $10.2 eV$

Answer: D

Watch Video Solution

20. The total energy of eletcron in the ground state of hydrogen atom is $-13.6eV$. The kinetic enegry of an electron in the first excited state is

A. $1.7eV$

B. $3.4eV$

C. $6.8eV$

D. $13.6eV$

Answer: B

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21. Ionization potential of hydrogen atom is 13.6 eV. Hydrogen atoms in the ground state are excited by monochromatic radiation of photon energy 12.1 eV. According to Bohr's theory, the spectral lines emitted by hydrogen will be

A. Two

B. Three

C. Four

D. One

Answer: B

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22. In a discharge tube ionisation of enclosed gas is produced due to collisions between

A. Positive ions and neutral atoms/ molecules

B. Negative electrons and neutral atoms/molecules

C. Photons and neutral atoms/molecules

D. Neutal gas atoms/molecules

Answer: B

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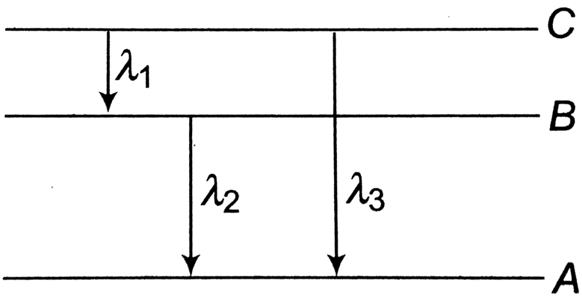
23. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of radiations correspnding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct?



A. $\lambda_3=\lambda_1+\lambda_2$

B. $\lambda_3=\frac{\lambda_1 \lambda_2}{\lambda_1+\lambda_2}$

C. $\lambda_1+\lambda_2+\lambda_3=0$

D. $\lambda_3^2=\lambda_1^2+\lambda_2^2$

Answer: B

Watch Video Solution

24. The total energy of an electron in the first excited state of hydrogen is about $-3.4eV$. Its kinetic energy in this state is:

A. $-3.4eV$

B. $-6.8eV$

C. $6.8eV$

D. $3.4eV$

Answer: D

Watch Video Solution

25. In a Rutherford scattering experiment when a projectile of charge Z_1 and mass M_1 approaches s target nucleus of charge Z_2 and mass M_2, te distance of closed approach is r_0. The energy of the projectile is

A. Directly proportional to mass M_1

B. Directly proportional of $M_1 * M_2$

C. Directly proportional of $z_1 z_2$

D. Inversely proportional to z_1

Answer: C

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26. An electron makes a transition from orbit $n = 4$ to the orbit $n = 2$ of a hydrogen atom. The wave length of the emitted radiations $(R =$ Rydberg's constant) will be

A. $\frac{16}{4R}$

B. $\frac{16}{5R}$

C. $\frac{16}{2R}$

D. $\frac{16}{3R}$

Answer: D

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27. When a hydrogen atom is raised from the ground state to an excited state

A. Both K.E and P.E increase

B. Both K.E and P.E, decrease

C. The P.E decreases and K.E increases

D. The P.E increases and K.E. Decreases

Answer: D

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28. The figure indicates the energy level diagram of an atom and the origin of six spectrsl lines in emission (e.g. Line number 5 arises from the transition from level B to A). Which of the following spectral lines will also occur in the absorption spectrum?

A. 4,5,6

B. 1,2,3,4,5,6

C. 1,2,3

D. 1,4,6

Answer: C

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29. The energy of a hydrogen atom in its ground state is $-13.6 eV$. The energy of the level corresponding to the quantum number $n=2$ (first excited state) in the hydrogen atom is

A. $0.54 eV$

B. $-3.4 eV$

C. $-2.72 eV$

D. $-0.85 eV$

Answer: B

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

A. $r \infty \frac{1}{n}$

B. $r \infty \frac{1}{n^2}$

C. $r \infty n$

D. $r \infty n^2$

Answer: D

Watch Video Solution

31. When hydrogen atom is in its first excited level, its radius is

A. Twice

B. 4 times

C. Same

D. Half

Answer: B

Watch Video Solution

32. Atomic weight of boron is 10.81 and it has twoisotopes $._5^{10}B$ and $._5^{11}B$. Then, the ratio of atoms of $._5^{10}B$ and $._5^{11}B$ in nature would be

A. $15:16$

B. $10:11$

C. $19:81$

D. $81:19$

Answer: C

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33. In the Bohr's model of a hydrogen atom, the centripetal force is furnished by the Coulomb attraction between the proton and the electron. If a_o is the radius of he ground state orbit, m is the mass i, is the charge non electron and ε_0 is the permittivity of free space the speed of the electron is

A. $\dfrac{e}{\sqrt{4\pi\varepsilon_0 a_0 m}}$

B. $\dfrac{e}{\sqrt{\varepsilon_0 a_0 m}}$

C. Zero

D. $\dfrac{\sqrt{4\pi\varepsilon_0 a_0 m}}{e}$

Answer: A

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34. Maximum frequency of emission is obtained for the transition:

A. $n = 2 \rightarrow n = 1$

B. $n = 6 \rightarrow n = 2$

C. $n = 1 \rightarrow n = 2$

D. $n = 2 \rightarrow n = 6$

Answer: A

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35. When an electron do transition from n = 4 to n = 2, then emitted line in spectrum will be:

A. First line of Lyman series

B. Second line of Balmer series

C. First line of Paschen series

D. Second line of Paschen series

Answer: B

Watch Video Solution

36. If the energy of a hydrogen atom in nth orbit is E_n, then energy in the nth orbit of a singly ionised helium atom will be

A. $4E_n$

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

C. $2E_n$

D. $\frac{E_n}{2}$

Answer: A

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37. In which of the following systems will be the radius of the first orbit $(n = 1)$ be minimum ?

A. Doubly ionized lithium

B. Singly Ionized helium

C. Deuterium atom

D. Hydrogen atom

Answer: A

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38. The Bohr model of atoms

A. Assumes that the angular momentum of electrons is quantized

B. Uses Einstein's phot-electric equation

C. Predicts continuous emission spectra for atoms

D. Predicts the same emission spectra for all types of atom

Answer: A

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39. Energy E of a hydrogen atom with principle quantum number n is given by $E = \frac{-13.6}{n^2} eV$. The energy of a photon ejected when the electron jumps from $n = 3$ state to $n = 2$ state of hydrogen is approximately

A. $1.5 eV$

B. $0.85 eV$

C. $3.4 eV$

D. $1.9 eV$

Answer: D

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40. The ratio of radii of first shell of H atom and that of fourth shell of He^{+} ion is

A. $1:8$

B. $1:4$

C. $1:\sqrt{8}$

D. $1:3$

Answer: A

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41. The ionisation energy of 10 times innised sodium atom is

A. $13.6eV$

B. $13.6 * 11eV$

C. $\frac{13.6}{11^2}eV$

D. $13.6 * (11)^2eV$

Answer: D

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42. The wavelength of radiation emitted is λ_0 when an electron jumps from the third to second orbit of hydrogen atom. For the electron jumping from the fourth to the second orbit of the hydrogen atom, the wavelength of radiation emitted will be

A. $\frac{16}{25}\lambda_0$

B. $\frac{20}{27}\lambda_0$

C. $\frac{27}{20}\lambda_0$

D. $\frac{25}{16}\lambda_0$

Answer: B

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43. The ratio of wavelengths of the $1st$ line of Balmer series and the $1st$ line of Paschen series is

A. $20:7$

B. $7:20$

C. $7:4$

D. $4:7$

Answer: B

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44. The shortest wavelength of Balmer series of H-atom is

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

B. $\frac{36}{5R}$

C. $\frac{1}{R}$

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

Answer: A

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45. An electron in a hydrogen atom makes a transition from $n_1 \rightarrow n_2$. If the time period of electron in the initial state is eight times that in the final state then Find the ratio $\frac{n_1}{n_2}$

A. 2

B. 3

C. 4

D. 8

Answer: A

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46. Assuming Bohr's model for Li^{++} atom, the first excitation energy of ground state of Li^{++} atom is

A. $10.2eV$

B. $91.8eV$

C. $13.6eV$

D. $3.4eV$

Answer: B

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47. The absorpotion transitions between the first and the fourth energy states of hydrogen atom are 3. The emission transitions between these states will be

A. 3

B. 4

C. 5

D. 6

Answer: D

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48. When a hydrogen atoms emits a photon of energy $12.1 eV$, its orbital angular momentum changes by (where h os Planck's constant)

A. $3\frac{h}{\pi}$

B. $2\frac{h}{\pi}$

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

D. $4\frac{h}{\pi}$

Answer: C

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Assignment Objective Section D Assertion Reason Type Question

1. What were the drawbacks of Rutherford's model of an atom?

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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2. A: Bohr's orbits are regions where the electron may be found with large probability.

R: The orbital picture in Bohr's model of the hydrogen atom was inconsistent with the uncertainty principle.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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3. Consider a planet moving in an elliptical orbit round the sun. The work done on the planet by the gravitational force of the sun

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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4. A: In Bohr model , the frequency of revolution of an electron in its orbit is not connected to the frequency of spectral line for smaller principal quantum number n.

R: For transitions between large quantum number the frequency of revolution of an electron in its orbit is connected to the frequency of spectral line, as per Bohr's Correspondence principle.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: B

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5. For the Balmer series in the spectrum oF H atom, $\overrightarrow{v} = R_H\left\{\frac{1}{n_1^2} - \frac{1}{n_2^2}\right\}$ the correct statement among (I) to (IV) are:

(I) As wavelength decreases, the lines in the series converage

(II) The integer n_1 is eqaual to 2.

(III) The lines oF longest wavelength corresponds to $n_2 = 3$

(IV) The ionization energy oF hydrogen can be calculated From wave number oF these lines:

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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6. A: If the accelerating potential in an X- ray machine is decreased, the minimum value of the wavelength of the emitted X -rays gets increased.

R: The minimum value of wavelength of the emitted X-rays is inversely proportional to the accelerating potential.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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7. A: According to Bohr's atomic model the ratio of angular momenta of an electron in first excited state and in ground state is $2:1$.

In a Bohr's atom the angular momentum of the electron is directly proportional to the principal quantum number.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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8. A: If a beam of photons of energy 10.0 eV each is incident on a sample of hydrogen gas containing all atoms in the ground state, then the beam of the photons is completely transmitted through the gas without absorption.

R: The minimum energy required by an

electron to make a transition to an excited state is $10.2eV$.`

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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9. A: The nature of the characteristic X -rays does not depend on accelerating potential.

R: X- rays are electromagnetic radiation.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: B

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10. A: If vacuum is not created inside an X -ray tube, X-rays will not be produced.

R: Without vacuum inside the X-ray tube the electrons are not emitted by the filament.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: C

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11. A: Gases are insulators at ordinary pressure but they start conducting at very low pressure.

R: At low pressures, ions have a chance to reach their respective electrodes and constitute a current but at ordinary pressures, ions undergo collision with gas molecules and recombination.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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12. A: The oil-drops of Millikan's experiment should be microscopic size.

R: For larger drops the electric fields needed in the experiment will be impractically high.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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13. A: Stoke's formula for viscous drag is not really valid for oil -drops of extremely minute sizes.

R: Stoke's formula is valid for motion through a homogeneous continuous medium and the size of the drop should be much larger than the intermolecular separation in the medium for this assumption to be valid.

A. If both Assertion & Reason are true and the reason is the correct explantion of the assertion , then mark (1)

B. if both Assertion & Reason are true but the reason is not the correct explantion of the assertion , then mark (2)

C. If Assertion is true statement but Reason is false, then mark (3)

D. If both Assertion and Reason are false statements, then mark (4)

Answer: A

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