PHYSICS

BOOKS - JEEVITH PUBLICATIONS PHYSICS (KANNADA ENGLISH)

ATOMS

One Mark Questions With Answers

1. Who discovered electrons ?

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2. What is the electrical charge on an atom ?

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3. Who proposed the first model of an atom ?

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4. What is plum pudding model ?

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5. Electromagnetic radiations are produced due to what effect ?

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6. Given any one source which emits electromagnetic radiations forming a continuous emission spectrum of several wavelengths differing in intensities.

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7. As per which model do atoms become unstable ?

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8. what is a stationary orbit ?

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9. Given the relation between radius and principal Quantum number of an atom .

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10. Are the electrons orbits equally spaced ?

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11. What is the relation between the energy of an electron and the principle Quantum, number ?

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12. What is an excited state of an atom ?

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13. What is meant by the wave number of spectral line ?

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14. Calculate the value of Rydberg's constant given $m = 9.1 \times 10^{-31} kg, e = 1.6 \times 10^{-19} c, \varepsilon_0 = 8.854 \times 10^{-12} Fm^{-1}, c = 3 \times$

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15. What is ionization energy ?

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16. What is excitation energy ?

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17. Define electron volt .

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Two Marks Questions With Answers

1. How does the spectrum emitted by rarefied gases differ from those of dense gases ?

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2. Given any one difference between Thomson's model and Rutherford's model of an atom.

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3. Write the expression for the radius of n^{th} orbit of the hydrogenic atoms and give the meanings of the symbols used.

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4. Give the expression for velocity of an electron in the n^{th} orbit. Explain the meanings of the symbols.

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5. What is the formula to calculate $\bar{v}$ (wave number) of spectral lines in hydrogen?

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6. what is the expression for the Rydberg's constant ? Give the meaning of the symbols.

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7. Write the formula for the wave number of the spectral lines of Lyman series.

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8. write the formula for the wave number of a spectral line of Balmer series.

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9. Mention the Merits of Bohr's theory.

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10. Mention any three demerits of Bohr's atom model.

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11. How does Rydberg's constant very with atomic number ?

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12. What is the value of ionization potential of $._{2}^{4}He$ atom ?

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13. Name the physicists who for the first time verified the wave nature of electrons.

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14. Name the two quantised conditions proposed by Bohr in the atom model .

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15. Write the mathematical conditions for quantisation of orbits and energy states.

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16. What are hydrogenic atoms?

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Three Marks Questions With Answers

1. Write de - Broglie wavelength associated with 3rd and 4th orbit in Bohr's atom model.

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2. Given de- Broglie's explanation of quantisation of angular momentum as proposed by Bohr.

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3. Relate KE, PE and TE (total energy) of an electron of hydrogenic atoms.

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4. How is the frequency of radiation different from that of frequency of electron in its orbit ?

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5. Arrive at the expression for electric current established due to the motion of electron in its orbit.

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6. Arrive at the expression for the magnetic field at the centre of the circular path due to an orbiting electron.

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7. Arrive at the expression for the magnetic flux density at the centre of the circular path of an electron in terms of magnetic moment.

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8. Why do we use gold in Rutherford's α - particle scattering experiment ?

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Five Marks Questions With Answers

1. State the three postulates of Bohr's theory of hydrogen atom.

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2. Derive an expression for the radius of n^{th} Bohr's orbit of hydrogen atom hence write the expression for the radius of first orbit of hydrogen atom.

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3. Obtain an expression for the total energy of an electron in the n^{th} orbit of hydrogen atom in terms of absolute constants.

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4. Obtain an expression for the total energy of an electron in the n^{th} orbit of hydrogen atom in terms of absolute constants.

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5. Give an account of the spectral series of an hydrogen atom.

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6. Draw the energy level diagram of hydrogen atom. Calculate the energy value upto fifth excited energy states of hydrogen.

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7. Derive an expression for the frequency of spectral series by assuming the expression for the total energy of the election of hydrogen.

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8. Outline the experimental study and the conclusion arrived in the α - scattering by a gold foil.

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9. Give the experimental conclusions arrived by Rutherford in the α scattering experiment or state the postulates of Rutherford atom model.

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10. Using Balmer empirical formula , obtain the wavelengths of $H_\alpha, H_\beta, H_\gamma, \ldots\ldots . H_\infty$

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Numericals With Solutions

1. Calculate the radius and velocity of the electron in the n^{th} orbit in hydrogen atom from the following data $e = 1.6 \times 10^{-19} C, m = 9.11 \times 10^{-31}, h = 6.625 \times 10^{-34} JS, \varepsilon_0 = 8.85 \times$

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2. Calculate the wavelength of H_α line (first member of Balmer series) and also Balmer series limit. Given $R = 1.097 \times 10^7 m^{-1}$

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3. Calculate K.E., P.E total energy of the electron in Bohr's first orbit of an hydrogen atom.

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4. Calculate the value of Rydberg's constant given $m = 9.1 \times 10^{-31} kg$, $e = 1.6 \times 10^{-19} c$, $\varepsilon_0 = 8.854 \times 10^{-12} Fm^{-1}$, $c = 3 \times$

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5. calculate the velocity of the electron in the orbit of hydrogen atom. Compare this speed with the speed of light.

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6. calculate the longest wavelength in Balmer series and the series limit . (Given $R = 1.097 \times 10^7 m^{-1}$)

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7. calculate the frequency of revolution of the electron in the ground state of hydrogen atom.

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8. calculate the wave number , wavelength and frequency of the spectral line of hydrogen for the transition from $n_2 = 4 \text{ to } n_1 = 2$. (Given $R = 1.097 \times 10^7 m^{-1}$)

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9. when a certain energy is applied to an hydrogen atom, an electron jumps from n =1 to n = 3 state. Find (i) the energy absorbed by the electron. (ii) wavelength of radiation emitted when the electron jump back to its initial state. (Energy of electron in first orbit = - 13.6 eV , Planck's constant = 6.6225×10^{-34} Js, Charge on electron = 1.6×10^{-19} C, speed of light in vacuum $= 3 \times 10^8 ms^{-1}$

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10. The last member of Lymann series of Hydrogen atom is 912Å Calculate The wavelength of series limit of blamer series.

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11. A 12.5eV electron beam is used to bombard gaseous hydrogen at room temperature What series of wavelengths will be emitted.

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12. In accordance with Bohr's model, find the quantum number that characterises Earth's revolution around the sun in an orbit of radius $1.5 \times 10^{11} m$ With orbital speed $3 \times 10^4 ms^{-1}$ (mass of the earth $= 6.0 \times 10^{24} kg$)

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13. The first member of the Balmer series of hydrogen atom has wavelength of 656.3nm. Calculate the wavelength and frequency of the second member of the same series. Given, $c = 3 \times 10^8 m/s$.

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