Physicsaholics

DPP – 1

Video Solution on Website:- https://physicsaholics.com/home/courseDetails/46

Video Solution on YouTube:- https://youtu.be/1yehhC5DbsU

Written Solution on Website:- https://physicsaholics.com/note/notesDetalis/19

Q 1. Which of the following parameters are the same for all hydrogen-like atoms and ions in their ground states ?
(a) radius of the orbit
(b) speed of the electron
(c) energy of the atom
(d) orbital angular momentum of the electron

Q 2. The radius of electron's second stationary orbit in Bohr's atom is R. The radius of the third orbit will be-
(a) 3R (b) 2.25 R (c) 9 R (d) R/3

Q 3. The ratio of the area of orbit of first excited state of electron to the area of orbit of ground level, for hydrogen atom, will be -
(a) 2 : 1 (b) 4 : 1 (c) 8 : 1 (d) 16 : 1

Q 4. The ratio of velocities of electron in H-atom in its first, second & third orbit respectively will be –
(a) 6 : 3 : 1 (b) 3 : 2 : 1 (c) 6 : 3 : 2 (d) 1 : 3 : 6

Q 5. The kinetic energy of an electron in second Bohr orbit of hydrogen atom will be -
(a) 13.6 eV (b) 6.8 eV (c) 3.4 eV (d) 1.7 eV

Q.6 Total energy of electron in the first orbit of hydrogen atom is equal to the –
(a) total energy of electron in 2nd orbit of He^+
(b) total energy of electron in 3rd orbit of He^+
(c) total energy of electron in 2nd orbit of Li^{++}
(d) total energy of electron in 4th orbit to Li^{++}

Q 7. The energy of an electron in the first Bohr orbit for hydrogen is –13.6 eV. Which one (s) of the following is (are) possible excited state (s) for electrons in Bohr orbits of hydrogen –
(a) – 3.4 eV (b) – 6.8 eV (c) – 1.7 eV (d) 13.6 eV

Q 8. The binding energy of the hydrogen atom in the first excited state is –
(a) 13.6 eV (b) 10.2 eV (c) 3.40 eV (d) 1.51 eV

Q 9. As per Bohr model, the minimum energy (in eV) required to remove an electron from the ground state of doubly ionized Li atom (Z = 3) -

(a) 1.51 (b) 13.6 (c) 40.8 (d) 122.4

Q 10. When a hydrogen atom is raised from the ground state to an excited state -
(a) the P.E. decreases and K.E. increases
(b) the P.E. increases and K.E. decreases
(c) both K.E. and P.E. increases
(d) both K.E. and P.E. decrease

Q 11. The angular momentum of an electron in a given orbit is J. Its kinetic energy will be –
(a) $\frac{1}{2}\frac{J^2}{mr^2}$ (b) $\frac{Jv}{r}$
(c) $\frac{J^2}{2m}$ (d) $\frac{J^2}{2\pi}$

Q 12. From Bohr's theory the product of the radius and the velocity of the electron in different orbits is
(a) constant
(b) proportional to the square root of radius
(c) proportional to the radius
(d) proportional to the square of the radius

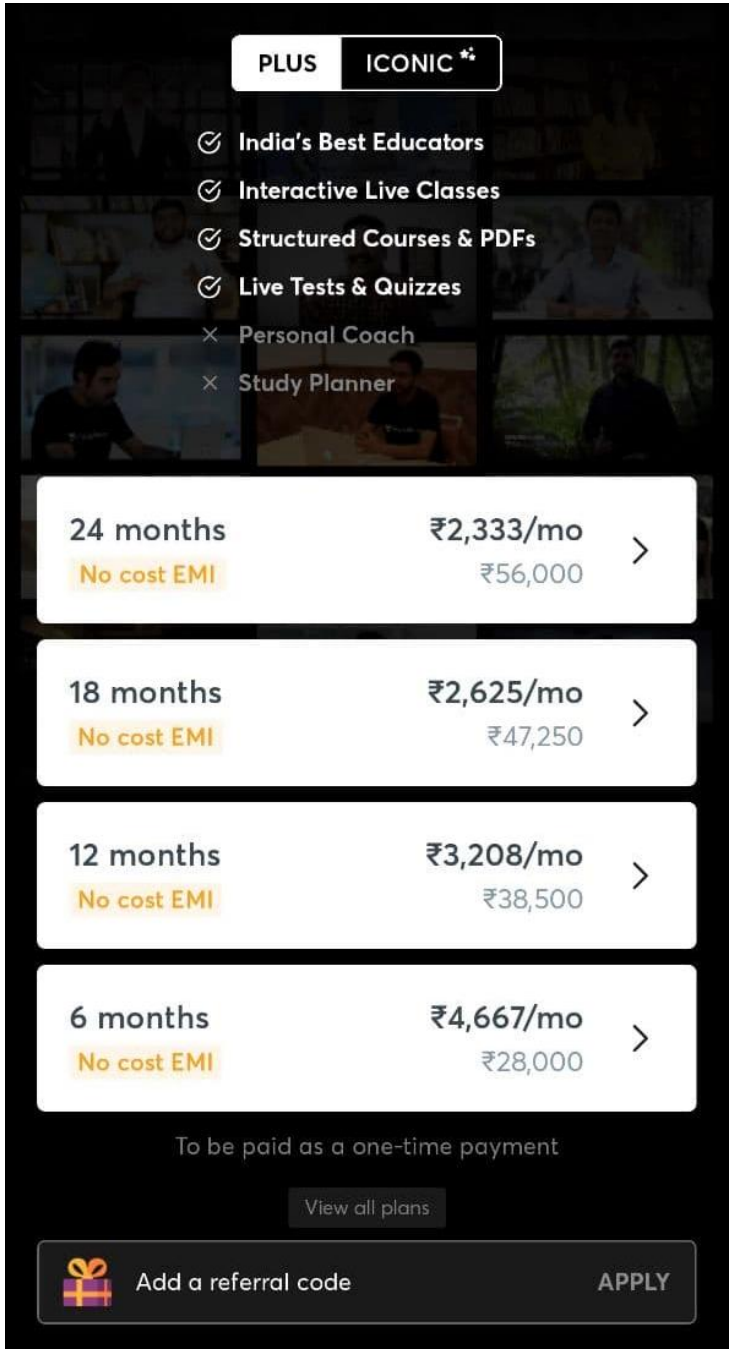
Q 13. The angular momentum of electron in hydrogen atom is proportional to –
(a) √r (b) 1/r (c) r^2 (d) 1/√r

Q 14. The electron in a hydrogen atom jumps from ground state to the higher energy state where its velocity is reduced to one-third its initial value. If the radius of the orbit in the ground state is r, the radius of new orbit will be –
(a) 3r (b) 9r (c) $\frac{r}{3}$ (d) $\frac{r}{9}$

Q 15. Which of the following products in a hydrogen atom are independent of the principal quantum number n? The symbols have their usual meanings?
(a) vn (b) Er^2 (c) En (d) vr

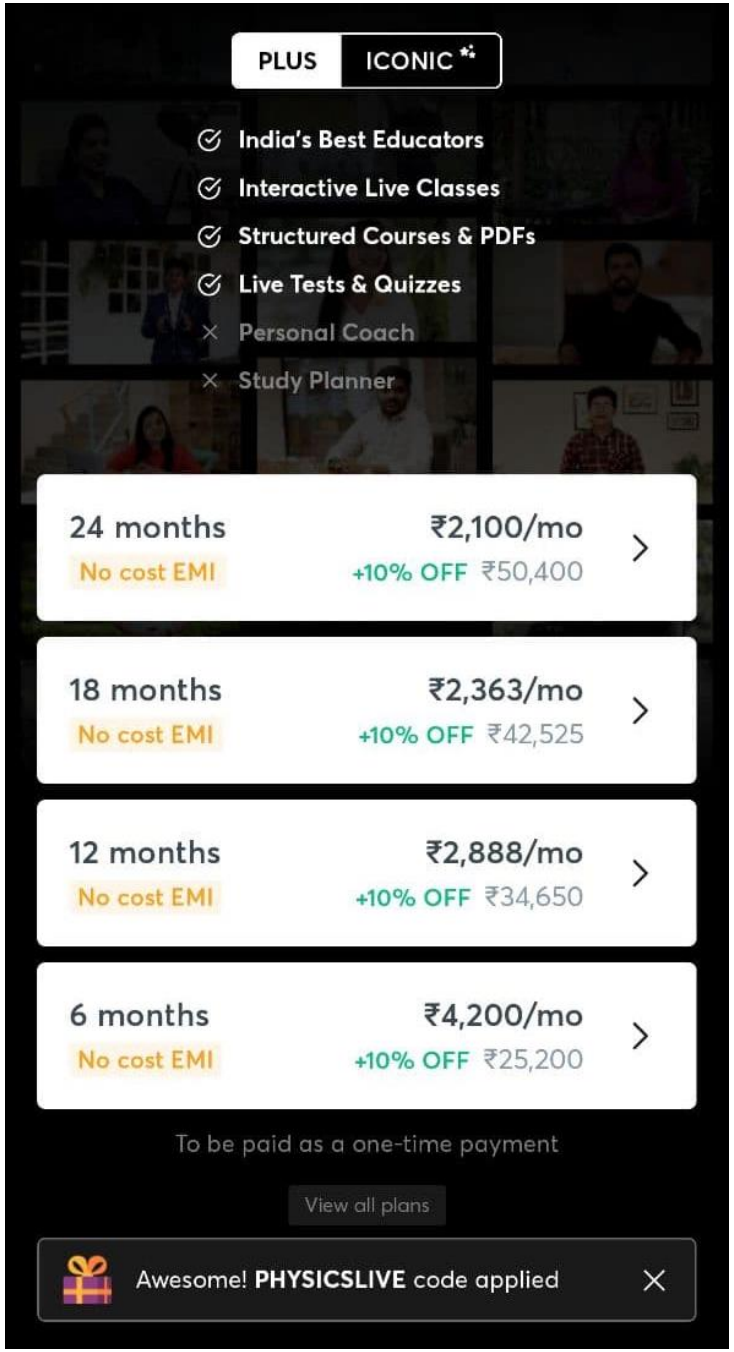
Answer Key

Q.1 d	**Q.2 b**	**Q.3 d**	**Q.4 c**	**Q.5 c**
Q.6 a	**Q.7 a**	**Q.8 c**	**Q.9 d**	**Q.10 b**
Q.11 a	**Q.12 b**	**Q.13 a**	**Q.14 b**	**Q.15 a**



PHYSICSLIVE

Use code PHYSICSLIVE to get 10% OFF on Unacademy PLUS.



Physics DPP

DPP- 1 Bohr Model : Bohr Model, Energy of Atom, Ionisation Energy, Excitation Energy

By Physicsaholics Team

Q1) Which of the following parameters are the same for all hydrogen-like atoms and ions in their ground states ?

$L = \frac{nh}{2\pi}$

(a) radius of the orbit $r \propto \frac{n^2}{z}$

(b) speed of the electron $v \propto \frac{z}{n}$

(c) energy of the atom $E \propto \frac{z^2}{n^2}$

(d) orbital angular momentum of the electron

Q2) The radius of electron's second stationary orbit in Bohr's atom is R. The radius of the third orbit will be-

$$r = r_0 n^2$$

$$r_2 = 4 r_0 = R$$

$$r_3 = 9 r_0 = \frac{9R}{4}$$

(a) 3R (b) 2.25 R (c) 9 R (d) R/3

Q3) The ratio of the area of orbit of first excited state of electron to the area of orbit of ground level, for hydrogen atom, will be -

$$r = r_0 n^2$$

$$r = r_0 \times 4$$

$$\pi r^2 = 16 r_0^2 \pi$$

$$A = A_0 \times 16$$

(a) 2 : 1 (b) 4 : 1 (c) 8 : 1 ✓ (d) 16 : 1

$$\frac{A}{A_0} = \frac{16}{1}$$

Q4) The ratio of velocities of electron in H-atom in its first, second & third orbit respectively will be -

$$V = \frac{(2.19 \times 10^6)}{n}$$

$$V_1 \quad V_2 \quad V_3 = \frac{1}{1} \quad \frac{1}{2} \quad \frac{1}{3} = 6 \quad 3 \quad 2$$

(a) 6 : 3 : 1 (b) 3 : 2 : 1 (c) 6 : 3 : 2 (d) 1 : 3 : 6

Q5) The kinetic energy of an electron in second Bohr orbit of hydrogen atom will be -

$$KE = (13.6\,eV)\frac{Z^2}{n^2} = \frac{(13.6\,eV)}{n^2}$$

$$= \frac{13.6\,eV}{4}$$

(a) 13.6 eV (b) 6.8 eV (c) 3.4 eV ✓ (d) 1.7 eV

Q6) Total energy of electron in the first orbit of hydrogen atom is equal to the -

$$E = (-13.6\,eV)\frac{Z^2}{n^2} \qquad E_H = (-13.6\,eV)\frac{1}{1}$$

(a) total energy of electron in 2nd orbit of He^+

(b) total energy of electron in 3rd orbit of He^+

(c) total energy of electron in 2nd orbit of Li^{++}

(d) total energy of electron in 4th orbit to Li^{++}

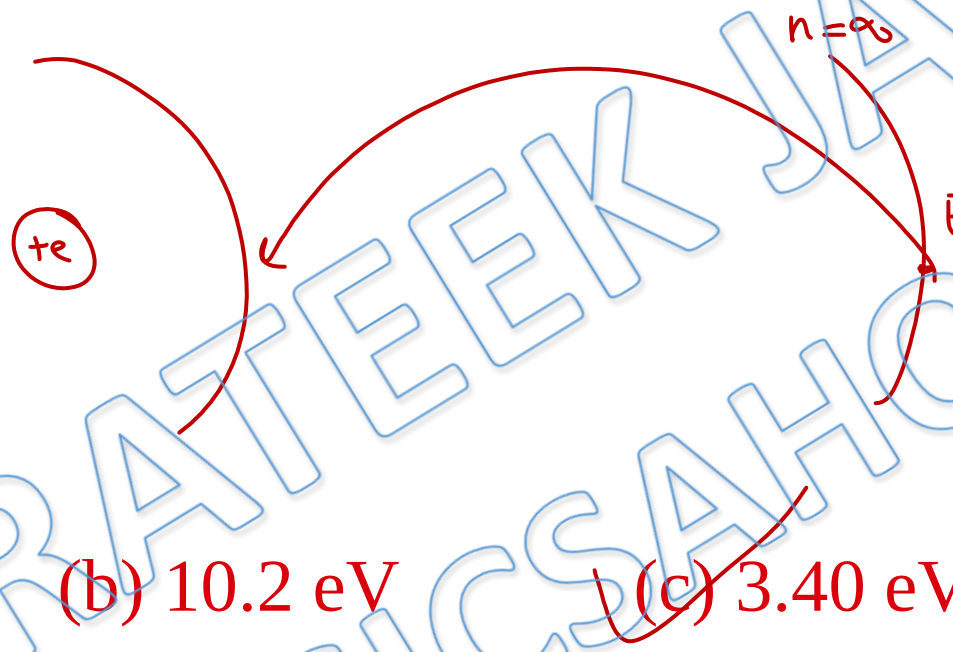
Q7) The energy of an electron in the first Bohr orbit for hydrogen is –13.6 eV. Which one (s) of the following is (are) possible excited state (s) for electrons in Bohr orbits of hydrogen –

$$E = \frac{(-13.6\,eV)}{n^2}$$

$$(1.5)$$

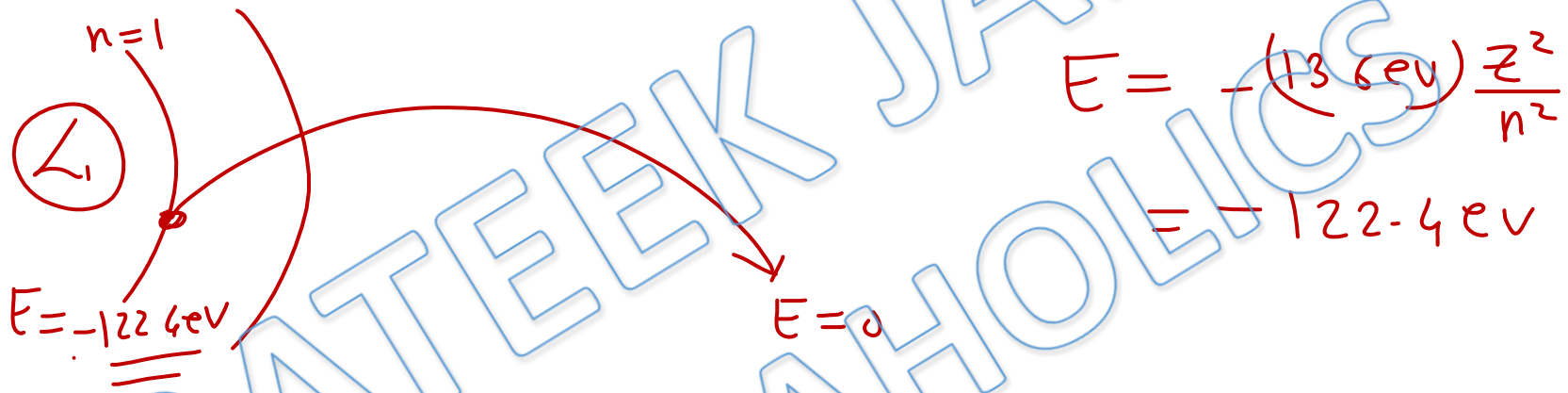
(a) – 3.4 eV (b) – 6.8 eV (c) – 1.7 eV (d) 13.6 eV

Q8) The binding energy of the hydrogen atom in the first excited state is –



(a) 13.6 eV (b) 10.2 eV (c) 3.40 eV (d) 1.51 eV

Q9) As per Bohr model, the minimum energy (in eV) required to remove an electron from the ground state of doubly ionized Li atom (Z = 3) -



(a) 1.51 (b) 13.6 (c) 40.8 (d) 122.4

Q10) When a hydrogen atom is raised from the ground state to an excited state -

$$KE = \frac{13.6\,eV}{n^2} \downarrow$$

$$PE = -\left(\frac{27.2\,eV}{n^2}\right) \uparrow$$

(a) the P.E. decreases and K.E. increases

(b) the P.E. increases and K.E. decreases

(c) both K.E. and P.E. increases

(d) both K.E. and P.E. decrease

Q11) The angular momentum of an electron in a given orbit is J. Its kinetic energy will be -

$J = mv\gamma$

$J^2 = m^2 v^2 \gamma^2$

$\frac{J^2}{2m\gamma^2} = \frac{m^2 v^2 \gamma^2}{2m\gamma^2}$

$= KE$

(a) $\frac{1}{2}\frac{J^2}{mr^2}$

(b) $\frac{Jv}{r}$

(c) $\frac{J^2}{2m}$

(d) $\frac{J^2}{2\pi}$

Q12) From Bohr's theory the product of the radius and the velocity of the electron in different orbits is

$$mvr = \frac{nh}{2\pi}$$

$$v r = \frac{nh}{2\pi m} \propto n \propto \sqrt{r}$$

$$r \propto h^2$$

$$h \propto r^{1/2}$$

(a) constant

(b) proportional to the square root of radius

(c) proportional to the radius

(d) proportional to the square of the radius

Q13) The angular momentum of electron in hydrogen atom is proportional to -

$r \propto n^2$

$L = mvr = \frac{nh}{2\pi}$

$L \propto n \propto \sqrt{r}$

(a) $\sqrt{r}$ (b) $1/r$ (c) r^2 (d) $1/\sqrt{r}$

Q14) The electron in a hydrogen atom jumps from ground state to the higher energy state where its velocity is reduced to one-third its initial value. If the radius of the orbit in the ground state is r, the radius of new orbit will be -

$v \propto \frac{1}{n}$

$n = 1 \longrightarrow n = 3$

$r \qquad 9r$

$r \propto n^2$

(a) 3r (b) 9r (c) $\frac{r}{3}$ (d) $\frac{r}{9}$

Q15) Which of the following products in a hydrogen atom are independent of the principal quantum number n ? The symbols have their usual meanings ?

$V \propto \frac{1}{n}$

$Vn = \text{Constant}$

(a) vn

(b) Er^2

$E \propto \frac{1}{n^2}$

$r^2 \propto n^4$

(c) En

$E \propto \frac{1}{n^2}$

$En \propto \frac{1}{n}$

(d) vr

$V \propto \frac{1}{n}$

$r \propto n^2$

$Vr \propto n$

For Video Solution of this DPP, Click on below link

Video Solution on Website:- https://physicsaholics.com/home/courseDetails/46

Video Solution on YouTube:- https://youtu.be/1yehhC5DbsU

Written Solution on Website:- https://physicsaholics.com/note/notesDetalis/19

SUBSCRIBE

@Physicsaholics

@Physicsaholics_prateek

@NEET_Physics
@IITJEE_Physics

physicsaholics.com

Unacademy

CLICK

Chalo Niklo