CHAPTER

3 Atomic Structure

1. Ejection of the photoelectron from metal in the photoelectric effect experiment can be stopped by applying 0.5 V when the radiation of 250 nm is used. The work function of the metal is

(a) 5 eV (b) 4 eV (c) 5.5 eV (d) 4.5 eV

(Online 2018)

2. The de-Broglie's wavelength of electron present in first Bohr orbit of 'H' atom is

(a) $\frac{0.529}{2\pi}$ Å (b) $2\pi \times 0.529$ Å
(c) 0.529 Å (d) 4×0.529 Å

(Online 2018)

3. Which of the following statements is false?

(a) Photon has momentum as well as wavelength.
(b) Splitting of spectral lines in electrical field is called Stark effect.
(c) Frequency of emitted radiation from a black body goes from a lower wavelength to higher wavelength as the temperature increases.
(d) Rydberg constant has unit of energy. *(Online 2018)*

4. The radius of the second Bohr orbit for hydrogen atom is (Planck's constant (h) = 6.6262×10^{-34} J s;
mass of electron = 9.1091×10^{-31} kg;
charge of electron = 1.60210×10^{-19} C;
permittivity of vacuum (ε_0) = 8.854185×10^{-12} kg^{-1} m^{-3} A^2)

(a) 0.529 Å (b) 2.12 Å
(c) 1.65 Å (d) 4.76 Å *(2017)*

5. If the shortest wavelength in Lyman series of hydrogen atom is A, then the longest wavelength in Paschen series of He^+ is

(a) $\frac{5A}{9}$ (b) $\frac{36A}{5}$ (c) $\frac{36A}{7}$ (d) $\frac{9A}{5}$

(Online 2017)

6. The electron in the hydrogen atom undergoes transition from higher orbitals to orbital of radius 211.6 pm. This transition is associated with

(a) Paschen series (b) Brackett series
(c) Lyman series (d) Balmer series.

(Online 2017)

7. A stream of electrons from a heated filament was passed between two charged plates kept at a potential difference V esu. If e and m are charge and mass of an electron respectively, then the value of h/λ (where λ is wavelength associated with electron wave) is given by

(a) meV (b) $2meV$ (c) $\sqrt{\quad s}$ (d) $\sqrt{7 \quad s}$

(2016)

8. The total number of orbitals associated with the principal quantum number 5 is

(a) 20 (b) 25 (c) 10 (d) 5

(Online 2016)

9. Which of the following is the energy of a possible excited state of hydrogen?

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

(2015)

10. If the principal quantum number $n = 6$, the correct sequence of filling of electrons will be

(a) $ns \rightarrow np \rightarrow (n-1)d \rightarrow (n-2)f$
(b) $ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$
(c) $ns \rightarrow (n-1)d \rightarrow (n-2)f \rightarrow np$
(d) $ns \rightarrow (n-2)f \rightarrow np \rightarrow (n-1)d$ *(Online 2015)*

11. At temperature T, the average kinetic energy of any particle is $\frac{8}{7}$ $q3$ The de Broglie wavelength follows the order

(a) thermal proton > visible photon > thermal electron
(b) thermal proton > thermal electron > visible photon
(c) visible photon > thermal electron > thermal neutron
(d) visible photon > thermal neutron > thermal electron.

(Online 2015)

12. The correct set of four quantum numbers for the valence electrons of rubidium atom ($Z = 37$) is

(a) $5, 0, 1, +\frac{1}{2}$ (b) $5, 0, 0, +\frac{1}{2}$
(c) $5, 1, 0, +\frac{1}{2}$ (d) $5, 1, 1, +\frac{1}{2}$ *(2014)*

13. Energy of an electron is given by $E = -2.178 \times 10^{-18}\ \text{J}\left(\frac{Z^2}{n^2}\right)$.
Wavelength of light required to excite an electron in an hydrogen atom from level $n = 1$ to $n = 2$ will be

($h = 6.62 \times 10^{-34}$ J s and $c = 3.0 \times 10^8$ m s^{-1})
(a) 8.500×10^{-7} m (b) 1.214×10^{-7} m
(c) 2.816×10^{-7} m (d) 6.500×10^{-7} m *(2013)*

14. The electrons identified by quantum numbers n and l:
(1) $n = 4, l = 1$ (2) $n = 4, l = 0$
(3) $n = 3, l = 2$ (4) $n = 3, l = 1$
can be placed in order of increasing energy as
(a) (4) < (2) < (3) < (1) (b) (2) < (4) < (1) < (3)
(c) (1) < (3) < (2) < (4) (d) (3) < (4) < (2) < (1)
(2012)

15. A gas absorbs a photon of 355 nm and emits at two wavelengths. If one of the emission is at 680 nm, the other is at
(a) 1035 nm (b) 325 nm (c) 743 nm (d) 518 nm
(2011)

16. The energy required to break one mole of Cl—Cl bonds in Cl_2 is 242 kJ mol^{-1}. The longest wavelength of light capable of breaking a single Cl—Cl bond is ($c = 3 \times 10^8$ m s^{-1} and $N_A = 6.02 \times 10^{23}$ mol^{-1})
(a) 494 nm (b) 594 nm (c) 640 nm (d) 700 nm
(2010)

17. Ionisation energy of He^+ is 19.6×10^{-18} J atom^{-1}. The energy of the first stationary state ($n = 1$) of Li^{2+} is
(a) 8.82×10^{-17} J atom^{-1} (b) 4.41×10^{-16} J atom^{-1}
(c) -4.41×10^{-17} J atom^{-1} (d) -2.2×10^{-15} J atom^{-1}
(2010)

18. Calculate the wavelength (in nanometre) associated with a proton moving at 1.0×10^3 m s^{-1}.
(Mass of proton = 1.67×10^{-27} kg and $h = 6.63 \times 10^{-34}$ J s)
(a) 0.032 nm (b) 0.40 nm
(c) 2.5 nm (d) 14.0 nm *(2009)*

19. In an atom, an electron is moving with a speed of 600 m/s with an accuracy of 0.005%. Certainty with which the position of the electron can be located is ($h = 6.6 \times 10^{-34}$ kg m^2 s^{-1}, mass of electron, $e_m = 9.1 \times 10^{-31}$ kg)
(a) 1.52×10^{-4} m (b) 5.10×10^{-3} m
(c) 1.92×10^{-3} m (d) 3.84×10^{-3} m *(2009)*

20. The ionization enthalpy of hydrogen atom is 1.312×10^6 J mol^{-1}. The energy required to excite the electron in the atom from $n = 1$ to $n = 2$ is
(a) 9.84×10^5 J mol^{-1} (b) 8.51×10^5 J mol^{-1}
(c) 6.56×10^5 J mol^{-1} (d) 7.56×10^5 J mol^{-1}
(2008)

21. Which of the following sets of quantum numbers represents the highest energy of an atom?
(a) $n = 3, l = 0, m = 0, s = +\frac{1}{2}$
(b) $n = 3, l = 1, m = 1, s = +\frac{1}{2}$
(c) $n = 3, l = 2, m = 1, s = +\frac{1}{2}$
(d) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$ *(2007)*

22. Uncertainty in the position of an electron (mass = 9.1×10^{-31} kg) moving with a velocity 300 m s^{-1}, accurate upto 0.001% will be ($h = 6.6 \times 10^{-34}$ J s)
(a) 19.2×10^{-2} m (b) 5.76×10^{-2} m
(c) 1.92×10^{-2} m (d) 3.84×10^{-2} m *(2006)*

23. According to Bohr's theory, the angular momentum of an electron in 5th orbit is
(a) $25\frac{h}{\pi}$ (b) $1.0\frac{h}{\pi}$ (c) $10\frac{h}{\pi}$ (d) $2.5\frac{h}{\pi}$
(2006)

24. Which of the following statements in relation to the hydrogen atom is correct?
(a) 3*s* orbital is lower in energy than 3*p* orbital.
(b) 3*p* orbital is lower in energy than 3*d* orbital.
(c) 3*s* and 3*p* orbitals are of lower energy than 3*d* orbital.
(d) 3*s*, 3*p* and 3*d* orbitals all have the same energy.
(2005)

25. In a multi-electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic and electric fields?
(i) $n = 1, l = 0, m = 0$ (ii) $n = 2, l = 0, m = 0$
(iii) $n = 2, l = 1, m = 1$ (iv) $n = 3, 1 = 2, m = 1$
(v) $n = 3, l = 2, m = 0$
(a) (i) and (ii) (b) (ii) and (iii)
(c) (iii) and (iv) (d) (iv) and (v) *(2005)*

26. The wavelength of the radiation emitted, when in a hydrogen atom electron falls from infinity to stationary state 1, would be (Rydberg constant = 1.097×10^7 m^{-1})
(a) 91 nm (b) 192 nm
(c) 406 nm (d) 9.1×10^{-8} nm *(2004)*

27. Consider the ground state of Cr atom ($Z = 24$). The numbers of electrons with the azimuthal quantum numbers, $l = 1$ and 2 are, respectively
(a) 12 and 4 (b) 12 and 5
(c) 16 and 4 (d) 16 and 5 *(2004)*

28. Which of the following sets of quantum numbers is correct for an electron in 4*f* orbital?
(a) $n = 4, l = 3, m = +4, s = +\frac{1}{2}$
(b) $n = 4, l = 4, m = -4, s = -\frac{1}{2}$
(c) $n = 4, l = 3, m = +1, s = +\frac{1}{2}$
(d) $n = 3, l = 2, m = -2, s = +\frac{1}{2}$ *(2004)*

29. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)} \cdot \frac{h}{2\pi}$. This momentum for an s-electron will be given by

(a) $+\frac{1}{2} \cdot \frac{h}{2\pi}$ (b) zero (c) $\frac{h}{2\pi}$ (d) $\sqrt{2} \cdot \frac{h}{2\pi}$

(2003)

30. The de Broglie wavelength of a tennis ball of mass 60 g moving with a velocity of 10 metres per second is approximately (Planck's constant, $h = 6.63 \times 10^{-34}$ J s)

(a) 10^{-33} metres (b) 10^{-31} metres
(c) 10^{-16} metres (d) 10^{-25} metres. *(2003)*

31. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inter-orbit jumps of the electron for Bohr orbits in an atom of hydrogen?

(a) $3 \rightarrow 2$ (b) $5 \rightarrow 2$ (c) $4 \rightarrow 1$ (d) $2 \rightarrow 5$

(2003)

32. Uncertainty in position of a minute particle of mass 25 g in space is 10^{-5} m. What is the uncertainty in its velocity (in m s^{-1})? ($h = 6.6 \times 10^{-34}$ J s)

(a) 2.1×10^{-34} (b) 0.5×10^{-34}
(c) 2.1×10^{-28} (d) 0.5×10^{-23} *(2002)*

33. In a hydrogen atom, if energy of an electron in ground state is 13.6 eV, then that in the 2nd excited state is

(a) 1.51 eV (b) 3.4 eV (c) 6.04 eV (d) 13.6 eV

(2002)

ANSWER KEY

1. (d)	**2.** (b)	**3.** (c)	**4.** (b)	**5.** (c)	**6.** (d)	**7.** (d)	**8.** (b)	**9.** (a)	**10.** (b)	**11.** (c)	**12.** (b)
13. (b)	**14.** (a)	**15.** (c)	**16.** (a)	**17.** (c)	**18.** (b)	**19.** (c)	**20.** (a)	**21.** (c)	**22.** (c)	**23.** (d)	**24.** (d)
25. (d)	**26.** (a)	**27.** (b)	**28.** (c)	**29.** (b)	**30.** (a)	**31.** (b)	**32.** (c)	**33.** (a)			

Explanations

1. (d) : $K.E. = h\upsilon - h\upsilon_0 = E - W_0$

where, $K.E.$ = Kinetic energy of ejected electron
= Stopping potential

E = Energy absorbed, W_0 = Work function

$$E = h\upsilon = \frac{hc}{\lambda} = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{250 \times 10^{-9}} = 7.9512 \times 10^{-19}\text{ J} = 4.96\text{ eV}$$

Then, $0.5 = 4.96 + W_0$

$W_0 = 4.46 \approx 4.5$ eV

2. (b) : $r_n = 0.529\,(n)^2$ Å

$$mvr = \frac{nh}{2\pi} \Rightarrow mv = \frac{nh}{2\pi r} = \frac{nh}{2\pi(0.529)}$$

$$\lambda = \frac{h}{mv} = \frac{h}{nh} \times 2\pi \times 0.529 = 2\pi \times 0.529\text{ Å}$$

3. (c) : When a black body is heated, more and more energy is absorbed by its atoms and they emit radiations of higher and higher frequency, *i.e.*, black body emits radiation from higher wavelength to lower wavelength.

4. (b) : Radius of n^{th} orbit for H-atom is $r = \frac{n^2 a_0}{Z}$ Å

$$r = \frac{(2)^2 \times 0.529}{1}\text{ Å} \quad [\because\ n = 2, \text{ for second orbit}]$$

$r = 2.12$ Å

5. (c) : The shortest wavelength of hydrogen atom in Lyman series is from $n_1 = 1$ to $n_2 = \infty$

$$\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$\frac{1}{\lambda_1} = \frac{1}{A} = R\left(\frac{1}{1^2} - \frac{1}{\infty^2}\right) = R \qquad \{\because Z = 1, \text{ for hydrogen}\}$$

$$\Rightarrow \quad R = \frac{1}{A}$$

The longest wavelength in Paschen series of He^+ is from $n_1 = 3$ to $n_2 = 4$

$$\frac{1}{\lambda_2} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) = \frac{1}{A}(2)^2\left(\frac{1}{3^2} - \frac{1}{4^2}\right) = \frac{4}{A} \times \frac{7}{16 \times 9} = \frac{7}{36A}$$

$$\therefore \quad \lambda_2 = \frac{36A}{7}$$

6. (d) : $r = 211.6$ pm $= 2.11$ Å

$$r = 0.529 \times \frac{n^2}{Z} = 2.11\text{ Å } (Z = 1)$$

$\therefore \quad n^2 = 4 \Rightarrow n = 2$

In Balmer series, transition of electron occurs from higher orbitals to orbital of $n = 2$.

7. (d) : $\lambda = \frac{}{} = \frac{}{\sqrt{7 \quad h\,3b3}} = \frac{}{\sqrt{7 \quad s}} \quad (\because K.E. = eV]$

$$\frac{}{\lambda} = \sqrt{7 \quad s}$$

8. (b) : Number of orbitals in n^{th} shell $= n^2 = (5)^2 = 25$

9. (a) : Energy of electron in the n^{th} orbit of H-atom is,

$$b = \frac{-683}{7}\text{ qb D}\frac{-683}{7^7} = -839\text{ qb}$$

10. (b) : The electrons are filled as per $(n + l)$ rule. Orbital having lower $(n + l)$ value is filled first and when $(n + l)$ values are same, the one having lower n value is filled first. Hence, the sequence of filling electrons in sixth period will be

$6s - 4f - 5d - 6p$ *i.e.* $(ns) \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$

11. (c) : $\lambda = \frac{}{\sqrt{7 \quad b}}$; where, m is mass and E is kinetic energy of the particle.

At constant temperature, E is constant.

$$\lambda \propto \frac{6}{\sqrt{}}$$

12. (b) : Rb ($Z = 37$) : [Kr] $5s^1$

$$n = 5,\ l = 0,\ m = 0,\ s = +\frac{1}{2}$$

13. (b) : $E = -2.178 \times 10^{-18} Z^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

$$E = -2.178 \times 10^{-18}\left[\frac{1}{(2)^2} - \frac{1}{(1)^2}\right]$$

$$E = +2.178 \times 10^{-18} \times \frac{3}{4} = 1.6335 \times 10^{-18}\text{ J}$$

$$E = \frac{hc}{\lambda} \Rightarrow \lambda = \frac{hc}{E} = \frac{6.62 \times 10^{-34}\text{ J s} \times 3 \times 10^8\text{ m}}{1.6335 \times 10^{-18}\text{ J}}$$

$\lambda = 12.14 \times 10^{-8}$ m or $\lambda = 1.214 \times 10^{-7}$ m

14. (a) : (1) $n = 4, l = 1 \Rightarrow 4p$

(2) $n = 4, l = 0 \Rightarrow 4s$

(3) $n = 3, l = 2 \Rightarrow 3d$

(4) $n = 3, l = 1 \Rightarrow 3p$

Increasing order of energy is $3p < 4s < 3d < 4p$

(4) < (2) < (3) < (1)

Alternatively,

for (1) $n + l = 5$; $n = 4$

(2) $n + l = 4$; $n = 4$

(3) $n + l = 5$; $n = 3$

(4) $n + l = 4$; $n = 3$

Lower $n + l$ means less energy and if for two subshells $n + l$ is same than lower n, lower will be the energy.

Thus correct order is (4) < (2) < (3) < (1).

15. (c) : We know that, $E = h\upsilon = hc/\lambda$

$$E = E_1 + E_2 \quad \text{or} \quad \frac{hc}{\lambda} = \frac{hc}{\lambda_1} + \frac{hc}{\lambda_2}$$

$$\Rightarrow \frac{1}{\lambda} = \frac{1}{\lambda_1} + \frac{1}{\lambda_2} \Rightarrow \frac{1}{355} = \frac{1}{680} + \frac{1}{\lambda_2}$$

$$\therefore \lambda_2 = \frac{355 \times 680}{680 - 355} = 742.769\text{ nm} \approx 743\text{ nm}$$

16. **(a) :** Energy required to break 1 mol of bonds = 242 kJ mol^{-1}

$\therefore$ Energy required to break 1 bond $= \dfrac{242\times10^3}{6.02\times10^{23}}$ J

We know that, $E = \dfrac{hc}{\lambda}$; Given, $c = 3\times10^8$ m s^{-1}

$$\therefore \quad \frac{242\times10^3}{6.02\times10^{23}} = \frac{6.63\times10^{-34}\times3\times10^8}{\lambda}$$

$$\therefore \quad \lambda = \frac{6.63\times10^{-34}\times3\times10^8\times6.02\times10^{23}}{242\times10^3}$$

$= 0.494\times10^{-6}$ m = 494 nm

17. **(c) :** $I.E.(He^+) = 19.6\times10^{-18}$ J $atom^{-1}$

E_1 (for H) $\times Z^2 = I.E.$

$E_1\times4 = -19.6\times10^{-18}$

E_1 (for Li^{2+}) = E_1 (for H) $\times$ 9

$= \dfrac{-19.6\times10^{-18}\times9}{4} = -4.41\times10^{-17}$ J $atom^{-1}$

18. **(b) :** According to de-Broglie's equation, $\lambda = \dfrac{h}{mv}$

Given, $v = 1.0\times10^3$ m s^{-1}

$$\therefore \quad \lambda = \frac{6.63\times10^{-34}}{1.67\times10^{-27}\times1.0\times10^3} = 3.9\times10^{-10}\text{ m} \approx 0.4\text{ nm}$$

19. **(c) :** Given, velocity of e^-, $v = 600$ m s^{-1}

Accuracy of velocity = 0.005%

$$\therefore \quad \Delta v = \frac{600\times0.005}{100} = 0.03$$

According to Heisenberg's uncertainty principle,

$$\Delta x\cdot m\Delta v \geq \frac{h}{4\pi} \Rightarrow \Delta x = \frac{6.6\times10^{-34}}{4\times3.14\times9.1\times10^{-31}\times0.03} = 1.92\times10^{-3}\text{ m}$$

20. **(a) :** The ionisation of H-atom is the energy absorbed when the electron in an atom gets excited from first shell (E_1) to infinity (*i.e.*, E_∞)

$I.E = E_\infty - E_1$

$1.312\times10^6 = 0 - E_1$

$E_1 = -1.312\times10^6$ J mol^{-1}

$$E_2 = -\frac{1.312\times10^6}{(2)^2} = -\frac{1.312\times10^6}{4}$$

Energy of electron in second orbit ($n = 2$)

$\therefore$ Energy required when an electron makes transition from $n = 1$ to $n = 2$

$$\Delta E = E_2 - E_1 = -\frac{1.312\times10^6}{4} - (-1.312\times10^6)$$

$$= \frac{-1.312\times10^6 + 5.248\times10^6}{4} = 9.84\times10^5\text{ J mol}^{-1}$$

21. **(c) :** $n = 3, l = 0$ represents $3s$ orbital

$n = 3, l = 1$ represents $3p$ orbital

$n = 3, l = 2$ represents $3d$ orbital

$n = 4, l = 0$ represents $4s$ orbital

The order of increasing energy of the orbitals is :

$3s < 3p < 4s < 3d$

22. **(c) :** According to Heisenberg's uncertainty principle,

$$\Delta x\times\Delta p = \frac{h}{4\pi}$$

$$\Delta x\cdot(m\cdot\Delta v) = \frac{h}{4\pi} \Rightarrow \Delta x = \frac{h}{4\pi m\cdot\Delta v}$$

Here $\Delta v = \dfrac{0.001}{100}\times300 = 3\times10^{-3}$ m s^{-1}

$$\therefore \quad \Delta x = \frac{6.63\times10^{-34}}{4\times3.14\times9.1\times10^{-31}\times3\times10^{-3}} = 1.92\times10^{-2}\text{ m}$$

23. **(d) :** Angular momentum of the electron, $mvr = \dfrac{nh}{2\pi}$

when $n = 5$ (given)

$\therefore$ Angular momentum $= \dfrac{5h}{2\pi} = 2.5\dfrac{h}{\pi}$

24. **(d) :** For hydrogen the energy order of orbital is

$1s < 2s = 2p < 3s = 3p = 3d < 4s = 4p = 4d = 4f$

25. **(d) :** Orbitals having same ($n + l$) value in the absence of electric and magnetic field will have same energy.

26. **(a) :** $\dfrac{1}{\lambda} = R\left(\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}\right) = 1.097\times10^7\text{ m}^{-1}\left(\dfrac{1}{1^2} - \dfrac{1}{\infty^2}\right)$

$\therefore \quad \lambda = 91\times10^{-9}$ m = 91 nm

27. **(b) :** ${}_{24}Cr \rightarrow 1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^5\,4s^1$

we know for p, $l = 1$ and for d, $l = 2$.

For $l = 1$, total number of electrons = 12 [$2p^6$ and $3p^6$]

For $l = 2$, total number of electrons = 5 [$3d^5$]

28. **(c) :** For $4f$ orbital electrons, $n = 4$

$l = 3$ (because $\overset{s}{0}\ \overset{p}{1}\ \overset{d}{2}\ \overset{f}{3}$)

$m = +3, +2, +1, 0, -1, -2, -3$

$s = \pm1/2$

29. **(b) :** The value of l (azimuthal quantum number) for s-electron is equal to zero.

Orbital angular momentum $= \sqrt{l(l+1)}\cdot\dfrac{h}{2\pi}$

Substituting the value of l for s-electron $= \sqrt{0(0+1)}\cdot\dfrac{h}{2\pi} = 0$

30. **(a) :** $\lambda = \dfrac{h}{mv} = \dfrac{6.63\times10^{-34}\times1000}{60\times10} = 1.105\times10^{-33}$ metres.

31. **(b) :** The electron has minimum energy in the first orbit and its energy increases as n increases. Here n represents number of orbit, *i.e.* 1st, 2nd, 3rd .... The third line from the red end corresponds to yellow region *i.e.* 5. In order to obtain less energy electron tends to come in 1st or 2nd orbit. So jump may be involved either 5 $\rightarrow$ 1 or 5 $\rightarrow$ 2. Thus option (b) is correct here.

32. **(c) :** According to Heisenberg uncertainty principle,

$$\Delta x\cdot m\Delta v = \frac{h}{4\pi}$$

$$\Delta v = \frac{6.6\times10^{-34}\times1000}{4\times3.14\times25\times10^{-5}} = 2.1\times10^{-28}\text{ m s}^{-1}$$

33. **(a) :** 2nd excited state will be the 3rd energy level.

$$E_n = \frac{13.6}{n^2}\text{ eV} \quad\text{or}\quad E = \frac{13.6}{9} = 1.51\text{ eV}$$