Doubt Clearing Session

Course on Atomic Structure for Class XI

Akhilesh • Lesson 16 • Sept 24, 2021

13 B is incorrect ACD

frequency — photons

YES
NO
can't say.

16 3P 3P_x

1

3P_x, y, z

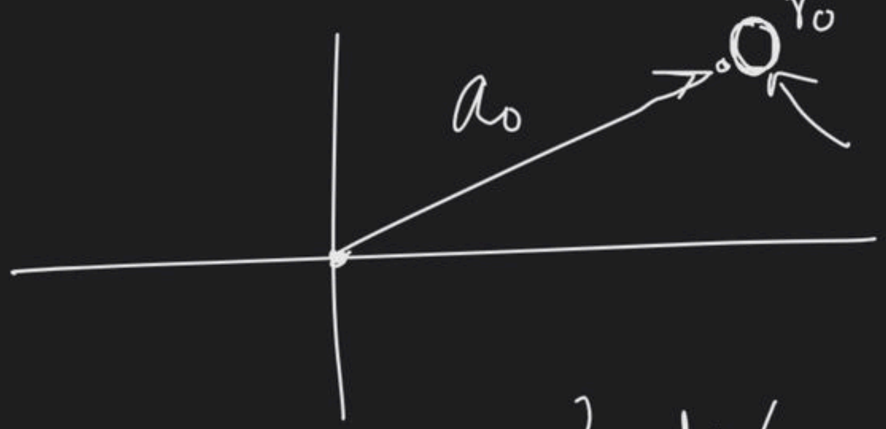
$P_x \longrightarrow \left(\frac{3}{4\pi}\right)^{1/2} \sin\theta \cos\phi$

$$\sqrt{\frac{h}{4\pi m}} \cdot dp = \frac{h}{4\pi}$$

$$= \sqrt{\frac{4m}{4\pi}}$$

$$k_1 \left(2 - \frac{r}{a_0}\right) e^{-r/a_0}$$

2s



$$\psi^2 \, dV$$

$$\psi = k_1 e^{-r/a_0}$$

$$k_2 \left(\frac{r}{a_0}\right) e^{-r/a_0} \cos\theta$$

2p

$$k_2 \, e^{-r/a_0} \, \gamma \, \frac{\sqrt{3}}{2}$$

ϕ azimuth

$2p_z$ & $3d_{z^2}$ θ

e^{-r/a_0}

e^{-2r/a_0}

(B) $T.E = -\frac{1}{2}\frac{KZe^2}{r}$ $\qquad \frac{1}{r} = TE^{1}$

(C) $r_n = 0.529\,\frac{n^2}{Z}$

8) (A) orbital angular momentum — l, m

(B) n, l, m, s

(C) Size → n

Shape → l

orient → m

(D)

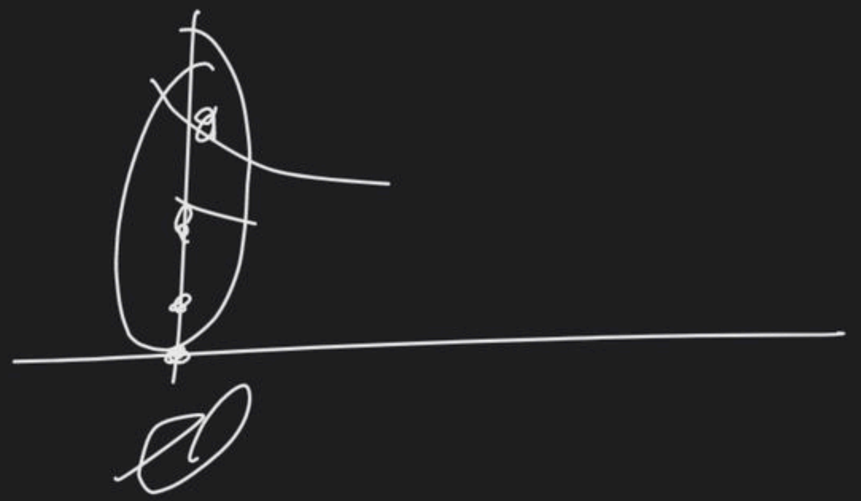
s-Orbital

p, d

m

Radial

(n/l)



l = 0

l = 1, 2, 3, ...

1s

2s

3s

(14) $KE = -TE = 13.6 \frac{Z^2}{n^2}$

a_0

$KE = \frac{1}{2} \frac{ke^2}{r}$

$KE = \frac{1}{2} mv^2$

$KE = \frac{1}{2} \frac{1}{m} (mv)^2$

$mv = \frac{nh}{2\pi r}$

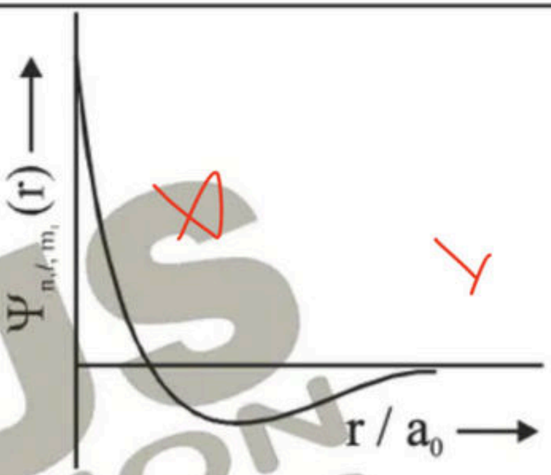
$KE = \frac{1}{2m} \times \frac{n^2 h^2}{4\pi^2 r^2}$

$r = 4a_0$

$$\lambda = \frac{h}{mv}$$

$$2\pi(4a_0) = 2\lambda$$

$$4\pi a_0 = \lambda$$

Column 1	Column 2	Column 3
(I) 1s orbital	(i) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{3}{2}} e^{-\left(\frac{Zr}{a_0}\right)}$	(P) 
(II) 2s orbital	(ii) One radial node	(Q) Probability density at nucleus $\propto \frac{1}{a_0^3}$
(III) $2p_z$ orbital	(iii) $\psi_{n,l,m_l} \propto \left(\frac{Z}{a_0}\right)^{\frac{5}{2}} re^{-\left(\frac{Zr}{2a_0}\right)} \cos\theta$	(R) Probability density is maximum at nucleus
(IV) $3d_z^2$ orbital	(iv) xy-plane is a nodal plane	(S)Energy needed to excite electron from n = 2 state to n = 4 state is

4d

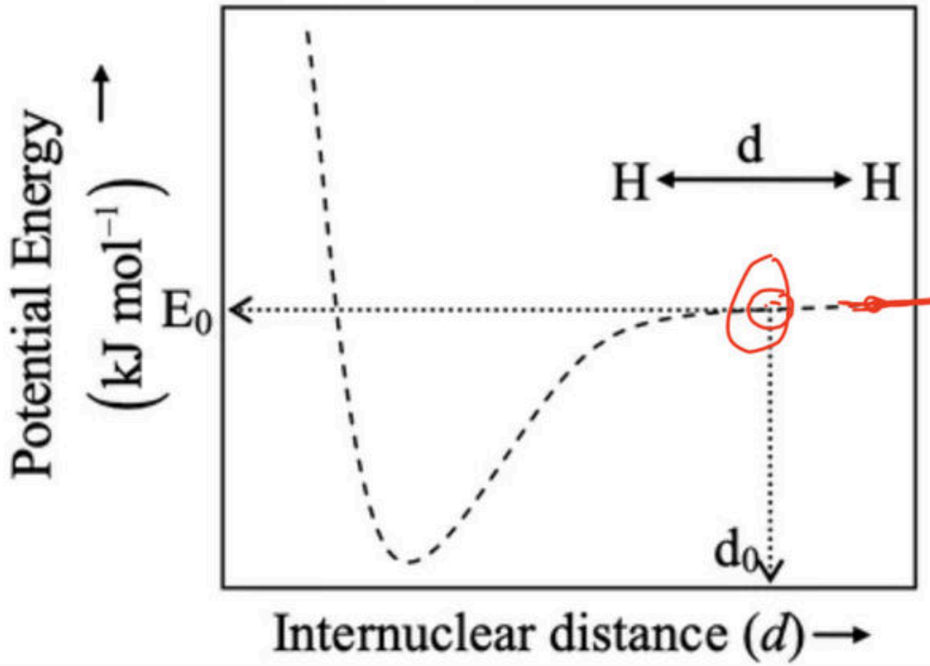
1, 4

15. The figure below is the plot of potential energy versus internuclear distance (d) of H_2 molecule in the electronic ground state. What is the value of the net potential energy E_0 (as indicated in the figure) in kJ mol^{-1}, for $d=d_0$ at which the electron-electron repulsion and the nucleus-nucleus repulsion energies are absent? As reference, the potential energy of H atom is taken as zero when its electron and the nucleus are infinitely far apart. **[Atomic Structure-T]**

Use Avogadro constant as 6.023×10^{23} mol^{-1}.

JEE-~~Adv~~-2020

$PE = \frac{-kze^2}{r}$ ✓



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

$-13.6Z^2 = TE$

$-13.6Z^2 \times 2\ eV$

$\lambda = \frac{h}{mv}$

$m_e v_e = m_p v_p$

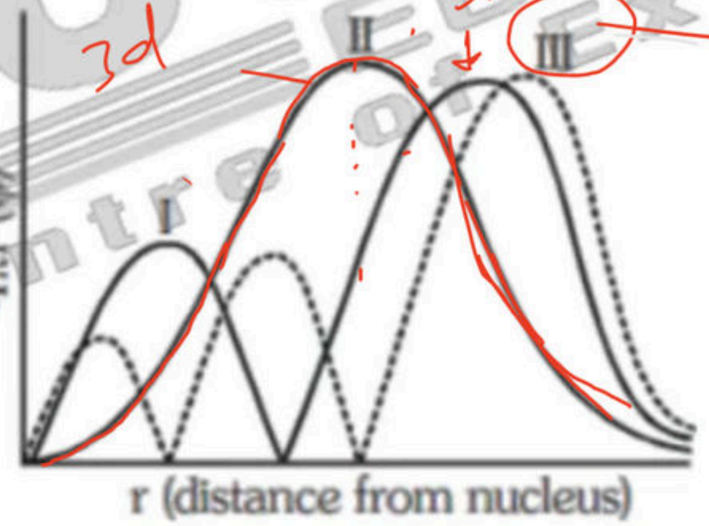
$m_e v_e = 1840\, m_e v_p$

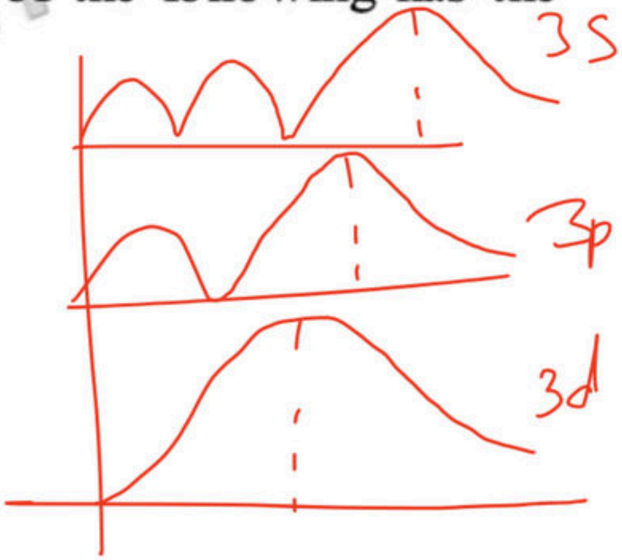
$\frac{x}{1840} = v_p$

122. An electron travels with a velocity of Xms^{-1}. For a proton to have the same de-broglie wavelength, the velocity will be approximately

(A) $\frac{1840}{x}$ (B) $\frac{x}{1840}$ (C) 1840x (D) x

152. Consider the following radial distribution function diagrams. Which of the following has the correct matching of curve and orbital ?





(A) I(3s), II(3p), III(3d)

(B) I(3d), II(3p), III(3s)

(C) I(3p), II(3d), III(3s)

(D) I(3s), II(3d), III(3p)

162. Miss Ritika has two ~~correct~~ information's from Mr. Gupta and Mr. Agarwal about a particular orbital of hydrogen atom. Identify the orbital

Mr. Gupta: $\Psi_{(angular)}$ of orbital is $\left(\frac{1}{4\pi}\right)^{1/2}$

Mr. Agarwal: The orbital has two radial nodes.

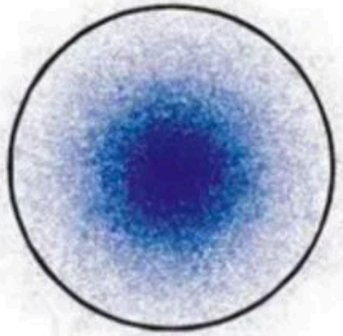
(A) 's' orbital with any principal quantum number

(B) any orbital with principal quantum number 3

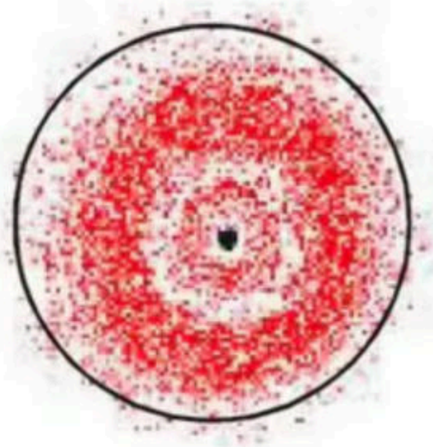
(C) 3s orbital

(D) Mr. gupta & Mr. Agarwal are "naughty", together their information cannot predict the orbital.

34. The probability density plots of 1s and 2s orbitals are given in diagram.



1s orbital



2s orbital

The density of dots in a region represents the probability density of finding electrons in the region. On the basis of above diagram which of the following statement(s) is/are correct ?

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

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

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

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

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▲ 12 • Asked by Yuvrajvidh...

sir mera Ideal Gas ka backlog h to kya sir me recording se kar lu ya ap droppers me karaoge tab karu ???

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▲ 10 • Asked by Shivam

Sir for disturbing .Sir mera school 1 month phale khol gaya aur 3:45 per chhuti hote hai jis se Hw chot jata hai . Aur jab school nahi jata teacher pettee hai . please help

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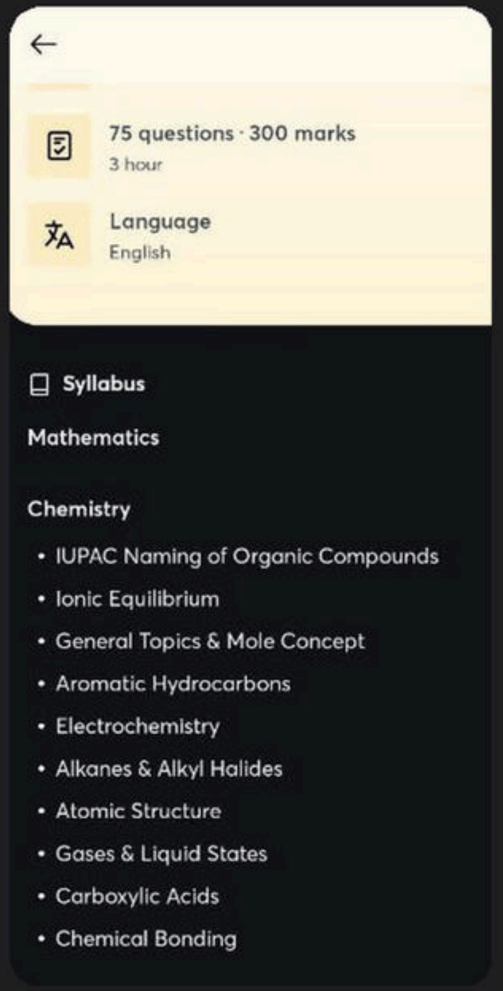
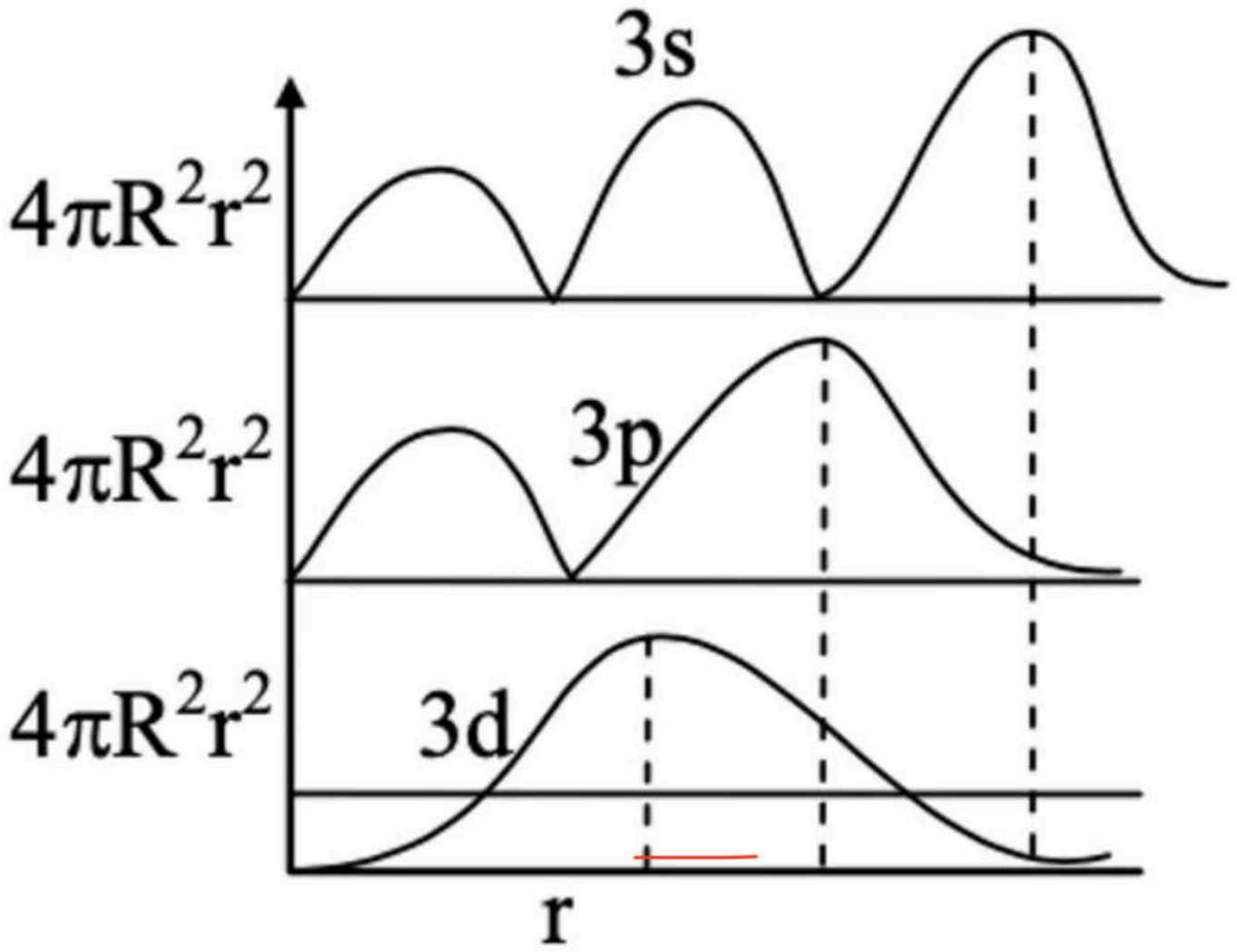
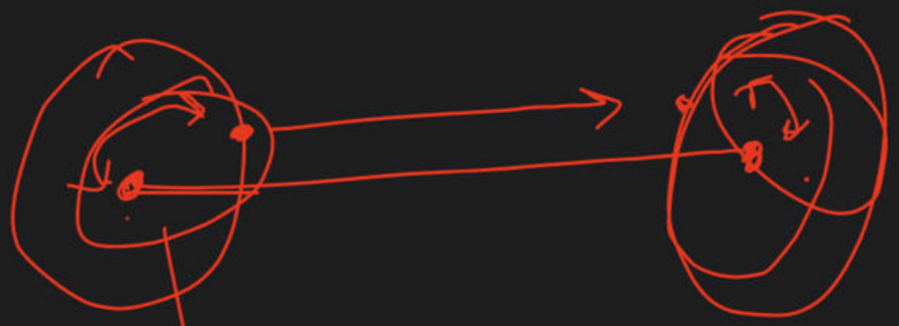
▲ 19 • Asked by Sounak

Sir chemistry Syllabus mein Electrochemistry nd Ionic Equilibrium bhi hai...Sir wo toh padhe nhi hai abhi tab?





r_{max}



-5242.49

$$PE = -13.6 \frac{Z^2}{n^2} \times 2 \times 2 \text{ eV}$$

$$= -13.6 \times 4 \times N_A \times 1.6 \times 10^{-19}$$

-5280 -5240

$$\left(\frac{1}{a_0}\right)^{3/2}\left(\frac{2r}{n a_0}\right)^{l}$$

P_ℓ

$$\frac{1}{a^{3/2}} \cdot \frac{1}{a}$$

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▲ 9 • Asked by Arsh

Sir , school me half yearly chal rhe hain isiliye HW nahi ho pa rha .... baad me kr lu theek rahega ????

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▲ 21 • Asked by Om

Please help me with this doubt