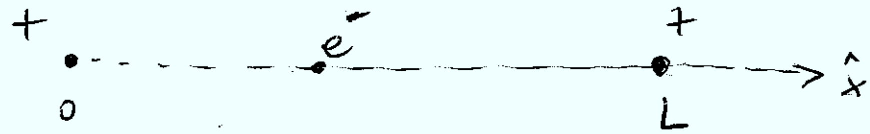
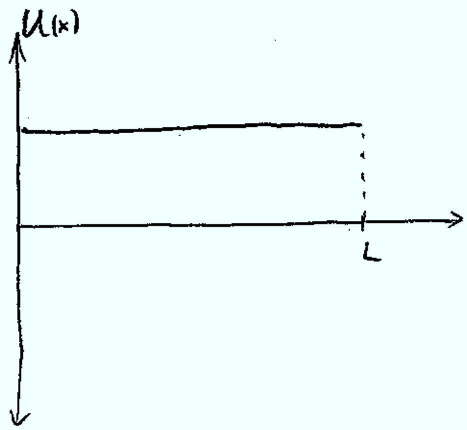
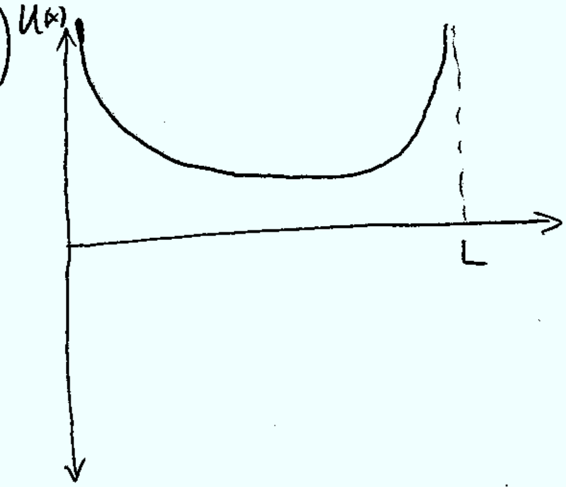


Which of the following diagrams best represents the potential energy function for an electron moving along the x-axis between two positive charges?

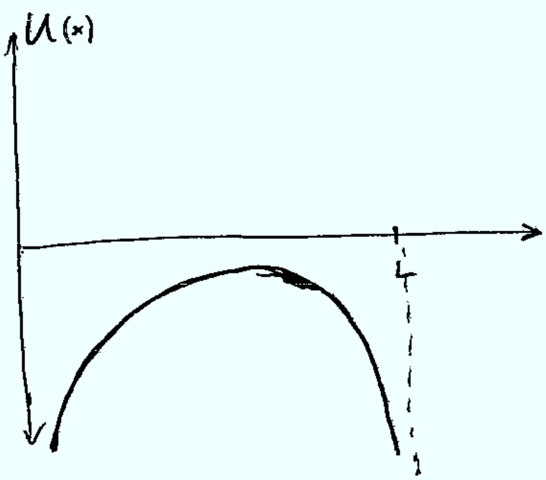
A)



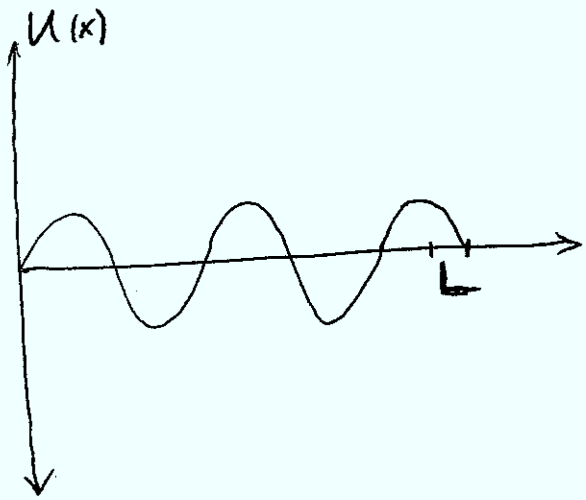
B)

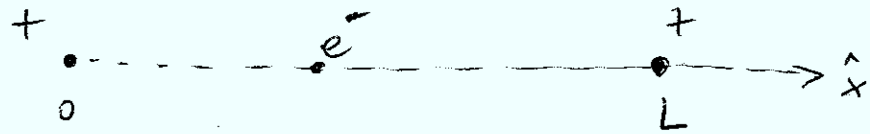


C)



D)





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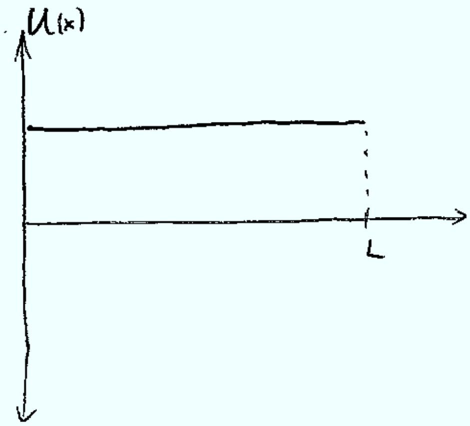
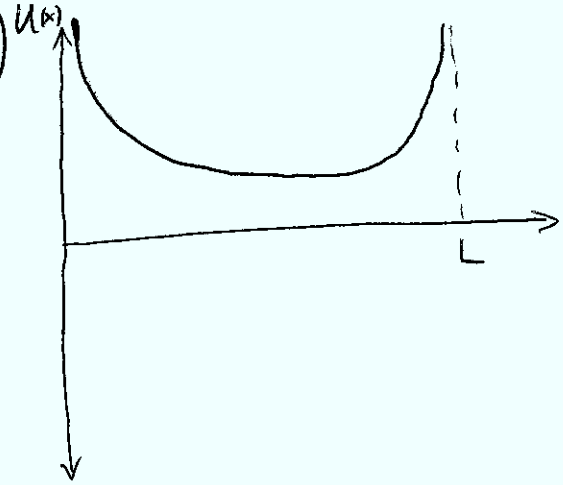
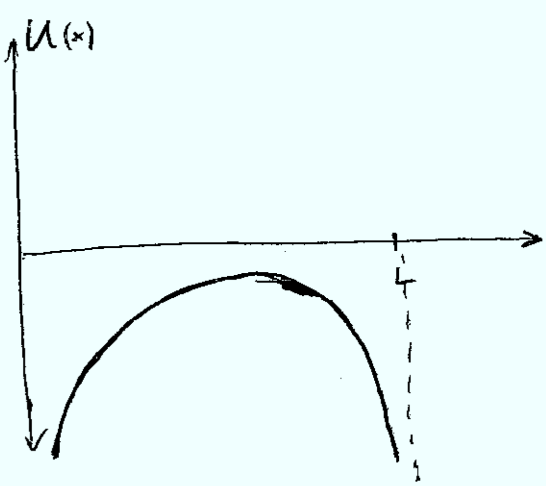


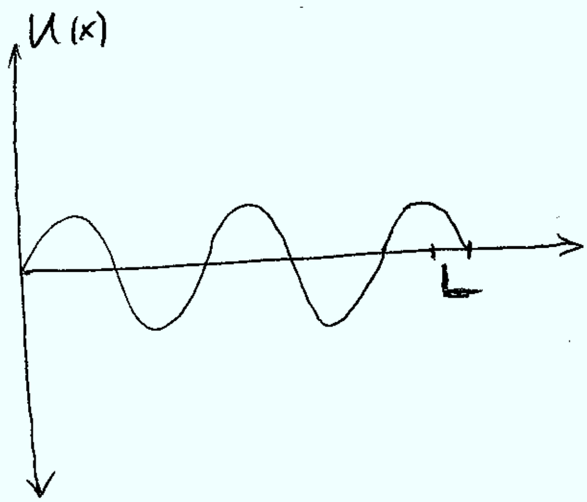
B)



C)

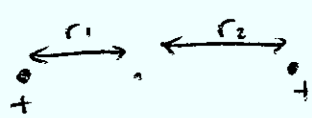


D)



Each charge has Coulomb potential:

$$U_1(x) = -\frac{e}{r_1} \qquad U_2(x) = -\frac{e}{r_2}$$



$$U(x) = U_1(x) + U_2(x)$$

The quantum picture explains the stability of atoms because:
(choose the best answer)

A) The energy levels are discrete.

B) There is a finite minimum energy that the electron can have

C) There is no definite value for the electron's position.

The quantum picture explains the stability of atoms because:
(choose the best answer)

A) The energy levels are discrete.

B) There is a finite minimum energy that the electron can have → no other state for electron to go to. ground state completely stable

C) There is no definite value for the electron's position.

$\psi_1(x)$ and $\psi_2(x)$ energy-eigenstate wavefunctions for an electron corresponding to two different energies. If we have an electron with initial wavefunction

$$\psi(x,t=0) = \frac{1}{\sqrt{2}}\left(\psi_1(x) + \psi_2(x)\right)$$

we can say that:

A) The probability density for this electron will be constant in time.

B) The probability density for this electron will change with time.

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we can say that:

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$$\psi(x,t) = \frac{1}{\sqrt{2}}\left(\psi_1(x)\, e^{-i\frac{E_1}{\hbar}t} + \psi_2(x)\, e^{-i\frac{E_2}{\hbar}t}\right)$$

$$|\psi(x,t)|^2 = \frac{1}{2}\left|\psi_1(x) + \psi_2(x)\, e^{i\frac{(E_1-E_2)}{\hbar}t}\right|^2$$

phase doesn't cancel out $\Rightarrow$ $P(x,t)$ will depend on time

For the electron state in the previous question, a measurement of energy is performed. The result we will find is:

A) $E_1 + E_2$

B) something between E_1 and E_2, but the result is not predetermined

C) either E_1 or E_2, with equal probability

D) most likely the lowest energy value, E_1