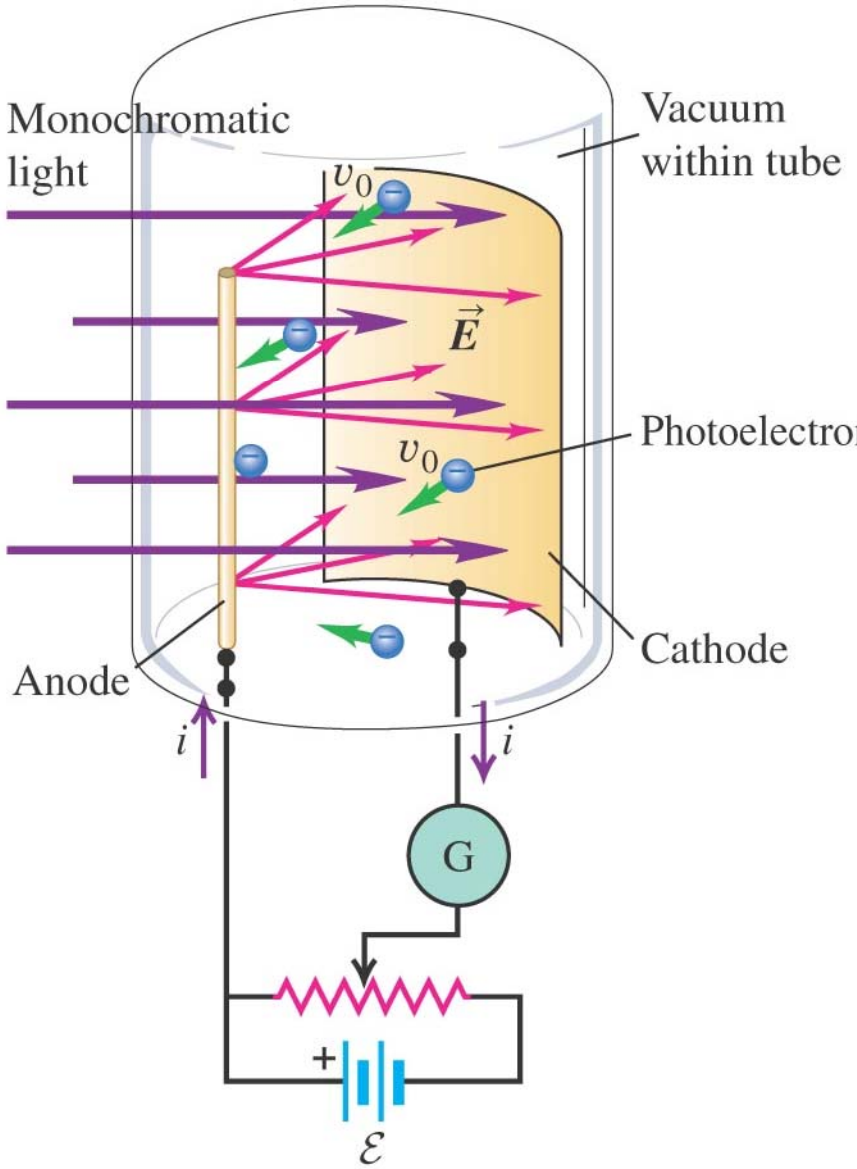
(a) Light causes the cathode to emit electrons, which are pushed toward the anode by the electric-field force.

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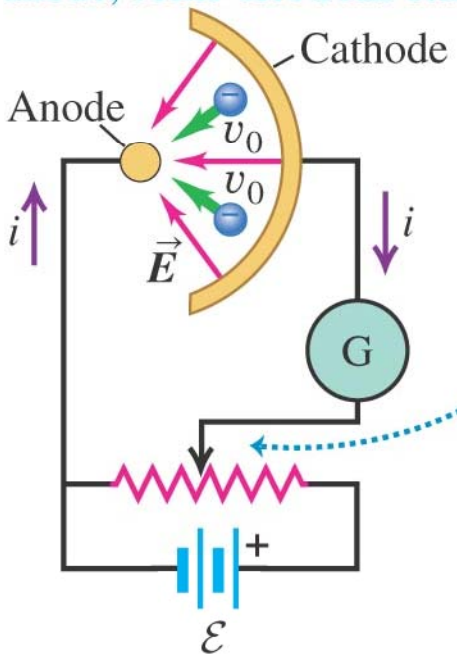
(b) Overhead view with $\vec{E}$ field reversed. Even when the direction of $\vec{E}$ field is reversed so that the electric-field force points away from the anode, some electrons still reach the anode ...




... unless the reversed potential difference has an absolute value of at least $V_0$. This *stopping potential* gives zero current.

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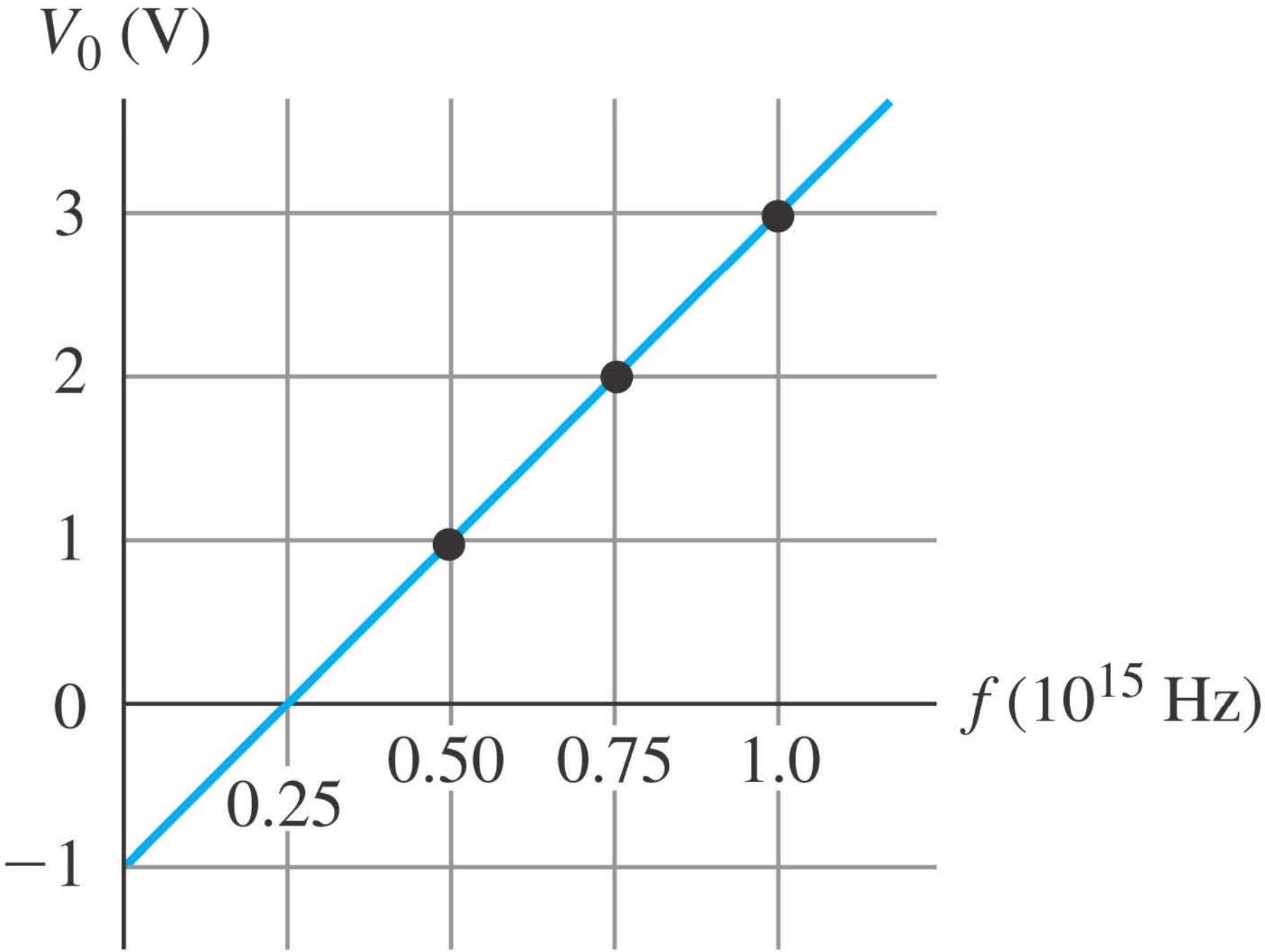


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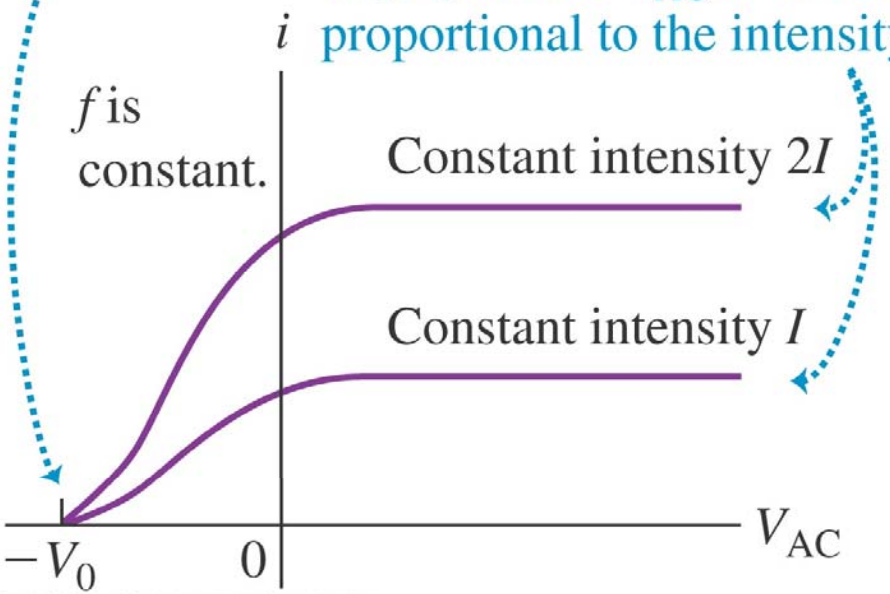
The stopping potential $V_0$ is independent of the light intensity ...

... but the photocurrent $i$ for large positive $V_{AC}$ is directly proportional to the intensity.

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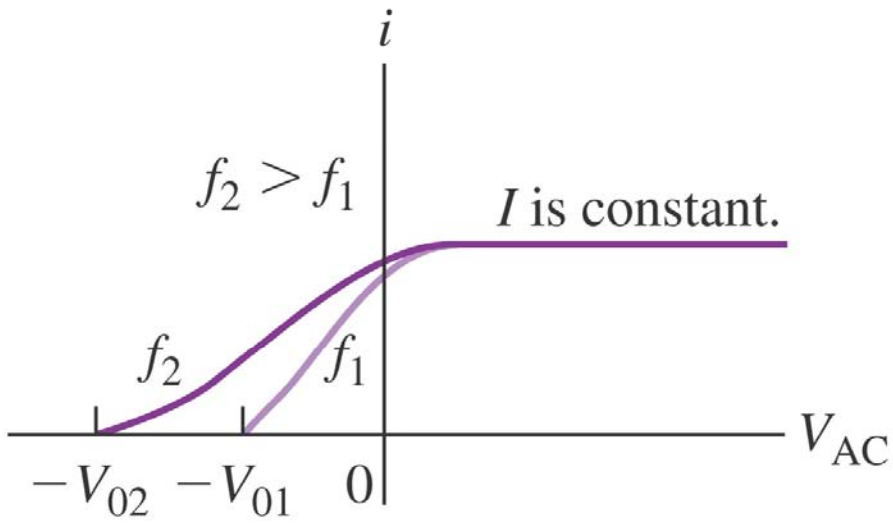


The stopping potential $V_0$ (and therefore the maximum kinetic energy of the photoelectrons) increases linearly with frequency: since $f_2 > f_1$, $V_{02} > V_{01}$.

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Q38.1

In an experiment to demonstrate the photoelectric effect, you shine a beam of monochromatic blue light on a metal plate. As a result, electrons are emitted by the plate.

If you increase the intensity of the light but keep the color of the light the same, what happens?

A. More electrons are emitted per second.

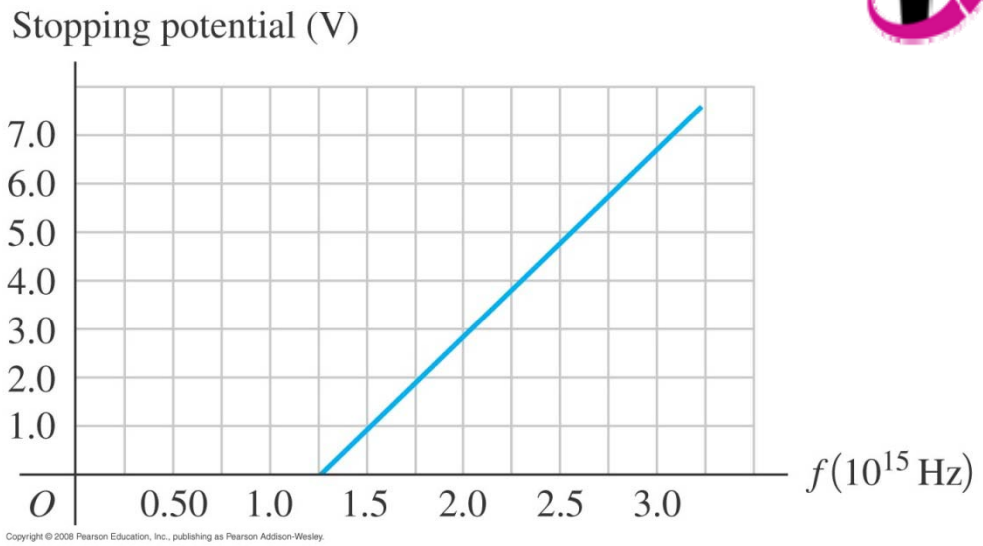
B. The maximum kinetic energy of the emitted electrons increases.

C. both A. and B.

D. neither A. nor B.

Q38.2

This graph in shows the stopping potential as a function of the frequency of light falling on a metal surface. If a different type of metal is used,



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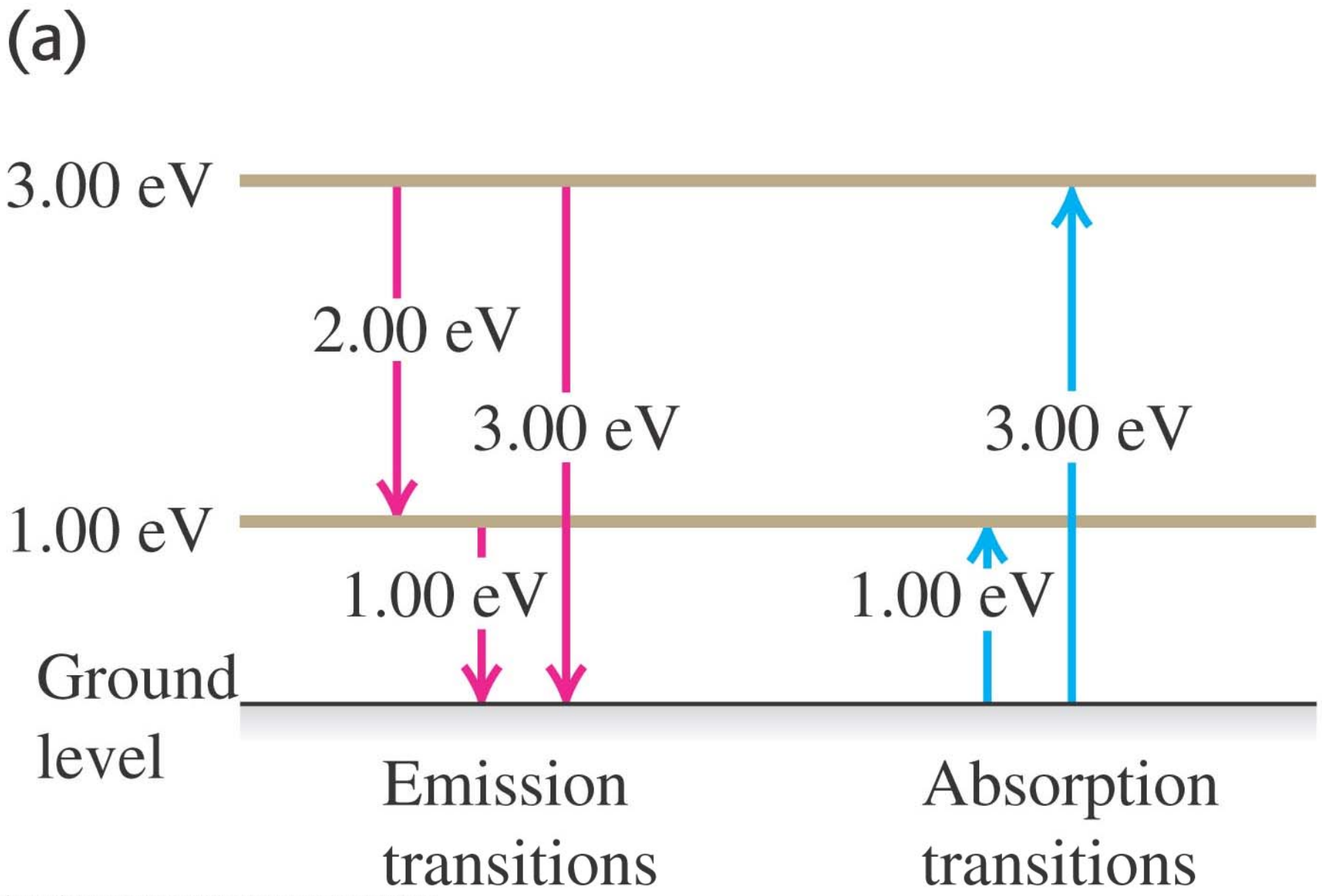
A. the graph could have a different slope.

B. the graph could intercept the horizontal axis at a different value.

C. both A. and B.

D. neither A. nor B.

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Q38.3

A certain atom has two energy levels whose energies differ by 2.5 eV.

In order for a photon to excite an electron from the lower energy level to the upper energy level, what must be true about the energy of the photon?

A. Its energy must be greater than or equal to 2.5 eV.

B. Its energy must be exactly 2.5 eV.

C. Its energy must be less than or equal to 2.5 eV.

D. none of the above