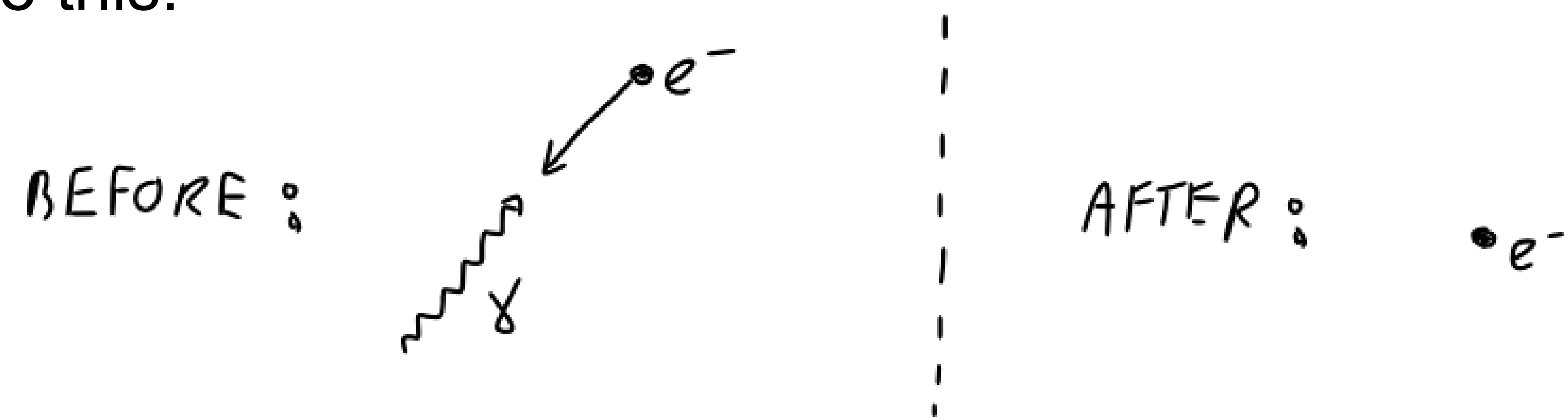
A stationary electron absorbs a photon. In the frame of reference in which the electron is stationary after the photon has been absorbed, the before and after look pictures are like this:



Which of the following is true?

A) This is a valid process
B) This process would violate conservation of momentum
C) This process would violate conservation of energy
D) B and C
E) A, B and C

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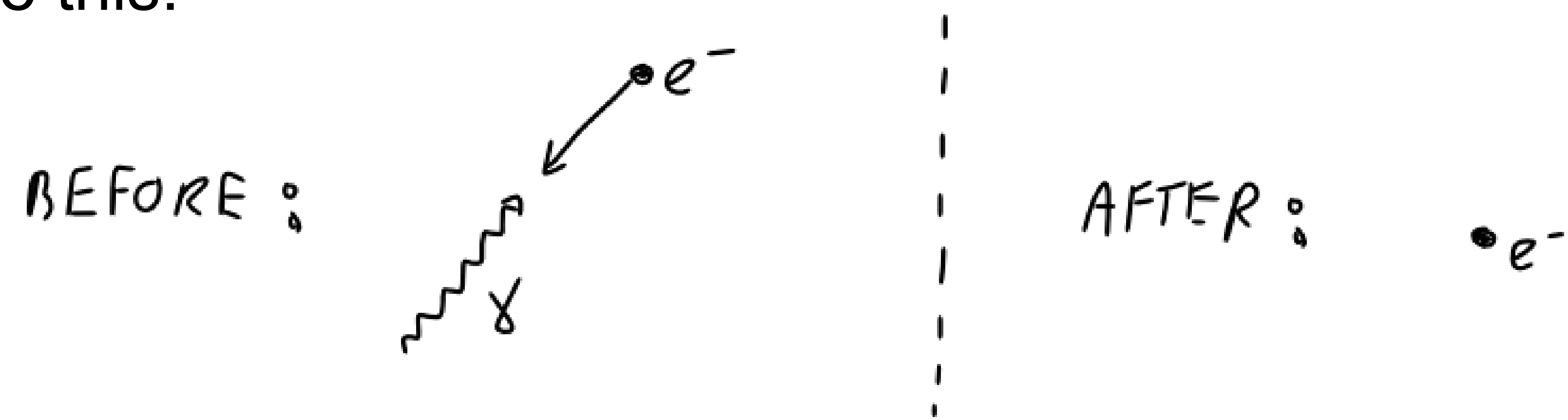

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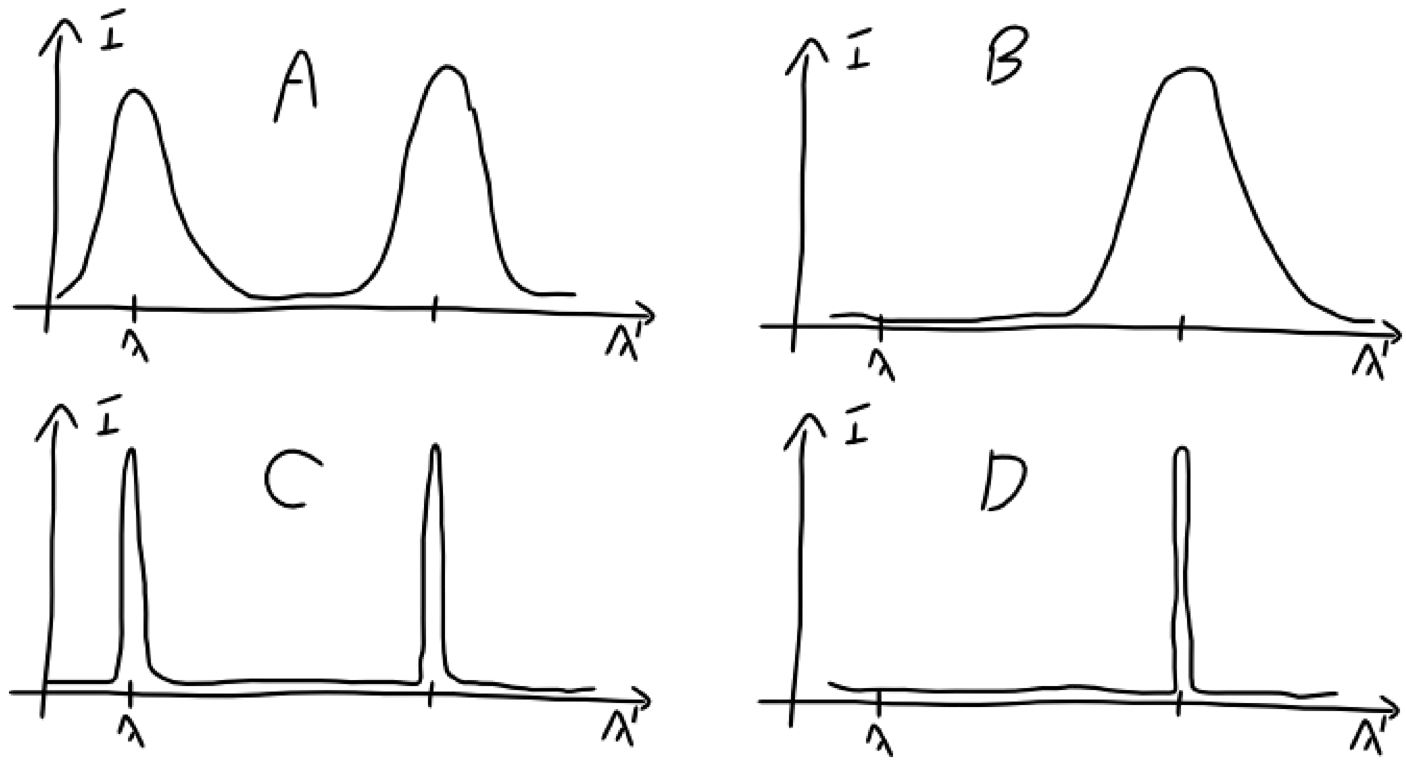
After the collision the energy is just mc^2 but before the collision it must be greater than that (from the photon and the kinetic energy of the electron).

In an actual Compton effect experiment, the X-rays can also scatter off the atomic nuclei, while the electrons in the metal have random velocities. Which of the following could represent actual data from a Compton experiment (intensity as a function of wavelength for light scattered at fixed angle)?
The incident light has wavelength λ.



E) None of the above (prepare to explain)

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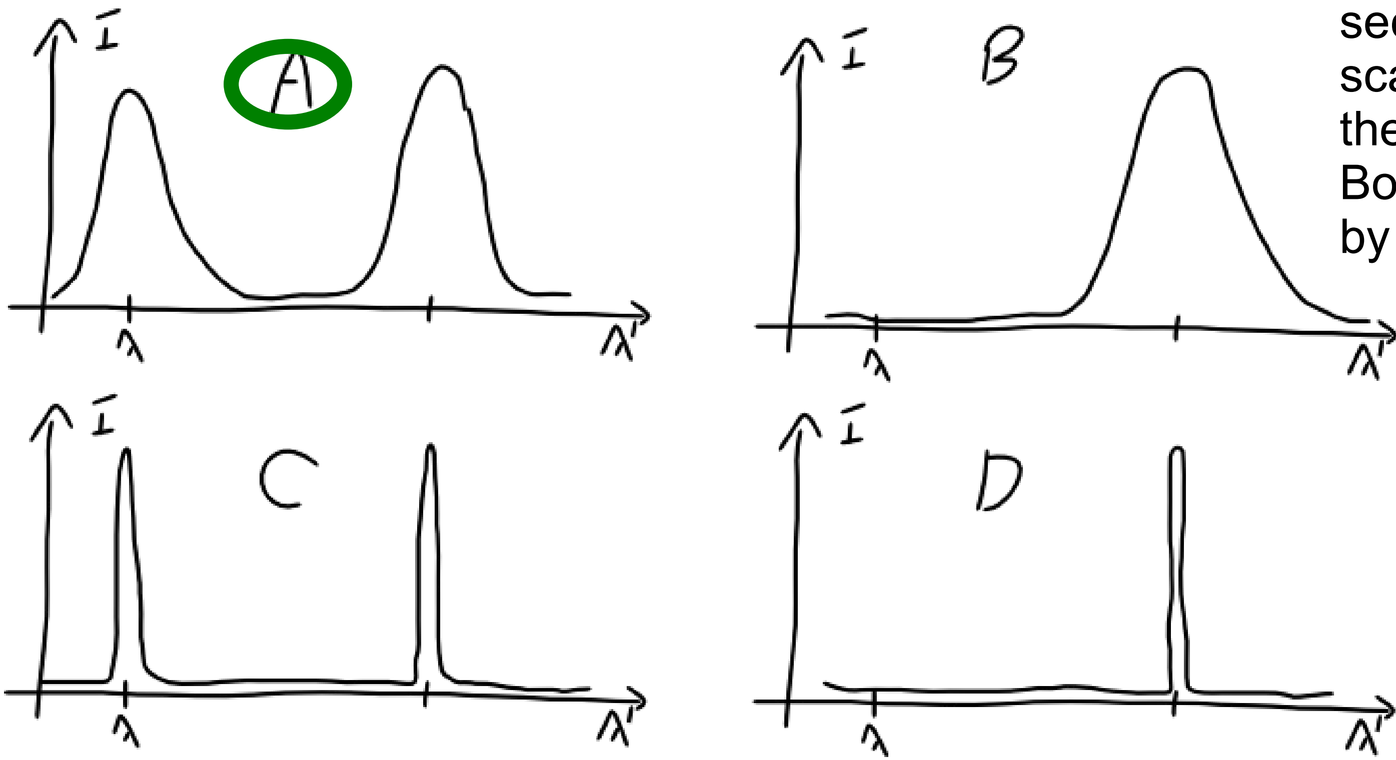
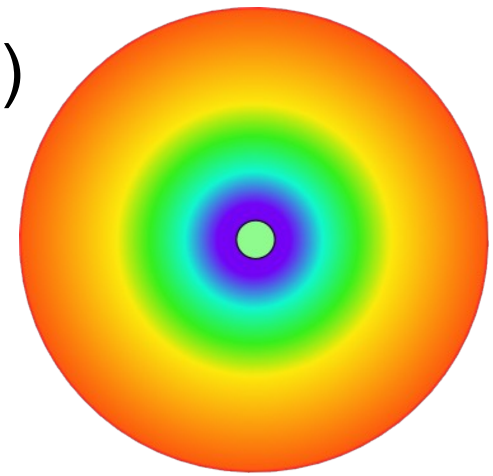
The first peak is due to scattering off nuclei and the second due to scattering off the electrons. Both are broadened by thermal effects



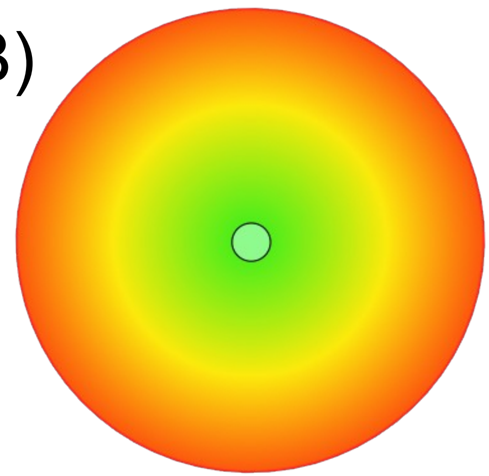
E) None of the above (prepare to explain)

A beam of X-rays is aimed at a chunk of metal. In false colour, with red=long wavelength and blue=short wavelength, which of the pictures below represents the resulting pattern if the incident light is 'green'?

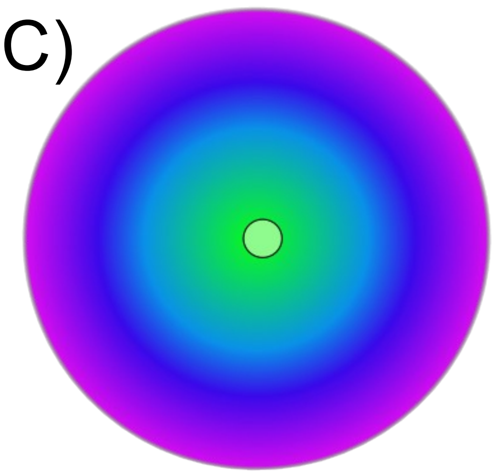
A)



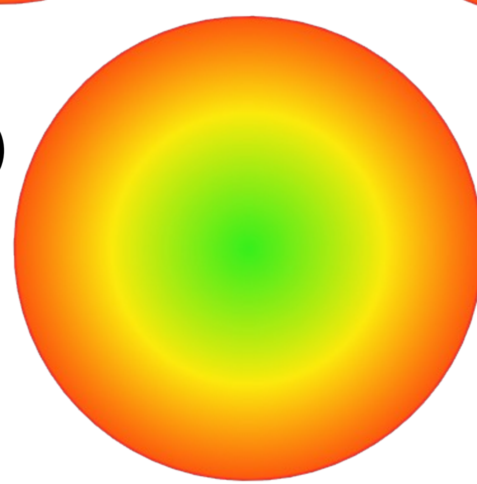
B)



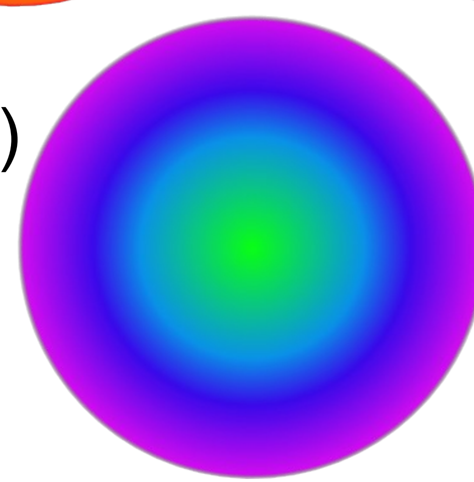
C)



D)



E)



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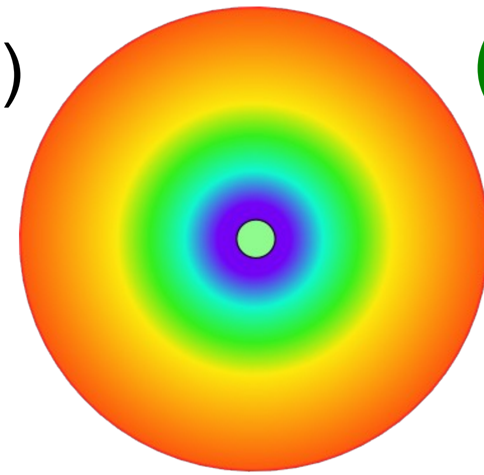
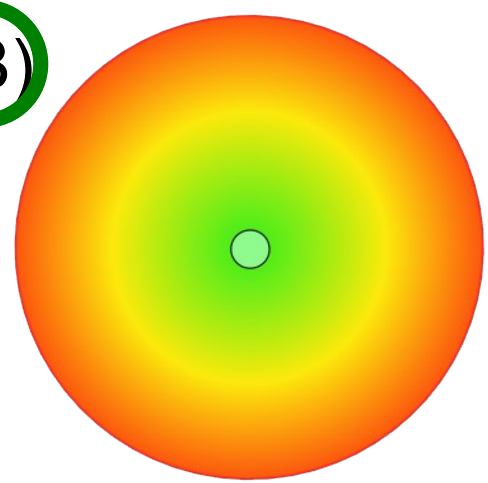
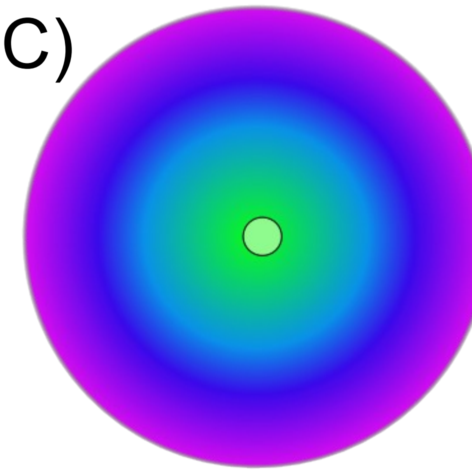


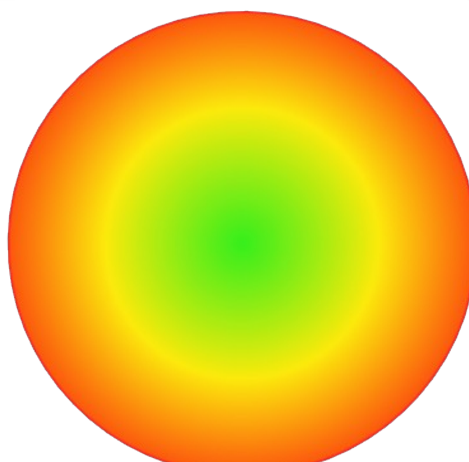
B)



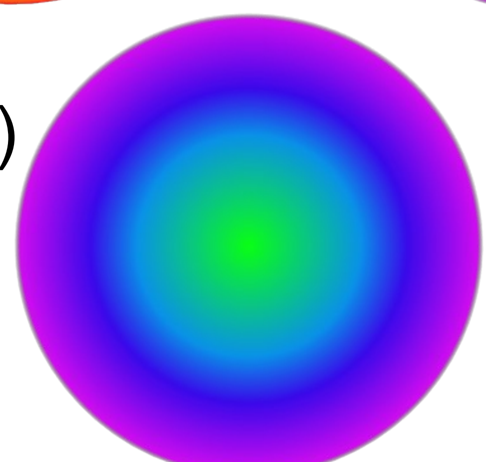
C)



D)



E)



Wavelengths increase with increased angle, starting with green towards red.
The bright circle in the middle is due to the beam going straight through.

Which of the phenomena below can be explained by black body radiation?

A) The shining of the Sun

B) The glowing of a hot kitchen burner

C) The warmth you feel when standing next to a fireplace

D) A and B only

E) A, B and C

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In all three cases, hot objects are emitting radiation with various wavelengths depending on temperature