Keystone - Chapter 14: Matter and Electric Fields

A balloon, with an average radius of approximately 11 cm, carries a uniformly-distributed positive charge of 8 nC ($8x10^{-9}C$) on its outer surface. An uncharged solid copper block is placed nearby. The block is 15 cm thick, and it is 12 cm away from the surface of the balloon.







Figure 2: Balloon, Glass, and Metal Block

(a) Sketch the approximate charge distribution of the neutral solid metal block and the balloon on Figure 1.

(b) Draw the electric field vector at the center of the metal block due solely to the distribution that you just sketched on that block, and label it \vec{E}_{block} .

(c) Calculate the magnitude of the electric field vector that you just drew, and explain how you arrived at this answer . Make any approximations necessary to perform the calculation, but state what they are and justify them.

(d) Now, you place a thin pane of neutral glass between the balloon and the metal block (Figure 2). Has \vec{E}_{block} increased, decreased, or remained unchanged due to the presence of the glass? How do you know?