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## Quiz Question 1

- 1) Here are four possible things that could be done to any object.
- I. Hit it with another hard object.
  - II. Heat it to a very high temperature.
  - III. Cool it to a very low temperature.
  - IV. Bring it close to one end of a permanent magnet.

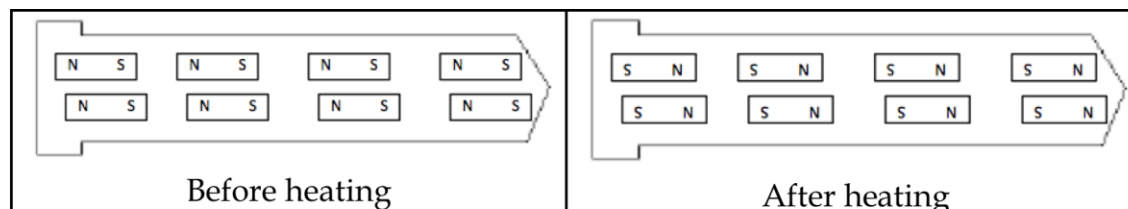
Considering all the evidence you have seen in this unit, in terms of the alignment of domains model, which of these seem to be able to change the orientation of at least some of the domains in a ferromagnetic object?

- A. I and II.
- B. II and III.
- C. I, II, and III.
- D. I, II and IV.
- E. I, II, III, and IV.

**Feedback:** Choice D is correct. In terms of the model, when at least some of the domains change their orientation we would observe some change in the magnetization of the object. You saw in class that hitting a magnetized nail demagnetizes it (I), while bringing it close to one end of a permanent magnet can magnetize a nail (IV). In this extension activity you saw that heating a magnetized nail also demagnetizes it (II), but cooling it does NOT change its magnetization (III).

## Quiz Question 2

A group of students constructed the following explanation for why the N-pole of compass needle rotated toward the tip of a magnetized nail placed at the E-label, but after the nail was heated the needle showed no reaction.



*(1) Before it is heated all the S-poles of the domains in the magnetized nail are facing the tip of the nail, making it a S-pole that attracts the N-pole of the compass needle. (2) When the nail is heated the domains get jumbled up with no preferred direction of alignment. This means the tip of the nail is now unmagnetized and the tip is longer any particular pole. (3) Since there is an attraction between an unmagnetized object and both poles of a magnet, both ends of the compass needle are now attracted to the nail. These two attractions tend to make the needle rotate in opposite directions, so they cancel each other out and the needle does not move.*

What is your evaluation of this explanation in terms of whether it is **well constructed** or not?

- A. It is well-constructed.
- B. It is not well constructed because it is not relevant.
- C. It is not well-constructed because the diagram and narrative are inconsistent.
- D. It is not well constructed because the diagram is not clear or the narrative is not easy to read.

**Feedback:** C is the correct choice. The main problem is that the diagram and narrative are inconsistent with each other.

## Quiz Question 3

Now consider only the narrative from the same explanation

*(1) Before it is heated all the S-poles of the domains in the magnetized nail are facing the tip of the nail, making it a S-pole that attracts the N-pole of the compass needle. (2) When the nail is heated the domains get jumbled up with no preferred direction of alignment. This means the tip of the nail is now unmagnetized and the tip is longer any particular pole. (3) Since there is an attraction between an unmagnetized object and both poles of a magnet, both ends of the compass needle are now attracted to the nail. These two attractions tend to make the needle rotate in opposite directions, so they cancel each other out and the needle does not move.*

What is your evaluation of this narrative in terms of whether it is **accurate** or not?

- A. It is accurate.
- B. It is not accurate because part (1) is not consistent with the class consensus model and/or the Law of Magnetic Poles.
- C. It is not accurate because part (2) is not consistent with the class consensus model.
- D. It is not accurate because part (3) is not consistent with how we know unmagnetized and magnetized objects interact with each other.

**Feedback:** A is the correct choice. All of the narrative is consistent with the ideas developed in class.

## Quiz Question 4

Again, consider only the narrative from the same explanation

*(1) Before it is heated all the S-poles of the domains in the magnetized nail are facing the tip of the nail, making it a S-pole that attracts the N-pole of the compass needle. (2) When the nail is heated the domains get jumbled up with no preferred direction of alignment. This means the tip of the nail is now unmagnetized and the tip is longer any particular pole. (3) Since there is an attraction between an unmagnetized object and both poles of a magnet, both ends of the compass needle are now attracted to the nail. These two attractions tend to make the needle rotate in opposite directions, so they cancel each other out and the needle does not move.*

What is your evaluation of this narrative in terms of whether it is well-reasoned or not?

- A. It is well-reasoned.
- B. It is not well reasoned because it does not explain why the compass needle is attracted to the nail before heating.
- C. It is not well-reasoned because it does not explain why heating the nail causes the domains to change their orientation.
- D. It is not well-reasoned because it does not explain why the compass needle does not react to the the nail after it was heated.

**Feedback:** C is the correct choice. No reason is given why heating the nail causes the domains to reorient.