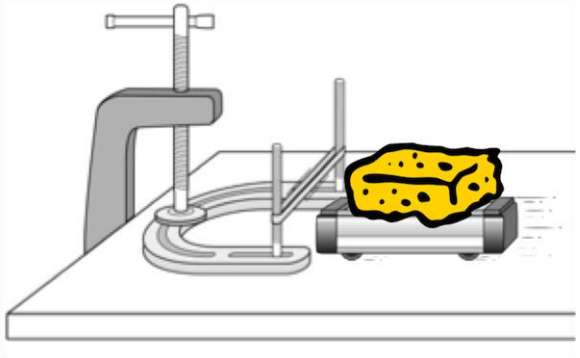
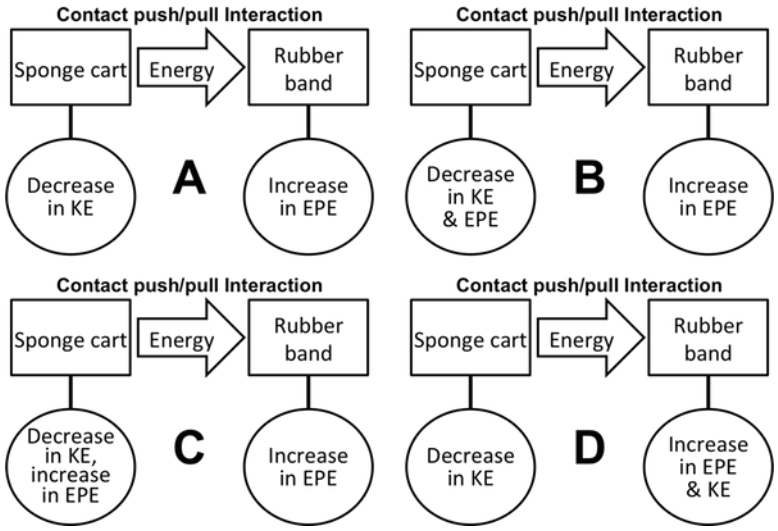
Quiz Question 3

Consider again the situation described in the last question, in which a sponge mounted on a low-friction cart collides with a rubber band. For the period between when the “sponge cart” first makes contact with the rubber band and when the sponge cart comes to a full stop, which one of the energy diagrams below best describes the interaction between the sponge cart and the rubber band?





Feedback: Energy diagram C is correct. As discussed in the feedback to the last question, the elastic potential energy of both the sponge and rubber band increase during the period the sponge cart slows to a stop. The kinetic energy of the cart decreases, while the kinetic energy of the rubber band is unchanged. Hence, the KE of the cart is transformed into the EPE of both the sponge (cart) and the rubber band, and there is a net transfer of energy from the sponge cart to the rubber band. This is what energy diagram C depicts.

Representing Magnetic Poles and Electric Charges – Quiz **KEY**

Quiz Question 1

Below are images of three positions of a compass near a bar magnet. The pointed end of the compass needle represents its North Pole. Only one of these three images shows the correct orientation of the compass needle, the other two are incorrect. Which image is correct?

(If you wish, you can look at the movie (https://youtu.be/Ni2KA0JbXyY) again of the compass being moved around the magnet.)

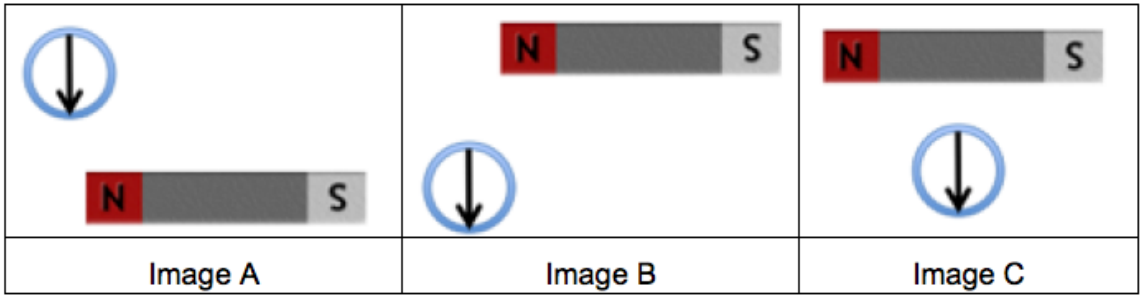


Image A	Image B	Image C

Feedback: Image B is the correct choice. The North Pole of the compass should point away from the North Pole of the magnet. While the compass needle should also point toward the South Pole of the magnet, the behavior of the needle depends largely on which pole it lies nearer. In image B, the needle is nearer the North Pole, so it points away from the magnet. In image C, it is equally distant from the magnet's two poles, so the compass needle should be pointing right (toward the South Pole, away from the North Pole).

Quiz Question 2

Magnetic compasses work because Earth behaves *as if* there is a large bar magnet inside it, with the poles of the bar magnet located near Earth's geographic poles.

Which of the following statements best explains why the North Pole of a compass needle points (approximately) toward the geographic North Pole of the Earth?

A) The North Pole of the imaginary large bar magnet inside the Earth lies close to the geographic North Pole.

B) The South Pole of the imaginary large bar magnet inside the Earth lies close to the geographic North Pole.

Feedback: Choice B is correct. The north pole of a compass needle would be attracted to the hypothetical south pole of the earth's bar magnet that is located beneath the geographical north pole of the earth. In that way, the compass' north pole would 'point north.'

Quiz Question 3

In one of the movies you watched in the extension, a demonstrator rubbed a balloon on his hair. The balloon acquired a **negative (–)** charge. The evidence for this was that when the balloon was brought near the T-tape and B-tape, it attracted the + charged T-tape and repelled the – charged B-tape.

When the balloon was brought near the demonstrator's hair, it attracted the hair. The picture to the left shows two pictures of the demonstrator's hair. The picture on the left shows the hair before the balloon was rubbed; the picture on the right shows the hair after the balloon was rubbed in the hair and moved away—but ***before*** it was brought close again.

Examine the two pictures closely. Based on this evidence and the evidence described above, ***right after the balloon is rubbed***, is the demonstrator's hair charged? If so, how is it charged?

A) No, the hair is uncharged.
B) Yes, the hair is positively charged.
C) Yes, the hair is negatively charged.

Hint: Consider that, after the balloon is rubbed against the hair, each strand of hair may be individually charged and can interact with adjacent hairs.

Movie URL: https://youtu.be/YaHUiipTC_E

Feedback: Choice B is the best answer. The hair is attracted to the balloon, so it cannot be negatively charged. When the balloon is removed right after it is rubbed in the hair, the strands of hair don't fall back into place on the head, but still stand apart, as if they are repelling one another. Thus, the hair is probably positively (+) charged rather than uncharged.

Quiz Question 4

Which one of the following statements is best supported by the evidence that you have seen in class and in this extension?

A) When two uncharged objects are rubbed together, if one of them acquires an electric charge of one sign (either + or –), the other object may acquire the same charge, the opposite charge, or remain uncharged. It depends on the objects.

B) When two uncharged objects are rubbed together, if one of them acquires an electric charge of one sign (either + or –), the other object will always acquire the opposite charge.

C) When two uncharged objects are rubbed together, if one of them acquires an electric charge of one sign (either + or –), the other object may acquire the opposite charge or remain uncharged. It depends on the objects.

Feedback: Choice B is the answer best supported by the evidence. It is also the only choice for which charge is conserved.