ML-8A 10/6/2010

# Engineering is Elementary

**My initials:**

| FIRST | MIDDLE | LAST |
|---|---|---|
| | | |
| Ⓐ | Ⓐ | Ⓐ |
| Ⓑ | Ⓑ | Ⓑ |
| Ⓒ | Ⓒ | Ⓒ |
| Ⓓ | Ⓓ | Ⓓ |
| Ⓔ | Ⓔ | Ⓔ |
| Ⓕ | Ⓕ | Ⓕ |
| Ⓖ | Ⓖ | Ⓖ |
| Ⓗ | Ⓗ | Ⓗ |
| Ⓘ | Ⓘ | Ⓘ |
| Ⓙ | Ⓙ | Ⓙ |
| Ⓚ | Ⓚ | Ⓚ |
| Ⓛ | Ⓛ | Ⓛ |
| Ⓜ | Ⓜ | Ⓜ |
| Ⓝ | Ⓝ | Ⓝ |
| Ⓞ | Ⓞ | Ⓞ |
| Ⓟ | Ⓟ | Ⓟ |
| Ⓠ | Ⓠ | Ⓠ |
| Ⓡ | Ⓡ | Ⓡ |
| Ⓢ | Ⓢ | Ⓢ |
| Ⓣ | Ⓣ | Ⓣ |
| Ⓤ | Ⓤ | Ⓤ |
| Ⓥ | Ⓥ | Ⓥ |
| Ⓦ | Ⓦ | Ⓦ |
| Ⓧ | Ⓧ | Ⓧ |
| Ⓨ | Ⓨ | Ⓨ |
| Ⓩ | Ⓩ | Ⓩ |

**I am a:**

- ○ Girl
- ○ Boy

**I was born in:**

MONTH BORN

- ○ January
- ○ February
- ○ March
- ○ April
- ○ May
- ○ June
- ○ July
- ○ August
- ○ September
- ○ October
- ○ November
- ○ December

**Today the date is:**

| MONTH | DAY | | YEAR |
|---|---|---|---|
| ○ January | | | ○ 2010 |
| ○ February | | | ○ 2011 |
| ○ March | ⓪ | ⓪ | ○ 2012 |
| ○ April | ① | ① | ○ 2013 |
| ○ May | ② | ② | ○ 2014 |
| ○ June | ③ | ③ | ○ 2015 |
| ○ July | | ④ | ○ 2016 |
| ○ August | | ⑤ | ○ 2017 |
| ○ September | | ⑥ | ○ 2018 |
| ○ October | | ⑦ | ○ 2019 |
| ○ November | | ⑧ | ○ 2020 |
| ○ December | | ⑨ | |

## Marking Instructions

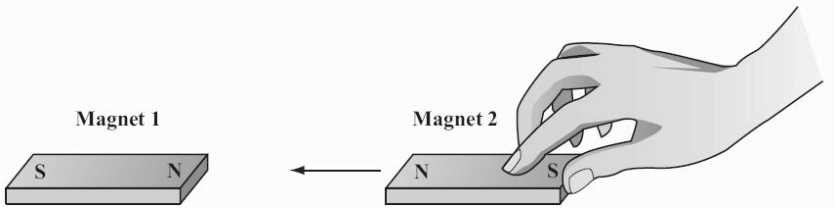
- Use a No. 2 pencil or a blue or black ink pen only.
- Do not use pens with ink that soaks through the paper.
- Make solid marks that fill the response completely.
- Make no stray marks on this form.

**CORRECT:** ●

**INCORRECT:** ⊘ ⊠ ◒ ◔

For each question below, fill in the bubble for the **BEST** answer.

**1. The picture below shows Magnet 2 being pushed toward Magnet 1.**




**Which of the following will MOST LIKELY happen to Magnet 1 as Magnet 2 is moved closer?**

Ⓐ Magnet 1 will not move.

Ⓑ Magnet 1 will move under Magnet 2.

Ⓒ Magnet 1 will move toward Magnet 2.

● Magnet 1 will move away from Magnet 2.

**2. A transportation engineer works for a city. What is he MOST LIKELY to do for his job?**

Ⓐ Drive subway trains.

Ⓑ Repair city buses when they break down.

● Decide where to put stop signs and traffic lights.

Ⓓ A transportation engineer would NOT work on any of these things.

**3. What would a transportation engineer NOT work on?**

Ⓐ Bridges and tunnels

Ⓑ Roads and highways

Ⓒ Stop lights and stop signs

● Engines for trains and buses

PLEASE DO NOT WRITE IN THIS AREA

[SERIAL]

53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

**4. Which of the following statements is TRUE?**

Ⓐ Some magnets have only one pole.

Ⓑ Magnets always repel other magnets.

Ⓒ Magnets always attract other magnets.

● Poles that are the same repel each other.

**5. What kind of work does a transportation engineer do? Choose the BEST answer.**

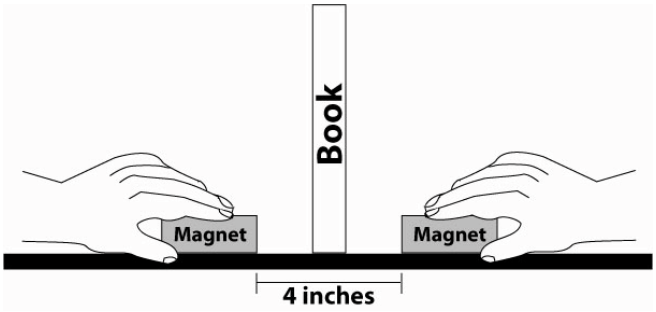
Ⓐ Drive trains and buses

Ⓑ Construct and repair roads and bridges

Ⓒ Repair trains and buses when they break down

● Make sure that roads, bridges, and trains are safe

**6. A student places two magnets on a table exactly four inches apart. They slide towards each other until they meet in the middle. If she places the two magnets four inches apart again, but this time with a book between them, what will happen to the magnets when she lets go?**




Ⓐ They will not move.

Ⓑ They will slide away from each other.

Ⓒ They will slide around the book, towards each other.

● They will slide together towards each other until they hit the sides of the book.

**7. The nail is attracted to the horseshoe magnet pictured here, but the penny is not. What does this tell us about the nail and the penny?**


Ⓐ The nail weighs less than the penny.

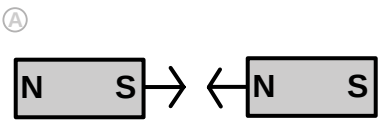
Ⓑ A flat object is more magnetic than a round object.

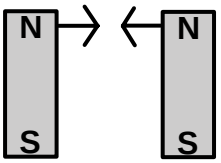
Ⓒ The nail and penny are made of the same material.

● The nail and the penny are made of different materials.

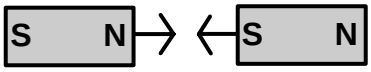
**8. Which pair of magnets would be MOST difficult to push together where the arrows show?**

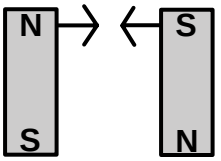
Ⓐ




● 


Ⓑ




Ⓓ 


**9. The South pole of a magnet will REPEL:**

Ⓐ All magnets.

Ⓑ Anything made of metal.

Ⓒ The North pole of another magnet.

● The South pole of another magnet.

**10. At work, a transportation engineer would probably NOT:**

● Drive trains that carry people and cargo.

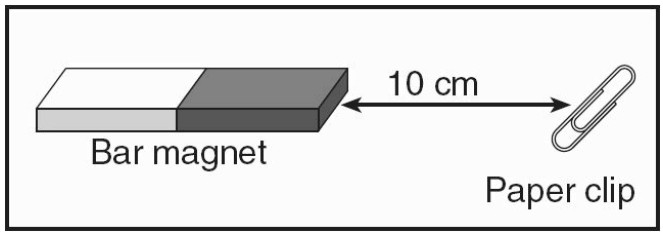
Ⓑ Figure out how to make a highway safer.

Ⓒ Improve how well a subway system works.

Ⓓ Decide on the best place to put a crosswalk.

**A girl is testing the properties of magnets. She slides a magnet towards a metal paperclip, as shown in the picture, and measures the distance the paperclip travels to stick to the magnet. She records her results in a table, shown below.**

**Use this information to answer questions 11 and 12.**




| Magnet Type | Distance |
|---|---|
| Bar Magnet | 10 cm |
| Ring Magnet | 5 cm |
| Disc Magnet | 15 cm |
| Strip Magnet | 20 cm |

**11. If she repeats her experiment using an iron nail that is heavier than the paperclip, what will happen to the distance the iron nail travels to stick to the magnets?**

Ⓐ All the distances travelled will be greater.

● All the distances travelled will be smaller.

Ⓒ All distances travelled will remain the same.

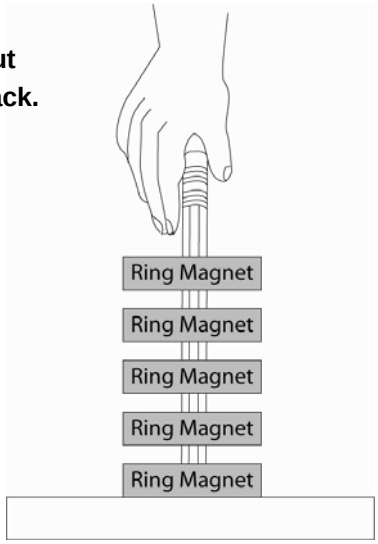
Ⓓ The iron nail will NOT move at all.

**12. Based on the table, which magnet has the strongest magnetic field?**

Ⓐ Bar magnet Ⓑ Ring magnet Ⓒ Disc magnet ● Strip magnet

---

**13. This picture shows five ring magnets on a pencil. The magnets do not touch, but seem to float in the air. When the magnets are pushed together, they bounce back.**




**Which statement BEST describes what is happening?**

● The magnets have opposite poles facing each other.

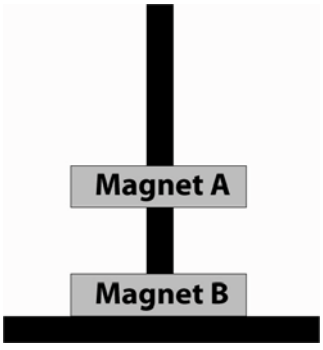
Ⓑ The magnets have the same poles facing each other.

Ⓒ The magnets floating higher weigh less than those floating lower.

Ⓓ Some magnets have like poles facing and some have opposite poles facing.

---

**14. A boy stacked two ring magnets on a peg. He made Ring Magnet A float over Ring Magnet B and measured the distance between them. What will happen if he wraps Ring Magnet A in cloth?**




Ⓐ Ring Magnet A will stick to the bottom magnet.

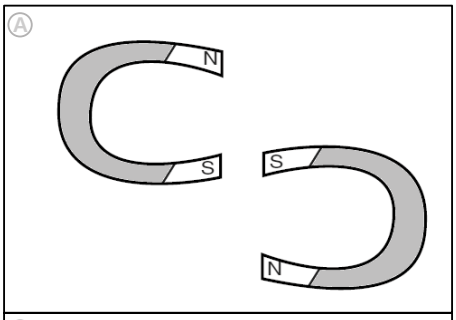
Ⓑ The distance between Ring Magnets A and B will increase.

Ⓒ The distance between Ring Magnets A and B will decrease.

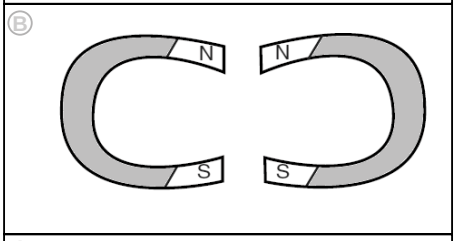
● The distance between Ring Magnets A and B will stay the same.

**15. Which of the following diagrams shows two magnets that would be attracted to each other?**

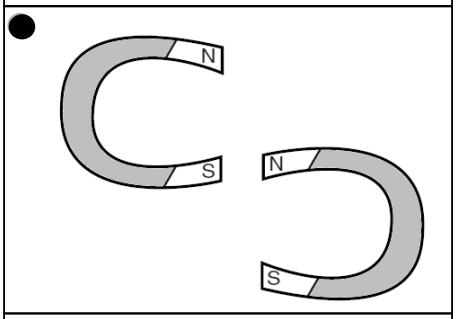
Ⓐ



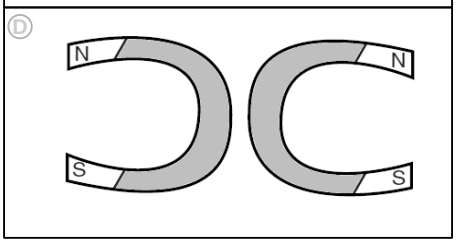

Ⓑ




● 




Ⓓ




**16. A girl found a box containing two magnets. Only one magnet has markings showing its North and South poles. How could she identify the poles of the unmarked magnet?**

● Stick both magnets together.

Ⓑ Stick both magnets to a refrigerator.

Ⓒ Sprinkle iron filings on both magnets.

Ⓓ Check to see if aluminum foil sticks to both magnets.

**17. A country is building a new train system. What is a transportation engineer MOST LIKELY to do to help?**

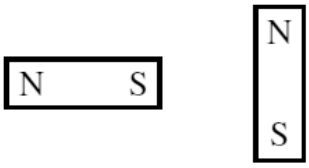
Ⓐ Repair the new trains when they break.

Ⓑ Drive machines to construct the train tracks.

● Figure out what kinds of trains and train track to use.

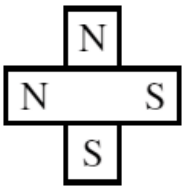
Ⓓ Improve the engines for the trains that will run on the tracks.

**18. The diagram shows 2 bar magnets.**




**A girl moves the 2 magnets closer together. Which of the pictures below shows what is MOST LIKELY to happen?**

Ⓐ




Ⓑ


Ⓒ


● 

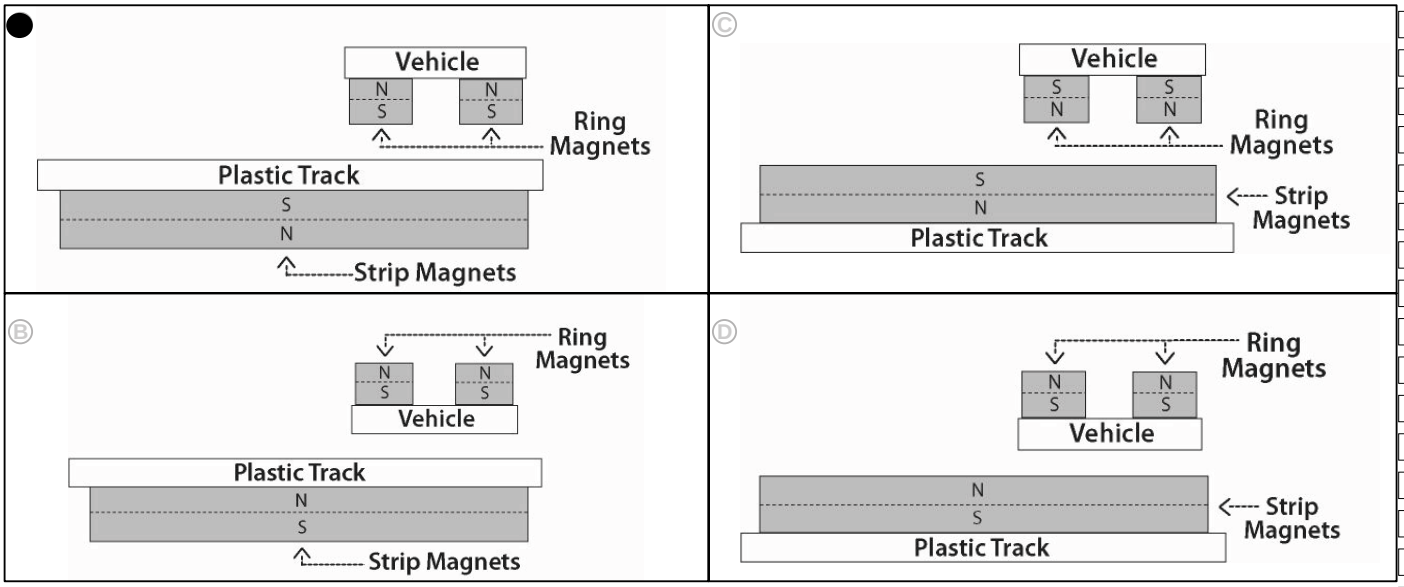

PLEASE DO NOT WRITE IN THIS AREA

[SERIAL]

**A Maglev transportation system is a way to get people and things from one place to another. It is made up of a vehicle and a track. The vehicle does not touch the track as it moves - instead it levitates (floats in the air) above the track.**

**A group of students are designing a Maglev transportation system to transport packages. They need to make the vehicle levitate as it is pushed along the track.**

**19. The students imagined the following designs. Which one shows a vehicle that might levitate?**



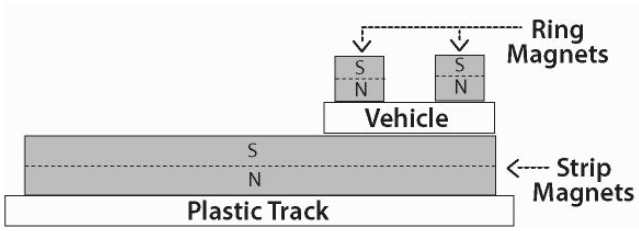

**20. The students created a design, made a plan, and built this model. They tested it, but it didn't levitate. What should they do to solve this problem?**

Ⓐ Use stronger ring magnets.

● Flip the ring magnets over so the North poles are up.

Ⓒ Attach the ring magnets to the bottom side of the vehicle.

Ⓓ Any of these ideas would work.



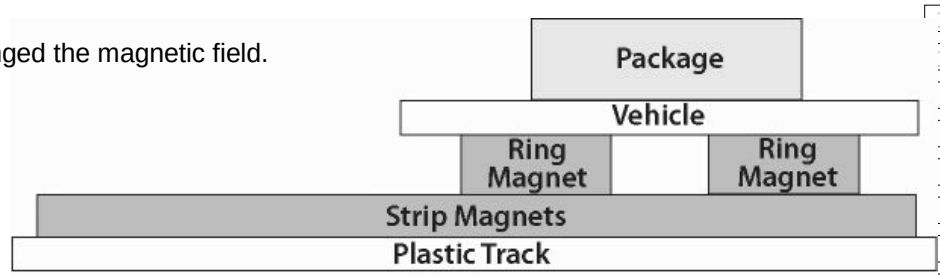

**21. The students tried again and got the vehicle to levitate above the track. However, when they put a package on the middle of the vehicle, the vehicle sank onto the track. What happened?**

Ⓐ The strip magnets are too strong and attracted the vehicle.

Ⓑ The package is magnetic, and it changed the magnetic field.

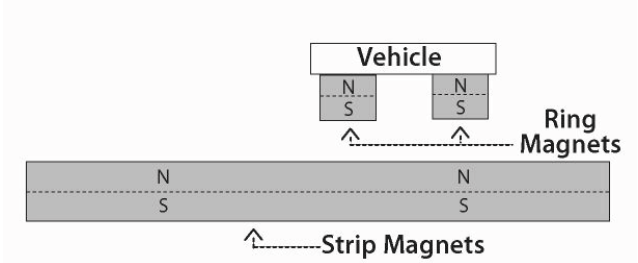
Ⓒ The ring magnets are in the wrong place to hold the package on top.

● The ring magnets on the vehicle are not strong enough to lift the package.

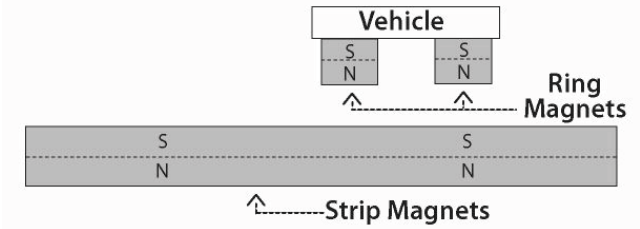


**22. A boy designed a Maglev system to make a vehicle levitate (float in the air) over a track made of strip magnets. He set up his track and vehicle in four different ways. Which picture shows a vehicle that MIGHT levitate?**

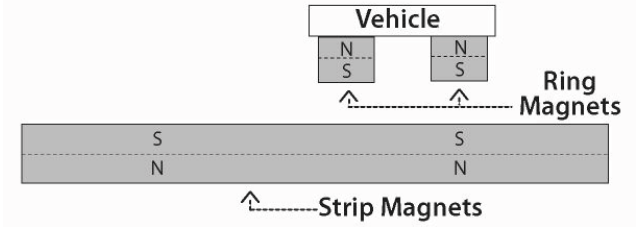
Ⓐ



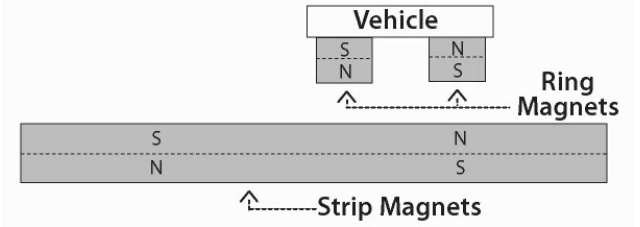

Ⓒ




● 




Ⓓ




**23. Which change to a working Maglev system will keep the vehicle at the SAME height?**

● Flip all the magnets over.

Ⓑ Add more magnets to the vehicle.

Ⓒ Make the vehicle out of a lighter material.

Ⓓ Replace the magnets on the vehicle with stronger magnets.

**24. Why would you want to use strong magnets in a Maglev design?**

Ⓐ Strong magnets will help to keep the vehicle from toppling over.

Ⓑ Strong magnets will help to keep the vehicle attached to the track.

● Strong magnets will help to levitate a vehicle higher above the track.

Ⓓ Strong magnets will help to keep the vehicle moving faster along the track.

Question 1: adapted from MCAS 2008 - Grade 5.

Question 7: adapted from Virginia Standards of Learning Assessments, Spring 2001 - Science q. 38, Grade 3.

Question 11: adapted from NYSED Regents 2006 - Grade 4.

Question 13: adapted from MCAS 2006 - Grade 5.

Question 15: adapted from MCAS 2002 - Grade 5.

Question 18: adapted from MCAS 2004 - Grade 5.

PLEASE DO NOT WRITE IN THIS AREA

[SERIAL]