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# QUESTION PAPER

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## ICATS SCIENCE CONTEST JUVENILES (GRADE 7 & 8)

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TIME ALLOWED: 90 MINUTES

MAXIMUM MARKS: 90

TOTAL QUESTIONS: 30 MCQS

### INSTRUCTIONS

1. DON'T OPEN THIS BOOKLET UNTIL INSTRUCTED.
2. WRITE YOUR NAME, FATHER NAME, SCHOOL ETC AT THE BUBBLE SHEET ONLY.
3. RECORD ALL ANSWERS ON THE BUBBLE SHEET ONLY.
4. SELECT BEST ANSWER FROM THE FOUR GIVEN OPTIONS AND MARK ONLY ONE OPTION IN EACH QUESTION.
5. USE BLUE / BLACK INK TO FILL UP THE CIRCLES FOR YOUR ANSWERS ON THE BUBBLE SHEET.
6. USE OF ANY HELPING MATERIAL INCLUDING CELL PHONES AND ELECTRONIC DEVICES IS STRICTLY PROHIBITED.
7. EVERY CORRECT ANSWER EARNS THREE POINTS.
8. ONE POINT WOULD BE DEDUCTED FOR EVERY INCORRECT ANSWER.



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**Q1. Which of these equations best shows the reactants and products of cellular respiration?**

- A carbon dioxide + water → sugar + oxygen
  - B water + oxygen → sugar + carbon dioxide
  - C sugar + oxygen → carbon dioxide + water
  - D sugar + carbon dioxide → oxygen + water
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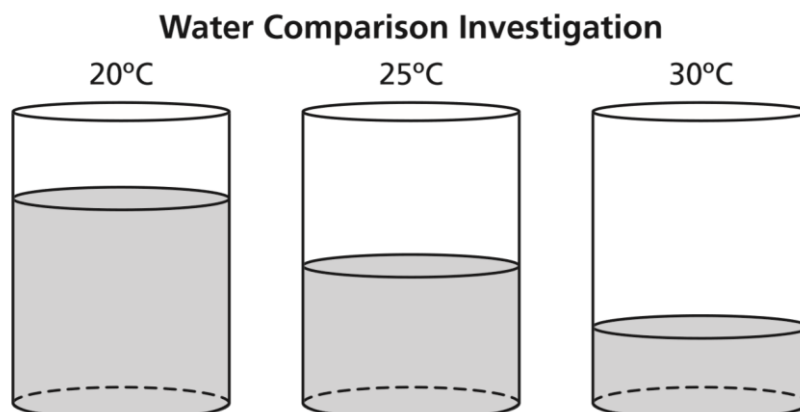
**Q2. Some processes in the rock cycle are described in the chart below**

1	New rock forms from rock that is melted and then cools.
2	New rock forms after rock experiences high temperatures and pressure.
3	New rock forms after pieces of rock weather and then erode and are deposited in layers.

**What type of rock is most likely formed by process 1?**

- A. sedimentary
  - B. igneous
  - C. metamorphic
  - D. magma
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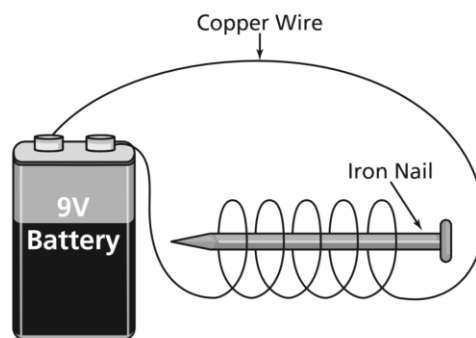
**Q3. A student filled three identical cups with equal amounts of water. The student placed each cup in a room with a different air temperature. After a few days, the student compared the amounts of water remaining in each cup.**



**What cause-and-effect relationship does this investigation support?**

- A. As evaporation decreases, air temperature decreases.
  - B. As evaporation increases, air temperature increases.
  - C. At higher air temperatures, more water evaporates.
  - D. At higher air temperatures, less water evaporates.
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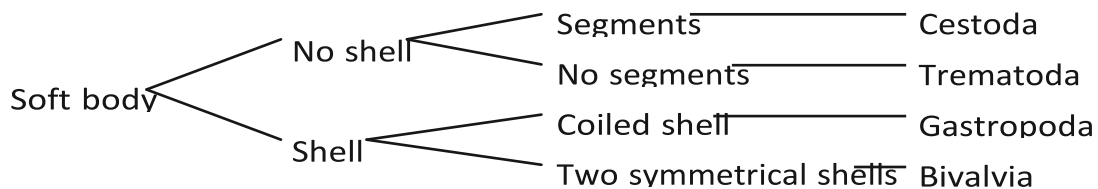
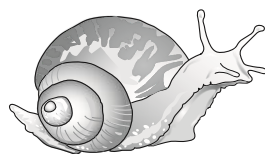
**Q4. The parts of an electromagnet are shown below.**



**The strength of the magnet will be increased by**

- A. using more nails.
  - B. adding a switch.
  - C. making more loops with the wire.
  - D. placing the battery closer to the nail
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**Q5. A classification key for an organism is shown below.**

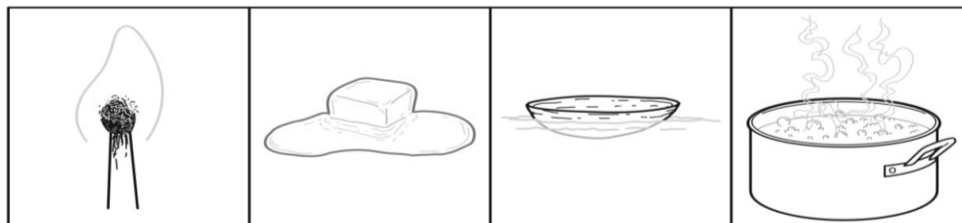


**To what class does the organism belong?**

- A. Cestoda
  - B. Gastropoda
  - C. Trematoda
  - D. Bivalvia
-

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**Q6. Four changes are shown below.**



**Which of these represents a chemical change?**

- A. A match is lit, creating a yellow-orange flame.
- B. A small piece of ice melts, changing from a solid to a liquid.
- C. A ball of clay sinks in water, and floats when reshaped.
- D. A pot of water is heated to boiling, and evaporation occurs.

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**Q7. The procedure below is designed to test how water temperature affects the rate at which sugar dissolves.**

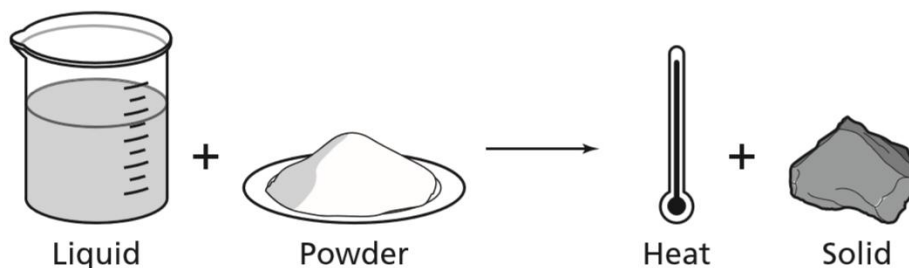
- **Measure 150 milliliters of water into each beaker.**
- **Heat water to three different temperatures.**
- **Put 5 grams of sugar into each of the beakers at the same time.**
- **Stir and record the time it takes for the sugar to completely dissolve.**

**Which additional step will most improve the investigation?**

- A. Use 200 milliliters of water in each beaker.
- B. Record the initial and final temperatures of the water.
- C. Stir at different rates for each beaker.
- D. Record the times when sugar is half dissolved.

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**Q8. A student performed a classroom investigation by mixing a purple liquid and a white powder. Diagrams of the setup and the resulting blue solid are shown below:**

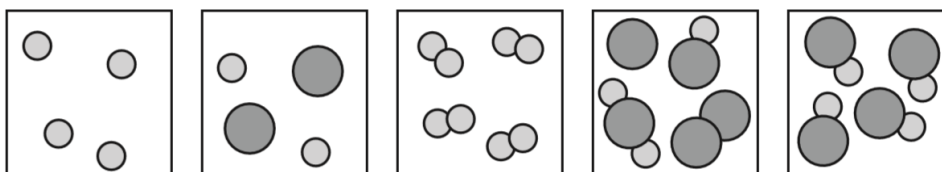


The student could best classify this reaction as a

- A. physical change.
- B. weight change.
- C. mass change.
- D. chemical change.

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**Q9. Five diagrams of atomic arrangements are shown below.**



Which of these best describes all five diagrams?

- A. All are compounds made of atoms.
- B. All have three types of atoms.
- C. All are composed of atoms.
- D. All have the same atomic symbol.

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**Q10. The table below lists properties of four different pure samples.**

**Table of Solution Properties**

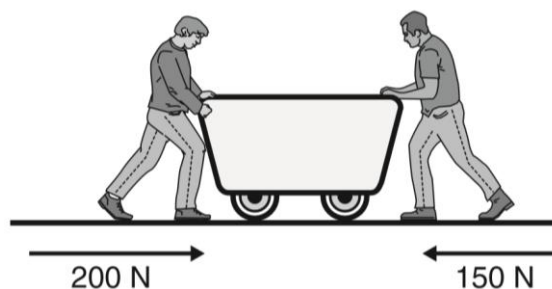
Sample	Color of Blue Litmus Paper After Dipped in Solution	pH	Does Sample Conduct Electricity?
1	Red	5.2	Yes
2	Purple	7.0	No
3	Blue	9.8	Yes
4	Red	4.3	Yes

Based on the table, which sample is a base?

- A. Sample 1
- B. Sample 2
- C. Sample 3
- D. Sample 4

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**Q11. Two students are pushing a cart, as shown below.**



**The cart will move as if it were acted on by a single force with a magnitude of**

- A. 50 N
- B. 150 N
- C. 200 N
- D. 350 N

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**Q12. The following equations represent chemical reactions.**

Chemical Reactions	
1	$2\text{Na} + 2\text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$
2	$\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
3	$\text{Mg} + \text{Cl}_2 \rightarrow \text{MgCl}_2$
4	$\text{NaOH} + \text{MgCl}_2 \rightarrow \text{NaCl} + \text{MgOH}$

**Which equation shows that the total mass during a chemical reaction stays the same?**

- A. 1
- B. 2
- C. 3
- D. 4

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**13. The table below shows the atomic mass of four stable calcium (Ca) isotopes.**

Isotope	Atomic Mass
Ca-40	40
Ca-42	42
Ca-43	43
Ca-44	44

**What characteristic is different in each isotope?**

- A. the position in the periodic table of the elements
- B. the net charge of the nucleus
- C. the mass of the protons in the nucleus
- D. the number of neutrons in the nucleus

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**14. The densities of four different woods are shown below.**

**Wood Sample Densities**

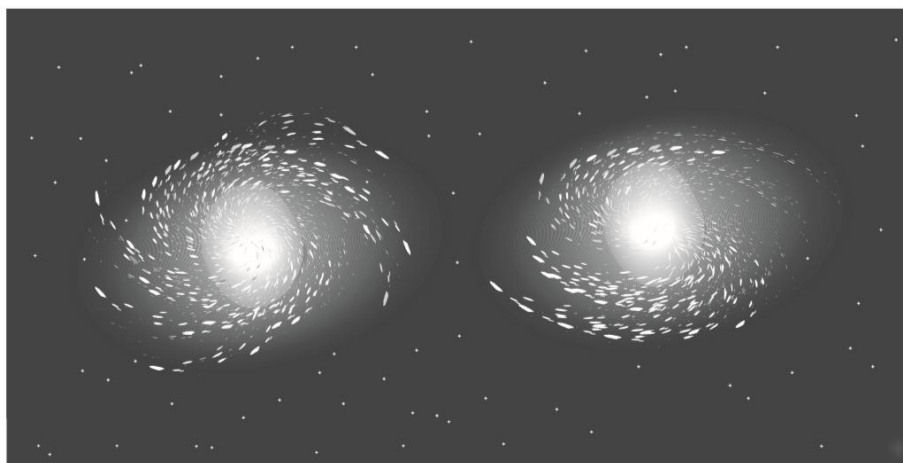
Type of Wood	Density ( $\frac{\text{g}}{\text{cm}^3}$ )
African Teakwood	0.98
Balsa	0.14
Cedar	0.55
Ironwood	1.23

**Which wood will sink when placed in a fluid with a density of 1.14 g/cm<sup>3</sup>?**

- A. African teakwood
- B. balsa
- C. cedar
- D. ironwood

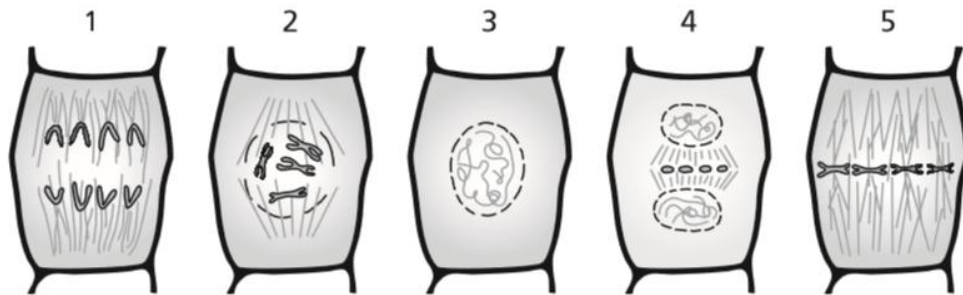
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**Q15. The galaxies pictured below would best be classified as**



- A. barred galaxies.
- B. spiral galaxies.
- C. irregular galaxies.
- D. symmetrical galaxies.

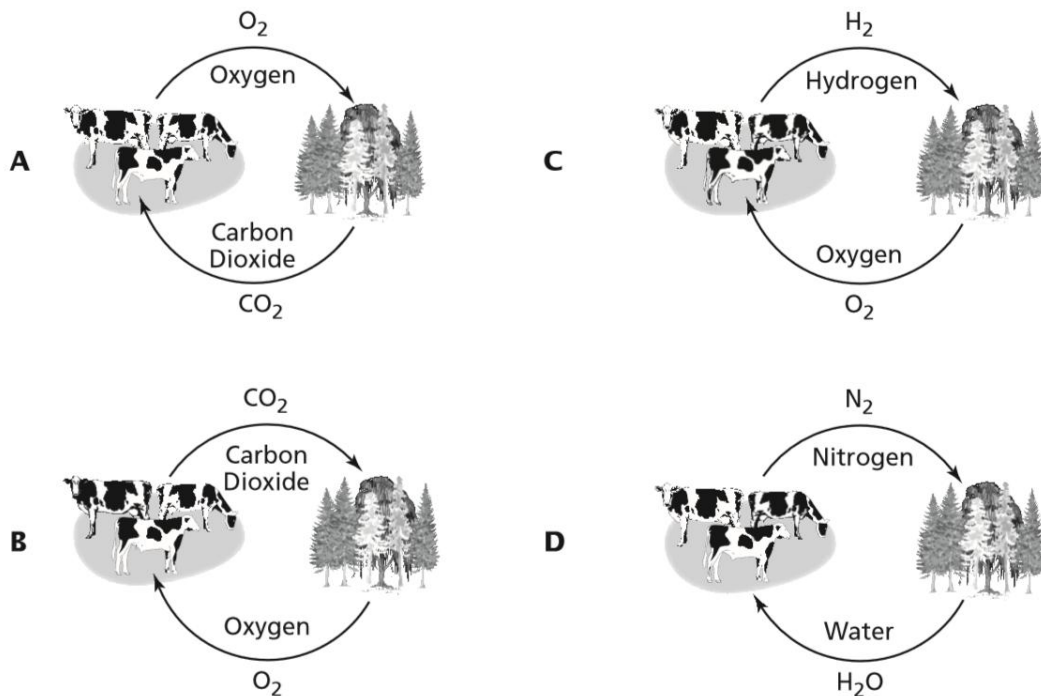
**Q16. Diagrams of a plant cell dividing are shown out of sequence.**



**What is the correct sequence of plant cell division?**

- A. 3, 2, 5, 1, 4
- B. 4, 3, 2, 1, 5
- C. 3, 4, 5, 1, 2
- D. 5, 1, 2, 4, 3

**Q17. Which diagram best represents an exchange of gases between plants and animals?**





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**Q18. Students were observing a green, odourless mineral, with no visible crystals. The mineral was very soft, with a slick feel. They compared its characteristics to the table below**

**Mineral Characteristics**

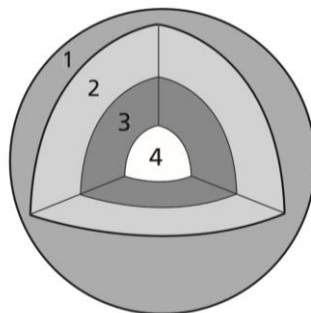
Mineral	Most Common Colors	Hardness	Other Common Characteristics
Talc	Gray, green, white, silver	1	Soapy feel
Sulfur	Yellow, yellow-brown	1.5	Greasy feel, mild rotten egg smell
Halite	Colorless, white, pink, yellow, gray	2	Salty taste
Quartz	All colors	7	Six-sided prism-shaped crystal

**Which of these were the students most likely observing?**

- A. Talc
- B. Sulfur
- C. Halite
- D. Quartz

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**Q19. A cross section of Earth is shown below**



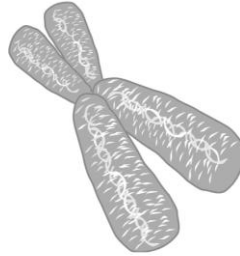
**Which layer of Earth is made mostly of liquid metal?**

- A. 1
- B. 2
- C. 3
- D. 4

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**Q20. The image shows a chromosome.**

Chromosome



**What is located on the chromosome?**

- A. cells
- B. genes
- C. enzymes
- D. organelles

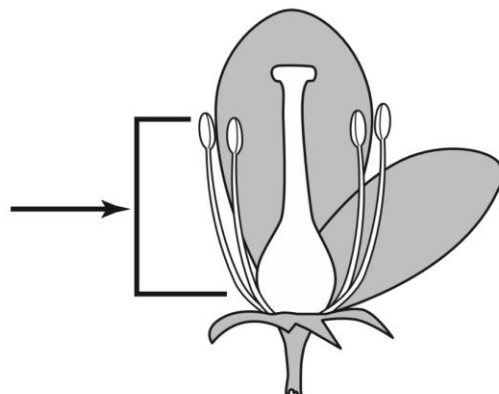
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**Q21. Technicians plan to develop a new type of keyboard that will have alphabet letters in different positions from a standard keyboard. Which will best help the technicians decide if the new keyboard is an improvement over the standard one?**

- A. asking people their opinions of how they like standard keyboards
- B. analyzing the problems that people have using standard keyboards
- C. determining how much it will cost to make a new keyboard
- D. comparing the speeds at which people type on each style of keyboard

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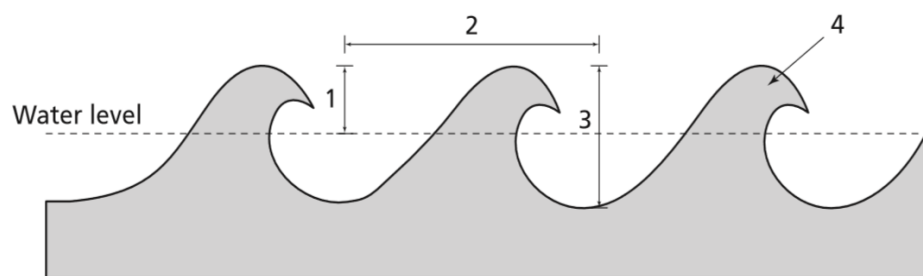
**22. A flower is shown in the diagram.**



**What is the main function of the flower part indicated by the arrow?**

- A. attracting pollinators
  - B. producing pollen
  - C. protecting the ovule
  - D. supporting the pistil
- 

**23. Scientists measured the amplitude of ocean waves during a storm.**



**Which part of the diagram shows the amplitude of a wave?**

- A. 1
  - B. 2
  - C. 3
  - D. 4
- 

**Q24. Which of these is the best reason to use a renewable energy source instead of relying on fossil fuels?**

- A. Fossil fuels can be solids, liquids, or gases.
  - B. Fossil fuels power many different devices.
  - C. Fossil fuels form naturally on Earth.
  - D. Fossil fuels create many kinds of pollution.
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**Q25. Some students investigated plant growth by growing two sets of the same type of plant. One set was grown indoors and the other set was grown outdoors. They recorded data in the table below.**

### Indoor vs. Outdoor Plant Growth

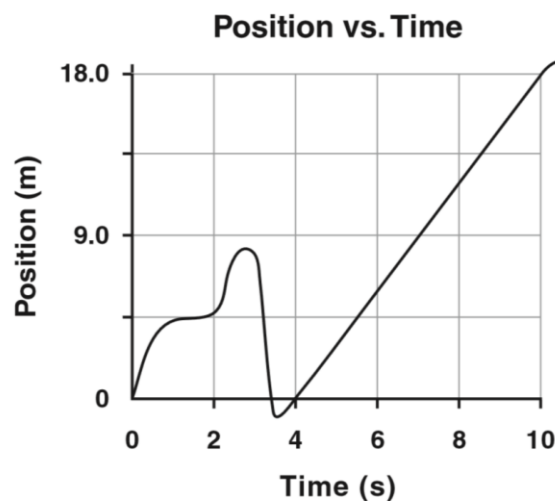
	Indoor Plants Height (cm)			Outdoor Plants Height (cm)		
	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Plant 6
Week 1	18.0	14.3	16.6	15.0	16.2	14.7
Week 2	22.1	16.5	18.2	16.5	17.3	15.9
Week 3	24.4	19.0	20.5	17.2	19.1	17.0
Week 4	26.3	22.1	23.6	19.1	20.6	19.4

The students concluded that the plants grown indoors grew faster because they received better quality light than the plants grown outdoors. Which is the most likely reason this conclusion may be flawed?

- A. The students measured the plants at different times.
- B. The students should have grown different types of plants.
- C. The growth of the plants in each set was affected by more than one factor.
- D. The outdoor plants grew faster than the indoor plants.

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**Q26.** The graph below shows how the position of an object changes over time.



What is the speed of the object during the time interval from 4 seconds to 10 seconds?

- A. 3 m/s
- B. 8 m/s
- C. 16 m/s
- D. 32 m/s

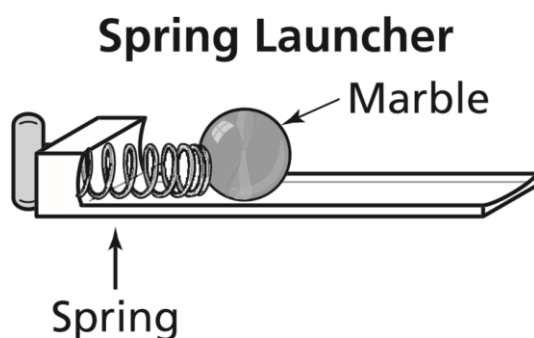
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**Q27. A ball is dropped from the top of a tall building. As the ball falls, the upward force of air resistance becomes equal to the downward pull of gravity. When these two forces become equal in magnitude, the ball will**

- A. flatten due to the forces.
- B. fall at a constant speed.
- C. continue to speed up.
- D. slow to a stop.

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**Q28. Students put a spring launcher on a wooden floor. The students applied different amounts of force on a marble with the spring. They used a meter stick to measure how far the marble rolled.**



**What is the dependent variable in this investigation?**

- A. mass of the marble
- B. amount of friction from the floor
- C. amount of stretch in the spring
- D. distance travelled by the marble

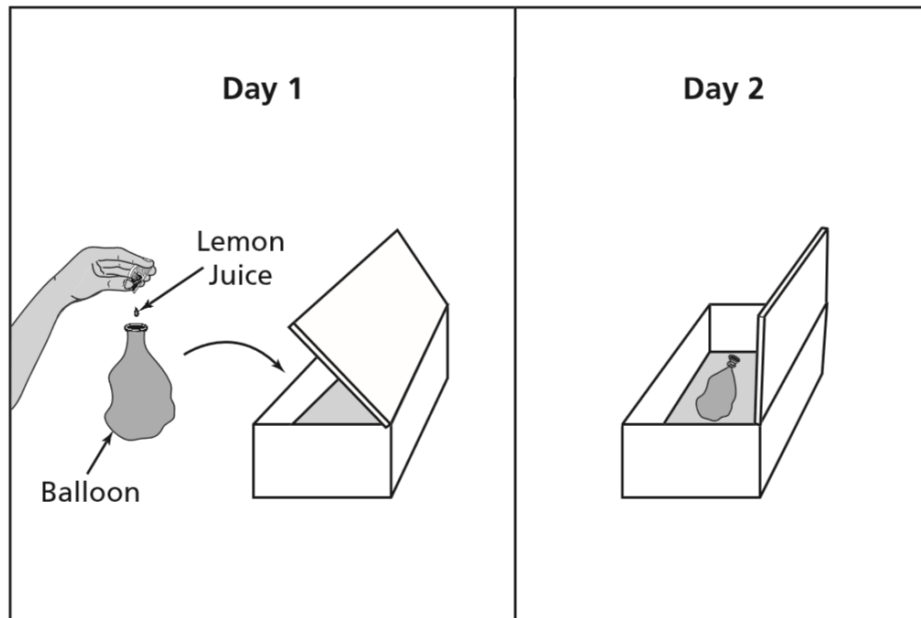
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**Q29. Which of these is the most likely unintended consequence of using ethanol made from corn as a replacement for gasoline in automobile engines?**

- A. a reduction in the use of nonrenewable fuels
  - B. lower emissions of sulfur and nitrogen compounds in auto exhaust
  - C. a decrease in the amount of farmland available to produce food crops
  - D. lower fuel costs for consumers
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**Q30. A student put a few drops of lemon juice into an uninflated balloon. The student tied a knot in the balloon, placed it in a shoebox and covered it with a lid.**



**The following day, the student opened the box and was able to smell lemon in the box. Through what process were molecules able to pass through the balloon?**

- A. respiration
- B. fermentation
- C. diffusion
- D. radiation



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