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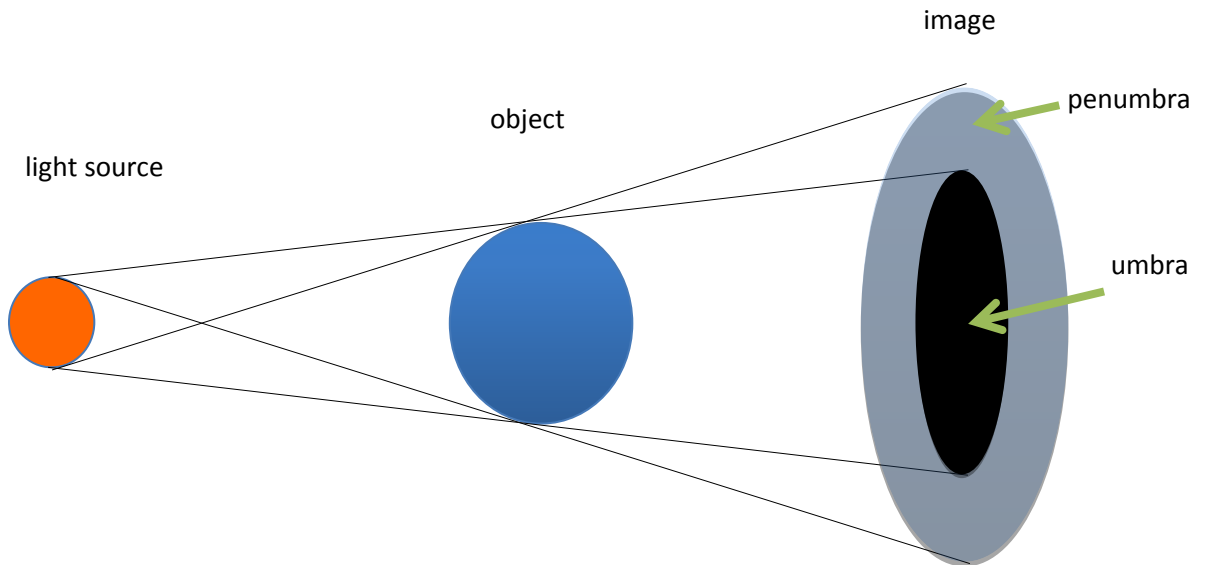
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**Question 4** If the size of the light source is getting smaller, how are the umbra and penumbra changing?

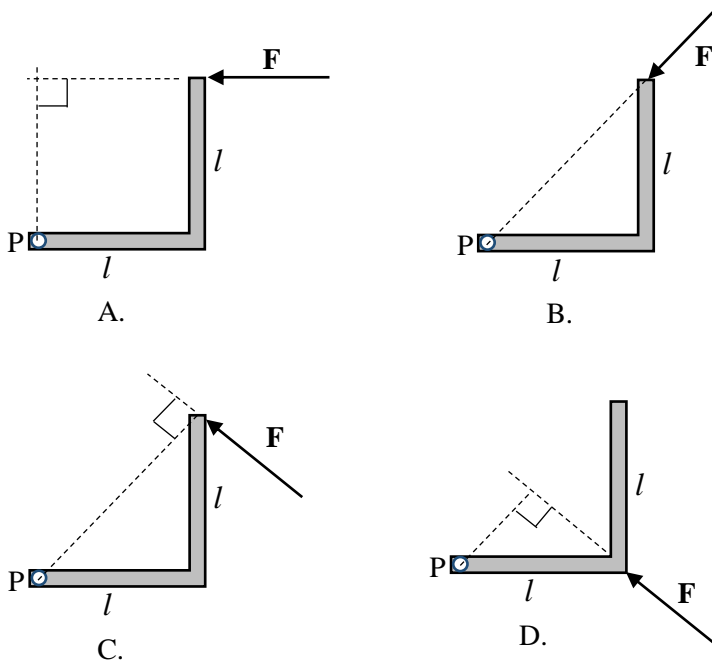
(1 point)



- A. The umbra is getting smaller. The penumbra is getting smaller.
- B. The umbra is getting smaller. The penumbra is getting bigger.
- C. The umbra is getting bigger. The penumbra is getting smaller.
- D. The umbra is getting bigger. The penumbra is getting bigger.

**Question 5** A force  $F$  is applied to an L-shaped rod with length  $l$  on each side, which is hinged at P as shown.

The force and L-shaped rod are on the same plane. In which diagram will  $F$  produce the greatest turning effect? (1 point)



**Question 6** An opera singer is singing with high pitch (frequency). What contributes to her high pitch singing? (1 point)

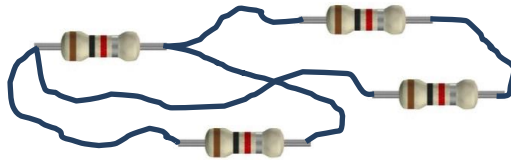
- A. Her larynx is vibrating very fast.    B. Air exits her lung at high speed.  
 C. Her very powerful voice.                D. Her very loud voice.

**Question 7** Rank the following materials (at room temperature) according to their sound speed from the lowest to the highest: (1 point)

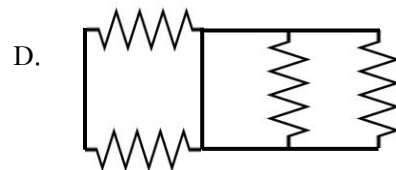
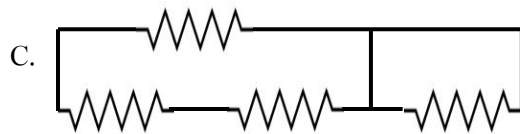
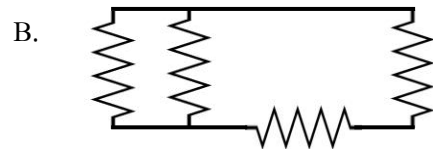
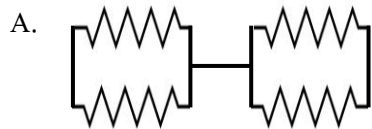
glass                      mercury                      air

Answer: ..... < ..... < .....

**Question 8** A picture of electrical wire connecting four resistors is shown as follows. The electrical wire is shielded by a plastic material and there is no short circuits between wires.



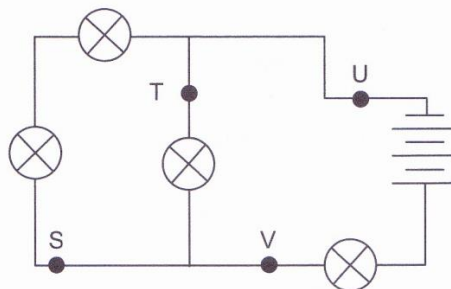
What is the circuit diagram? (1 point)



**Question 9** A resistance of a copper bar is proportional to its length and inversely proportional to the cross-sectional area. Which of the following has the greatest resistance? (1 point)

	Length (cm)	Cross-sectional area (cm <sup>2</sup> )
A.	4	2
B.	4	4
C.	8	2
D.	8	4

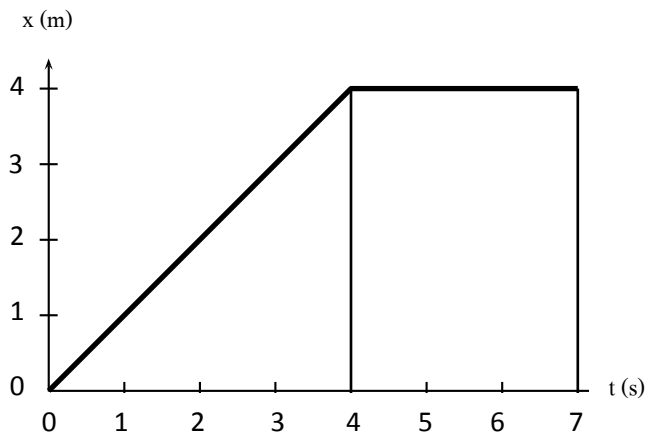
**Question 10** Study the electrical circuit. All four bulbs are lighted up.



Darcy wants to install a switch so that he is able to switch off TWO bulbs while leaving the rest of the bulbs lighted. Which part of the circuit S, T, U or V should Darcy install the switch? (1 point)

Answer: .....

**Question 11** The position vs. time graph below describes the motion of an athlete



11.1 What is the velocity of the athlete at  $t = 2$  s? (1 point)

Answer: .....

11.2 What is the displacement of the athlete from  $t = 4$  s to  $t = 7$  s? (0.5 point)

Answer: .....

11.3 What is the average speed from  $t = 0$  s to  $t = 7$  s? (0.5 point)

Answer: .....

**Question 12** A successful conservation strategy should involve ..... (1 point)

- A. protection of animals at the highest trophic level.
- B. protection of the forest from all recreational uses.
- C. protection of all physical and biological components.
- D. protection of only the ecological community of the forest.

**Question 13** Write down the scavengers from these group of organisms. (1 point)

Vulture, Caterpillar, Fungi, Millipede, Termite, Grasshopper

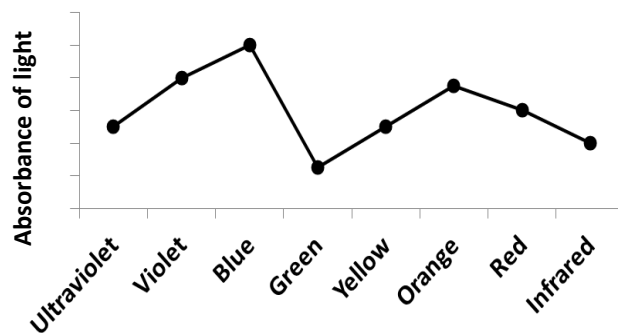
Answer: .....

**Question 14** The consumption of the top [apex] predators, like shark, is discouraged due to the high accumulation of mercury present in their body, including shark fins. Why would consumption of these fish products be dangerous while it remained safe to consume other fish normally eaten by shark? (1 point)

- A. Bioaccumulation allows mercury to build up in the larger predatory fish.
- B. Smaller fish do not live long enough for mercury to accumulate in them.
- C. Smaller fish is capable of detoxifying the mercury, while the shark lacks the ability.
- D. Unlike smaller fish, the shark skin is made of a matrix of placoid scales, allowing the accumulation of mercury

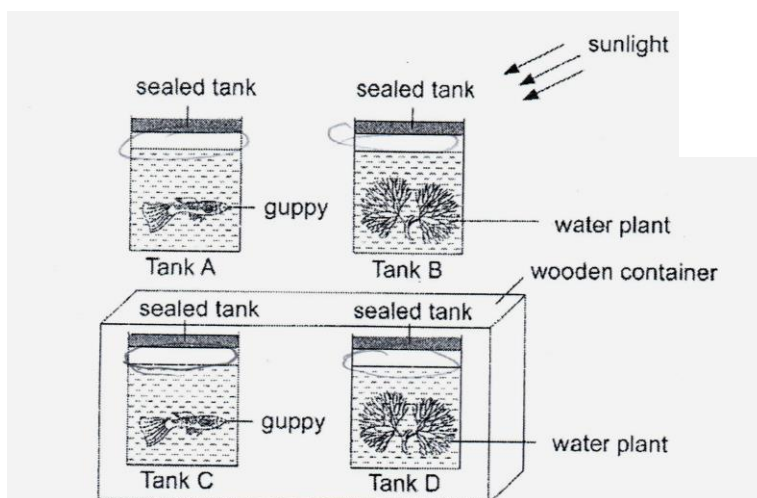
**Question 15** The graph below is the absorption spectrum for an unknown substance.

What is the color of this substance? (1 point)



- |           |           |
|-----------|-----------|
| A. Violet | B. Blue   |
| C. Green  | D. Orange |

**Question 16** Gilbert set up an experiment as shown below.



Tank A and tank B were placed in the presence of sunlight while tank C and tank D were put into a wooden container. After an hour Gilbert measured the amount of carbon dioxide (CO<sub>2</sub>) in each tank.

Which tank has the least amount of carbon dioxide? (1 point)

- |           |           |
|-----------|-----------|
| A. Tank A | B. Tank B |
| C. Tank C | D. Tank D |



**Question 17** Biomass is a fuel that is developed from organic materials, a renewable and sustainable source of energy used to create electricity or other forms of power. Which genes would geneticists introduce into plant cells to generate genetically engineered plants with extra biomass?  
(1 point)

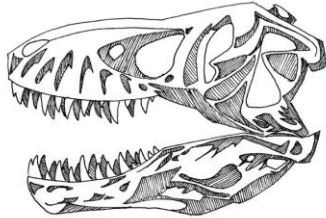
- A. Genes supporting the mitochondrial function.
- B. Genes accelerating the formation of plant cell wall.
- C. Genes promoting the protein synthesis in cytoplasm.
- D. Genes enhancing the accumulation of water in vacuole.

**Question 18** During the recent tsunami disaster a young child was separated from his/her biological parent in Sri Lanka. Years later with the help of a **technique**, the child was made to reunite with his/her parent. What technique is it? (1 point)

- A. DNA finger-printing
- B. Gene therapy
- C. Tissue culture
- D. Hybridoma technology



**Question 21** *Tyrannosaurus rex* are dinosaurs that became extinct for millions of years. Even though they have never seen a living *T. rex*, scientists who studied their fossils are certain that the *T. rex* was a carnivore. Which is paleontological evidence that demonstrates the *T. rex* was a carnivore? (1 point)

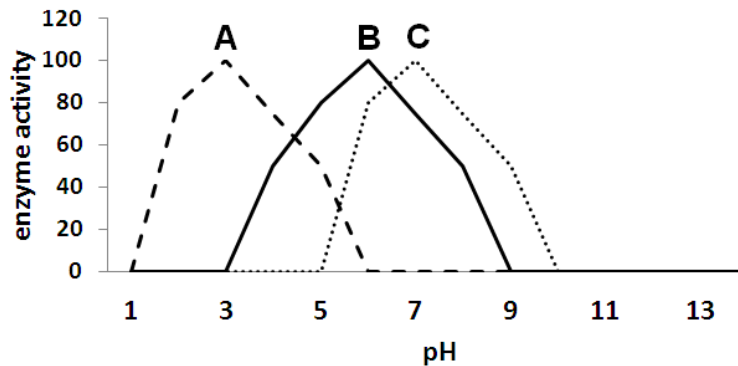


- A. Frontal nostril
- B. Frontal eye position
- C. Sharp teeth
- D. Massive skull

**Question 22** What is the feature that characterizes both reptiles and birds? (1 point)

- A. Feathers
- B. Homeothermy (warmblood)
- C. Scales
- D. Oviparousness (egg-laying)

**Question 23** The graph shows the activity of three human enzymes from different regions of the gut with different pH. Which regions of the gut the enzymes come from? (1 point)



	Enzyme A	Enzyme B	Enzyme C
A.	mouth	stomach	duodenum
B.	mouth	duodenum	stomach
C.	stomach	mouth	duodenum
D.	stomach	duodenum	mouth

**Question 24** The diagram below represents the location of the Sun and the planets not drawn to scale.

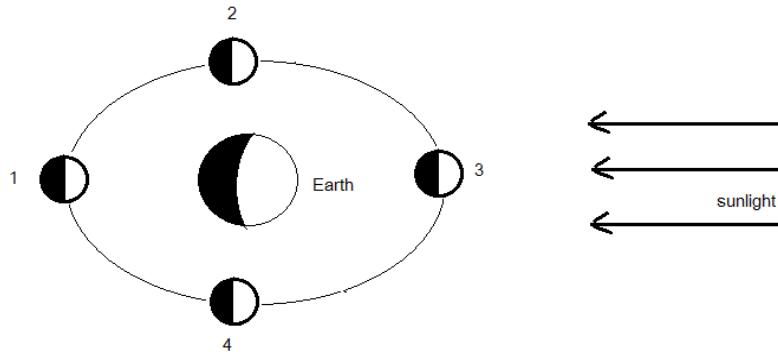
Which answer is a correct statement? (1 point)



- A. The distance between two neighboring outer planets is decreasing when the distance between the Sun and the planet closer to the Sun is increasing.
- B. The distance between two neighboring outer planets is increasing when the distance between the Sun and the planet closer to the Sun is increasing.
- C. The square of the distance between two neighboring outer planets has a random relation with the distance between the Sun and the planet closer to the Sun.
- D. The distance between two neighboring outer planets has no specific relation with the distance between the Sun and the planet closer to the Sun.

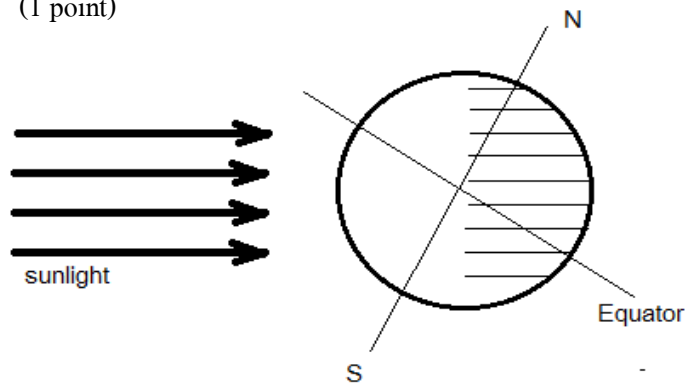
**Question 25** Which of the following phenomena will occur if the Moon is at the position number 3?

(1 point)



- A. Both of a solar eclipse and a spring tide
- B. Both of a lunar eclipse and a spring tide
- C. Neither a solar eclipse nor a lunar eclipse
- D. Neither a spring tide nor a neap tide

**Question 26** According to the diagram below, which of month and season are found in the Southern Hemisphere? (1 point)



- A. January, Winter
- B. January, Summer
- C. June, Winter
- D. June, Summer

**Question 27** The picture shows image of the Moon, Jupiter, and Mars. The image of the Moon has a diameter of 0.5 degree. Estimate the distance between Mars and Jupiter in the picture? (1 point)

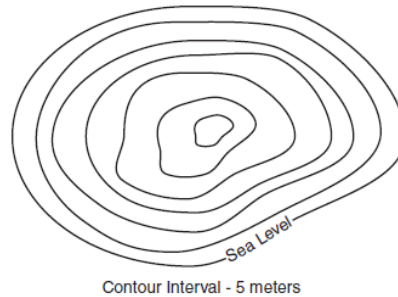


- |                     |                     |
|---------------------|---------------------|
| A. 0.5 - 1.0 degree | B. 1.5 - 2.0 degree |
| C. 2.5 - 3.0 degree | D. 3.5 - 4.0 degree |

**Question 28** Which planets experience a greenhouse effect ? (1 point)

- |                     |                      |
|---------------------|----------------------|
| A. Mars and Mercury | B. Earth and Mercury |
| C. Earth and Venus  | D. Mars and Venus    |

**Question 29** The highest elevation of the topographic map below cannot be more than ..... (1 point)



- |              |              |
|--------------|--------------|
| A. 25 meters | B. 34 meters |
| C. 40 meters | D. 49 meters |

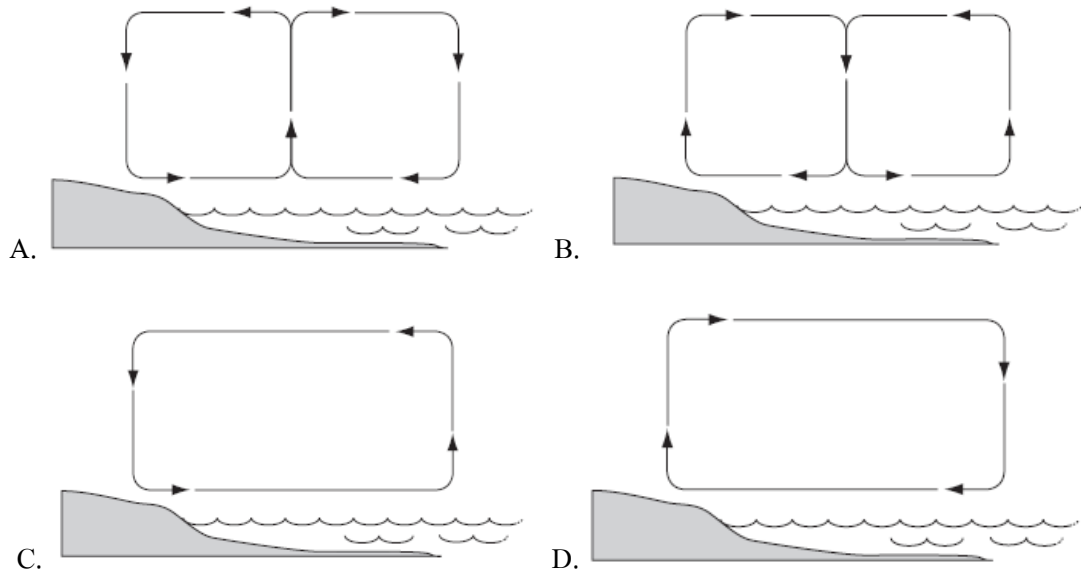
**Question 30** Mechanical weathering is the process of breaking down of rocks and minerals on Earth's surface into ..... (1 point)

- |                      |                      |
|----------------------|----------------------|
| A. Clay minerals     | B. Quartz            |
| C. Smaller particles | D. Calcium carbonate |

**Question 31** The Sun or the Moon halo will appear when they shine through ..... (1 point)

- |                         |                 |
|-------------------------|-----------------|
| A. Nimbostratus         | B. Altocumulus  |
| C. Fair weather cumulus | D. Cirrostratus |

**Question 32** Which diagram is the best model explaining the movement of coastal air during the afternoon? (1 point)



**Question 33** Which process is primarily responsible for the production of the oxygen ( $O_2$ ) in the Earth's atmosphere nowadays? (1 point)

- |                      |                                     |
|----------------------|-------------------------------------|
| A. Outgassing        | B. Photosynthesis                   |
| C. Volcanic eruption | D. Oxidation of iron-based minerals |



**Question 34** The type of polymer in plastic container can be identified by observing the floating and sinking of the unknown polymer in the liquid of known density.

Liquid	Composition	Density (g/cm <sup>3</sup> )	Polymer	Density Range (g/cm <sup>3</sup> )
1	Ethanol	0.79	PP - polypropylene	0.90-0.91
2	50% v/v ethanol/ water	0.91	LDPE – low density polyethylene	0.92-0.94
3	water	1.00	HDPE – high density polyethylene	0.95-0.96
4	6% CaCl <sub>2</sub> in water	1.05	PS – polystyrene	1.04-1.06
5	32% CaCl <sub>2</sub> in water	1.30	PVC – polyvinylchloride	1.16-1.58

From the result of the density test, what could be the identity of the unknown plastic? (1 point)

<b>Liquid of known density</b>				
1	2	3	4	5
Sink	Sink	Float	Float	Float

Answer: .....

**Question 35** Testing the chemical properties of an unknown substance gives the results below.

pH	Red litmus	Blue litmus	Solubility	Reaction with an acid
8	Change to blue	No change	Dissolved well in water	Generates gas bubbles

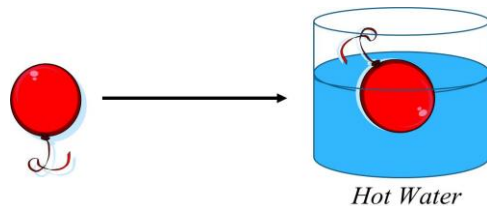
What could be the unknown substance? (1 point)

- A. Maalox<sup>®</sup> Alum Milk                      B. Vitamin C  
 C. Cube sugar                                      D. Aspirin

**Question 36** There are three jars containing a piece of wood, salad oil and oxygen gas. Would the volume and the shape of each substance remain the same if they were transferred into a larger container? If not the same, describe the changes that occur. (2 points)

Substance	Volume	Shape
Wood		
Salad oil		
Oxygen		

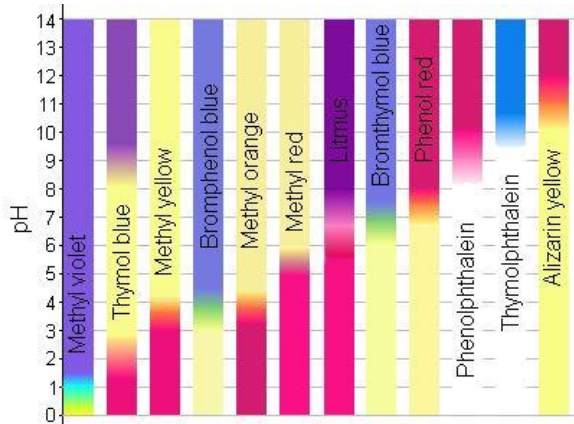
**Question 37** If a balloon is inflated and tied, air is held inside the balloon. What will happen to the balloon if it is put into hot water? Why does this happen? (1 point)



The balloon will ..... because .....

.....

**Question 38** Testing the pH of four unknown samples with four indicators gives the results in the table.



Indicator	Litmus	Phenolphthalein	Methyl red	Bromthymol blue
Sample A	purple	colorless	yellow	green
Sample B	red	colorless	red	yellow
Sample C	purple	colorless	orange	yellow
Sample D	blue	pink	yellow	blue

Rank the correct pH order of these unknown samples from the lowest pH to the highest pH? (1 point)

Answer: ..... < ..... < ..... < .....



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