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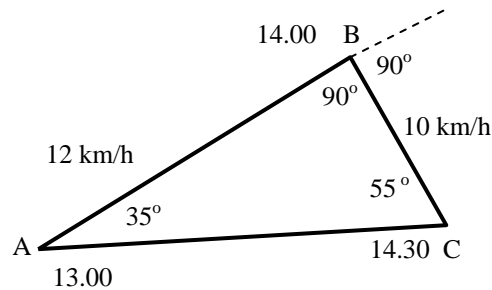
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26. A ship starts to cruise at 13 o'clock. Its speed is 12 km/h in the direction  $35^\circ$  from harbor A. After 1 hour that ship change the direction  $90^\circ$  to the right with a speed of 10 km/h. How far is the ship from harbor A at 14.30 o'clock?



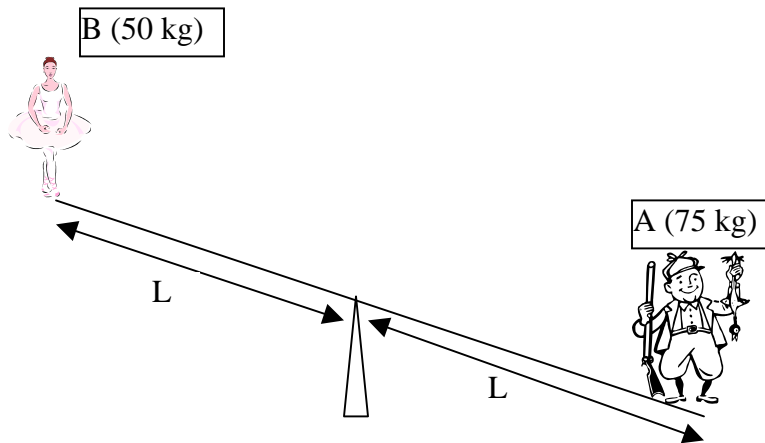
Answer :  
(point 2)

27. A student uses a cup of water to measure volume of an irregular screw. The diameter of the cup is 4 cm. The height of the water surface for several screws is measured using a ruler. The data is shown in the table below:

| Number of screws | Height of water surface (cm) |
|------------------|------------------------------|
| 0                | 5.00                         |
| 5                | 7.45                         |
| 15               | 12.30                        |
| 25               | 17.00                        |
| 35               | 21.85                        |

Explain how you can find the volume of a screw.  
Estimate the volume of one single screw.  
(point 3)

28. Look at the following picture:



Explain what will happen if A moves towards the pivot until reaching the middle of the lever

(point 3)

Answer:

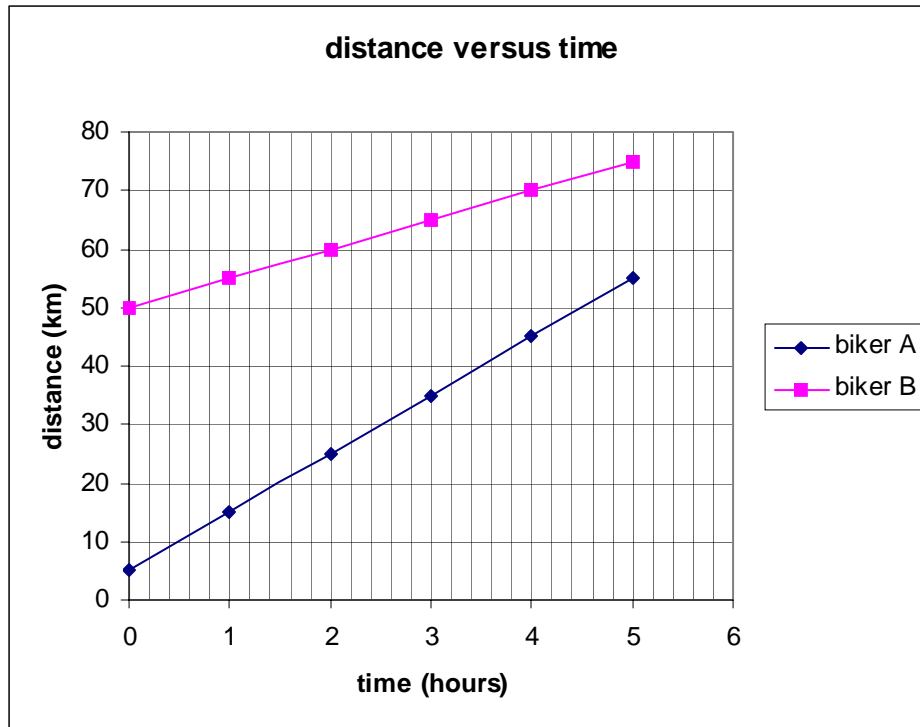
29. A tiger is running to catch a deer at an initial distance of 25 m. If the tiger has a constant speed of 20 m/s and the constant speed of the deer is 15 m/s, calculate the distance traveled by the tiger when he catches the deer.

(point 3)

Answer:

30. Look at the following graphs:

Two racers are biking. The monitor is showing their distance for every minute as illustrated at the graph.



- Who will be the winner, as they have constant speed along 100 km distance.
- Where both bikes will have at the same distance?

(point 4)

Answer:

31. A car starts from A to B which has a distance of 80 km, with an average speed of 50 km/hour. If the characteristics of the car are as follows:

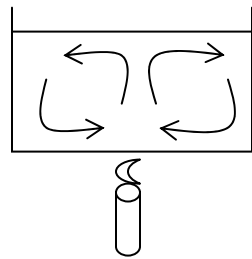
| Average speed (km/h) | Gasoline consumption (km/liter) |
|----------------------|---------------------------------|
| 0 – 20               | 12                              |
| 20 – 40              | 10                              |
| 40 – 60              | 8                               |
| 60 – 80              | 10                              |
| 80 – 100             | 12                              |

Calculate the gasoline consumption for the travel.

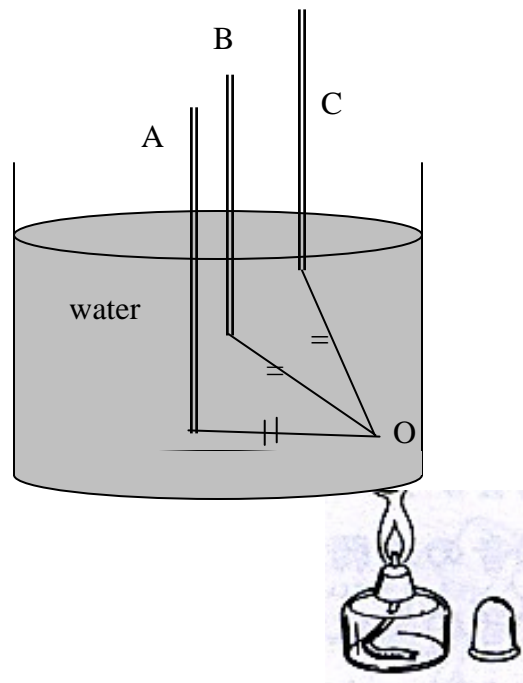
(point 3)

Answer:

32. Heat can be transferred in three ways. One of them requires a movement of matter as a medium to carry the heat from the hotter to the colder region. For example, heat transfer process in water when it is boiled in a pot. The direction of heat transfer in the pot is illustrated as in the figures below. The process whereby heat is transferred by mass movement of medium from one place to another is called **convection**.



Three thermometers are inserted into the boiling water in a large pot as shown in Figure below. If the distances from each thermometer to the point O are same, which one is the coldest thermometer? Sort form the coldest thermometer to the warmest one. Please explain the reason!

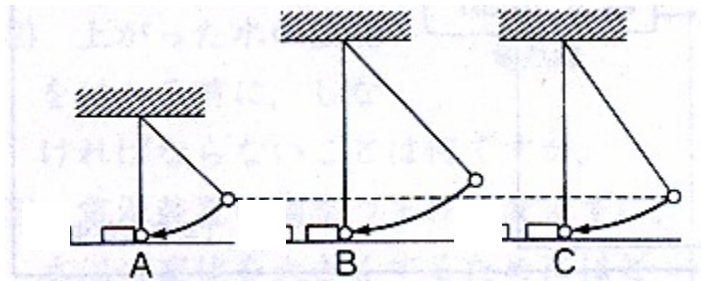


Answer:

33. Two small bins with the same mass are provided (height 15 cm, diameter 15 cm). Both are filled with water with same mass, but different temperature. First bin is filled with  $10^{\circ}\text{C}$  of water, while the second one with  $60^{\circ}\text{C}$  of water. After that, both bins are sealed tightly with polyethelyne plastics. Finally both bins are placed in each arm of balance. Explain what will happen to both bins at the balance.

Answer:

34. Look at the figure below. Three small balls with the exactly same size and mass are hanged with string. The lengths of strings are equal for B and C, but shorter for A. In front of each ball, a small same box is put. If each ball is pull to some certain height as shown in the figure, which ball is the faster to collide with the box? Sort the balls from the fastest to the slowest one.

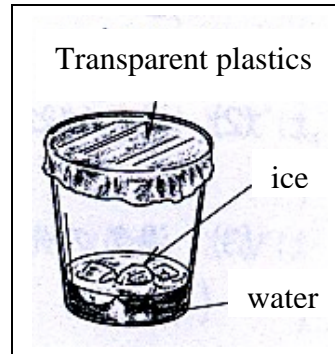


Answer:

35. A cup is filled with water and ice and then the cup is sealed with transparent plastics.

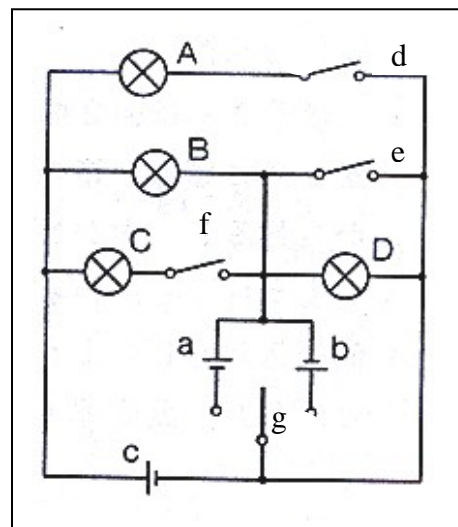
What will happen with the surface of the cup after a few minutes?

Explain why such a phenomenon occurs?



**Answer:**

36. An electric circuit compose of four same light bulbs (A, B, C, D), three same batteries (a, b, c) and four switches (d, e, f, g) as shown in figure below.



- (a). If from the beginning switch *d* is closed, which bulb will be the brightest light.
- (b). If from the beginning switch *f* is closed, which bulb will be the brightest light.
- (c). If from the beginning switch *d*, *e*, and *f* are closed together, which bulb will be the brightest light.

**Answer:**

**37. Look at the same figure as in problem no. 36.**

- (a). If from the beginning only switch  $g$  is connected to the battery  $a$ , which bulb will be the brightest light.
- (b). If from the beginning switch  $d$  is closed and switch  $g$  is connected to the bulb  $b$ , which bulb will be the brightest light.

Answer

38. A ship sailed from a harbor which is located at the equator to a station located in the North Pole. The total distance traveled was 10,000 km. If it remained at the same longitude during its cruise and assuming the Earth is a perfect sphere,

a) Predict the radius of the Earth

(point 2)

Answer:

b. If the average density of the Earth is  $5400 \text{ kg/m}^3$ , calculate the mass of the Earth (use the symbol of Earth's radius to make calculation easier)

(point 3)

Answer:

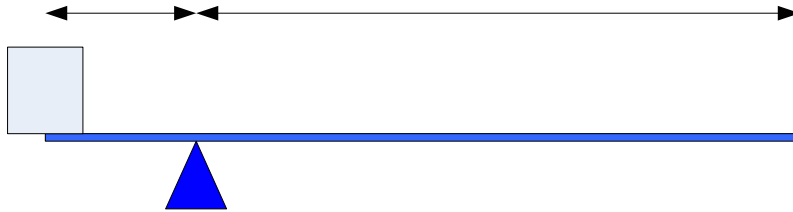
39 . If you roll a marble down the side of a round bowl, it will move back and forth about the center of the bowl a number of times before it stops. Please explain the changes of energy involved in the movement of the marble.

(point 2)

Answer:



40. Look at the figure below carefully:



If gravitational acceleration is equal to  $10 \text{ m/s}^2$ , how large and in which direction we must exert the force  $F$ ?

(point 2)

Answer:

1 m

41. The earth's crust is a thin layer that sits atop on the molten mantle. Why does it happen?

(Point 2)

Answer:

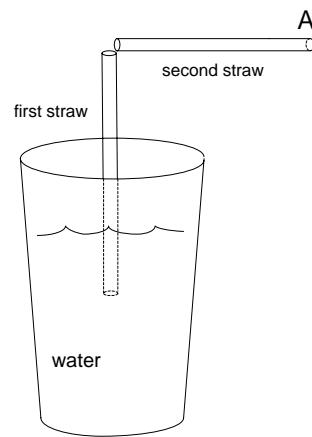
10  
kg

42. Look at the figure carefully.

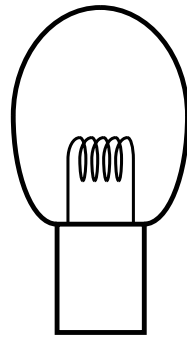
If you blow the air using your mouth at A (the second straw) hard enough, what will happen to the water and explain why.

(point 2)

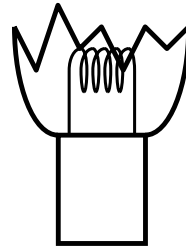
Answer:



43. When the bulb is broken, the glass chips move ... because ....



Good bulb

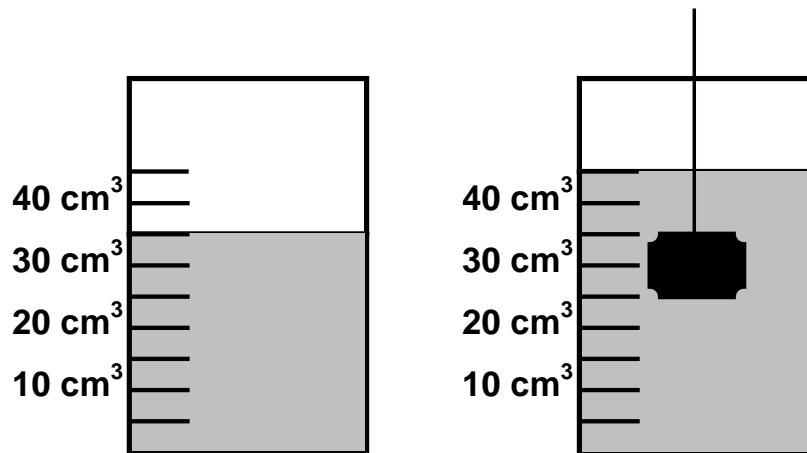


Broken bulb

(point 2)

Answer:

44. Figure 3 shows liquid levels in a measuring glass before and after a piece of wood of 100 grams is immersed into the liquid. What is the mass density of the wood?



Answer: (2)

45. Water does not wet lotus leaves because ...

Answer: (2)

46. What happens when a blue light of a laser pass through a prism?

Answer: (2)