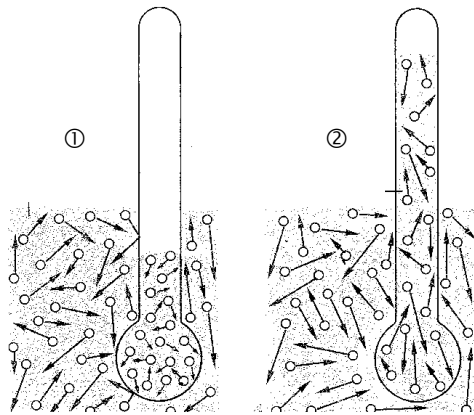


TEMPERATURE

1.

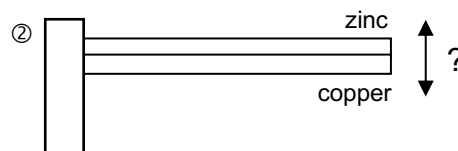
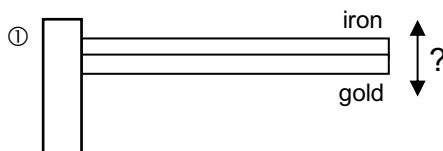


A common thermometer consists of a hollow glass tube filled with mercury or alcohol. A thermometer (filled with cool thermometer liquid) is placed into a cup of warm water (①). After a while, the column of thermometer liquid rises up the tube (②). Look at the pictures and explain what happens on the molecular level.

2. The lowest possible temperature is called *absolute zero*.
  - a) What is the temperature of absolute zero in °C and in K?
  - b) Why is there no lower temperature?
  
3. The highest temperature measured on earth is 56.7 °C, recorded at Death Valley (USA) on July 10th 1913. The lowest recorded temperature is -89.2 °C, observed at the Soviet Vostok Station in Antarctica on July 21st 1983.
  - a) What is the difference between these two temperatures?
  - b) Give both temperatures in Kelvin.

LINEAR EXPANSION OF SOLIDS

4. Complete the following sentences:
  - a) Porcelain expands ..... times as much as cork.
  - b) Zinc expands twice as much as .....
  
5. Here are two bimetallic strips.
  - a) To which side do they bend when cooled?
  - b) Which one bends more?



6. On a cold winter day at - 20.0 °C, the Eiffel tower (iron) is 324.0 m high.
  - a) What is the increase in height on a hot summer day at 30.0 °C?
  - b) What is the total height on a hot summer day at 30.0 °C?

7. At a temperature of  $17.260\text{ }^{\circ}\text{C}$ , the length of a gold rod is  $200.00\text{ mm}$ . Calculate its length at  $-2.7400\text{ }^{\circ}\text{C}$ .
8. At  $15.0\text{ }^{\circ}\text{C}$ , an aluminium rod is  $1000.0\text{ mm}$  long. What is its temperature if the rod's length is  $1001.0\text{ mm}$ ?
9. At a temperature of  $20\text{ }^{\circ}\text{C}$ , the length of a metal rod is  $1000.0\text{ mm}$ . When heated to  $70.0\text{ }^{\circ}\text{C}$ , its length increases by  $0.70\text{ mm}$ .
- What is the coefficient of linear expansion?
  - What material is it?

## VOLUME EXPANSION OF LIQUIDS

10. Compare a „normal“ substance to water. Fill in the table.

change in volume of:	„normal“ substance	water
when the temperature decreases from $4\text{ }^{\circ}\text{C}$ to $0\text{ }^{\circ}\text{C}$		
when ice water freezes to become solid ice		

11. Why are outdoor water fountains usually turned off in the fall?
12. The temperature of  $0.500\text{ l}$  ethanol increases from  $-25.0\text{ }^{\circ}\text{C}$  to  $+5.00\text{ }^{\circ}\text{C}$ .
- By what amount does the volume increase?
  - What is the volume at the higher temperature?
13. The temperature of  $1000.0\text{ ml}$  brandy (of which 40% of the volume is alcohol, 60% of the volume is water) increases from  $8.00\text{ }^{\circ}\text{C}$  to  $28.0\text{ }^{\circ}\text{C}$ . What is the increase in volume?
14. What is the density of mercury at  $145\text{ }^{\circ}\text{C}$ ?

---

solutions:

3. a)  $145.9\text{ K}$                       b)  $329.9\text{ K}$  uns  $184.0\text{ K}$   
 6. a)  $19\text{ cm}$                         b)  $324.2\text{ mm}$   
 7.  $199.94\text{ mm}$   
 8.  $57\text{ }^{\circ}\text{C}$   
 9. a)  $14 \cdot 10^{-6}\frac{1}{\text{K}}$                       b) gold  
 12.a)  $16.5\text{ ml}$                         b)  $0.517\text{ l}$   
 13.  $11.3\text{ ml}$   
 14.  $13.25 \cdot 10^3\frac{\text{kg}}{\text{m}^3}$