1. Transforma estas cantidades en unidades SI y expresa el resultado en notación científica:

a) $2{,}3\cdot10^{2}\ \frac{g}{cm^2}\cdot\frac{1\ kg}{10^{3}\ g}\cdot\frac{1^{2}\ cm^2}{(10^{-2})^{2}\ m^2}=2{,}3\cdot10^{3}\ \frac{kg}{m^2}$

b) $1\,295\,304\ mm^3\cdot\frac{(10^{-3})^{3}\ m^3}{1^{3}\ mm^3}=1{,}295\cdot10^{-3}\ m^3$

c) $0{,}45\ \frac{mg\cdot cm}{min}\cdot\frac{10^{-3}\ kg}{10^{3}\ mg}\cdot\frac{10^{-2}\ m}{1\ cm}\cdot\frac{1\ min}{60\ s}=7{,}5\cdot10^{-11}\ \frac{kg\cdot m}{s}$

2. To determine the elastic constant of spring, some forces are applied and its deformation is recorded in the data table below:

F (N)	216	576	1 224	2 016
Δl (m)	0,3	0,8	1,7	2,8

a) What is the value of its elastic constant? Don't forget to write its units.
b) What will be the elongation if we apply a 318 N force?
c) If we want to reach a 2,97 m deformation, what must be the force applied?

a) Hooke's Law says: $F=k\cdot\Delta l\rightarrow\frac{F}{\Delta l}=k$ (You need a couple of data in the data table)!!

$$k=\frac{(576-216)\ N}{(0{,}8-0{,}3)\ m}=720\ \frac{N}{m}$$

b) $\frac{F}{k}=\Delta l\rightarrow\Delta l=\frac{318\ N}{720\ \frac{N}{m}}=0{,}44\ m$

c) $F=k\cdot\Delta l\rightarrow F=720\ \frac{N}{m}\cdot2{,}97\ m=2{,}14\cdot10^{3}\ N$

3. Determina la sustancia de que está hecha una esfera de 3 cm de radio que tiene una masa de 87 g. El volumen de una esfera es $V=\frac{4}{3}\pi\cdot R^3$. (2 p)

Sustancia	Densidad (g/cm³)
Lana	1,32
Papel	0,80 – 1,15
Vidrio	2,40 – 2,80
Caucho	0,92 – 0,96
Pino rojo	0,48
Sal	0,77
Corcho	0,24
Cuero	0,86 – 1,02

Es muy importante tener en cuenta la unidad de la densidad que usa la tabla (g/cm^3).
La secuencia de pasos a dar es:

a) Calcular el volumen de la esfera:

$$V = \frac{4}{3}\pi \cdot R^3 = \frac{4}{3}\pi \cdot 3^3\,cm^3 = 113\,cm^3$$

b) Calcular la densidad de sustancia:

$$\rho_{sust} = \frac{m}{V} = \frac{87\,g}{113\,cm^3} = 0,77\,\frac{g}{cm^3}$$

c) Comparamos con los datos de la tabla. Está pintado en rojo que la sustancia es SAL.

4. Explain why <u>all</u> sentences below are FALSE: (1,5 p)

   a) Solids have not their own shape because their particles can move in layers while are vibrating too.

   Solids have their own shape because their particles are in fixed positions, vibrating around them.

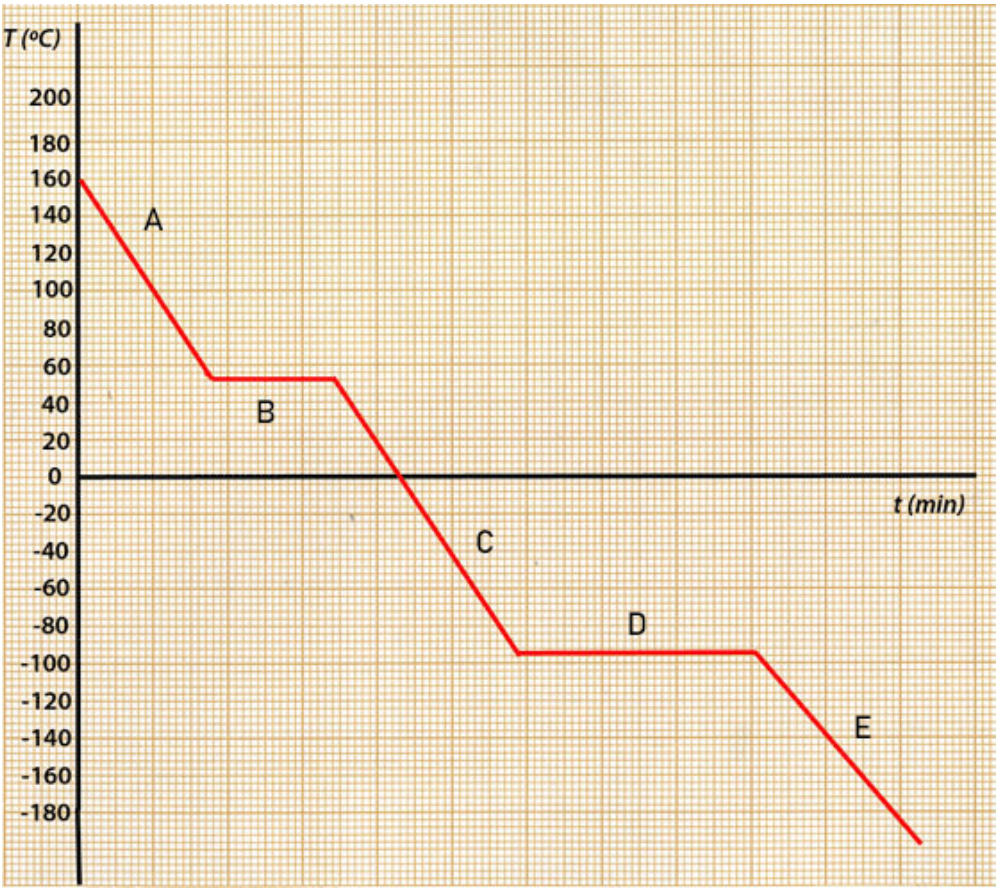
   b) Temperature is a macroscopic magnitude which is related to the number of collisions of the particles of the system between them.

   Temperature is related to the average energy (or velocity) of the system's particles.

   c) We put a liquid in a closed system at constant pressure. If the temperature increases, the volume will increase too because both magnitudes are directly proportional.

   The mathematical relation described cannot be applied to a liquid system. It is only for gases.

5. Responde <u>razonadamente</u> a partir de la gráfica adjunta: (2 p)
   a) ¿Qué está representando el gráfico, sabiendo que el sistema es un gas al principio? Es una curva de enfriamiento con dos cambios de estado.
   b) ¿Cuál es la temperatura de ebullición? ¿Y la de fusión? La temperatura de ebullición es de unos 52 ºC (325 K) y la de fusión es de unos -96 ºC (177 K).
   c) ¿En qué estado de agregación estará el sistema en el tramo C? ¿Y en el E? En C el sistema es líquido. En E está en estado sólido.
   d) ¿Qué está ocurriendo en los tramos B y D? En ambos tramos se están produciendo cambios de estado. En B se produce una condensación y en D una solidificación.



6. Now, you are going to watch a video and, after that, you must answer the questions below: (2,5 p)

a) If the initial volume is 1,4 L, what are the rest of the initial data?
$T_1 = 300\ K$; $P_1 = 0{,}60\ atm$

b) What are the final data of the experiment?
$T_2 = 402\ K$; $P_2 = 1{,}10\ atm$

c) Name the gas law that you must use to determine the final volume of the gas.
Fundamental equation of gases.

d) Calculate the final volume of the gas. Don't forget to write ALL units.

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \rightarrow \frac{P_1 \cdot V_1 \cdot T_2}{T_1 \cdot P_2} = V_2$$

$$V_2 = \frac{0{,}60\ \cancel{atm} \cdot 402\ \cancel{K} \cdot 1{,}40\ L}{300\ \cancel{K} \cdot 1{,}10\ \cancel{atm}} = 1{,}07\ L$$

7. Fill the gaps with appropriate words in order to give sense to the following text: (1 p)

Atmospheric pressure influences the changes of STATE which occur in OPEN containers where the substance is in contact with the atmosphere.

A change in pressure modifies the MELTING and BOILING points of a substance.

- An INCREASE in pressure favours the changes of state which produce a DECREASE in volume: solidification, condensation and inverse sublimation.
- A DECREASE in pressure favours the changes of state which produce an increase in volume: FUSION, vaporisation and sublimation.

8. Explain, in your own words, what differences are between evaporation and boiling during the vaporisation process. (1 p)

   Evaporation occurs at a temperature lower than the boiling point and only on the surface of the liquid. Boiling starts when the temperature reaches the boiling point and all the liquid is able to pass from liquid to gas state.