

## **S3/S4 Homework Exercises**

### **Properties of Matter Homework One**

1. Which Physics term is defined as “the heat energy required to change the temperature of 1 kg of a substance by 1 °C”?

(1)

2. Which Physics term is a “measure of the mean kinetic energy of the particles in a substance”?

(1)

3. An electric kettle is used to heat 0.4 kg of water. The initial temperature of the water is 25 °C. Calculate how much heat energy is required to bring the water to its boiling point of 100 °C.

( $c_{\text{water}} = 4180 \text{ J kg}^{-1} \text{ °C}^{-1}$ )

(3)

4. True or False. When a substance changes state there is no change in its temperature.

(1)

5. Calculate the amount of heat energy required to change 0.3 kg of water to steam at 100 °C.

(Specific latent heat of vaporisation of water =  $22.6 \times 10^5 \text{ J kg}^{-1}$ )

(3)

6. A solar furnace consists of a set of mirrors which reflect heat radiation on to a curved reflector.



A heating container is placed at the focus of the central curved reflector. Metals placed in the container are heated until they melt.

a) 8000 kg of pre-heated aluminium pellets at a temperature of 160 °C are placed in the container. Aluminium has a specific heat capacity of  $902 \text{ J kg}^{-1} \text{ } ^\circ\text{C}^{-1}$  and a melting point of 660 °C. Calculate the heat energy required to heat the aluminium from 160 °C to its melting point.

(3)

b) Calculate the extra heat energy required to melt the aluminium pellets.  
(Specific latent heat of fusion of aluminium =  $3.95 \times 10^5 \text{ J kg}^{-1}$ )

(3)

c)

i) The power of the furnace is 800 kW. Calculate how long it will take to melt the aluminium from the when it is first placed in the container.

(4)

ii) Explain why it actually takes longer than the time calculated in c) i)

(1)

## S3/S4 Homework Exercises

### Properties of Matter Homework Two

1. A box exerts a downwards force of 120 N, and has a base area of 2 m<sup>2</sup>. Calculate the pressure the box exerts on the ground.

(3)

2. Use some of the words below to copy and complete the statements about the Kinetic Model of Gases.

close together   far apart   fast   large

organised   random   slow   small

- a) Gases are made up of lots of very \_\_\_\_\_ particles.
- b) The particles in a gas are very \_\_\_\_\_.
- c) Gas particles always move in a very \_\_\_\_\_ fashion.
- d) The particles in a gas are always moving at very \_\_\_\_\_ speeds.

(4)

3. State the value of absolute zero on the degrees Celsius scale.

(1)

4. Give the value of the following Kelvin temperatures in °C.

- a) 310 K      b) 373 K      c) 250 K

(3)

5. Copy and complete the following:

“According to Charles’ Law, if mass and \_\_\_\_\_ do not change, the \_\_\_\_\_ of a gas is directly proportional to its temperature measured in \_\_\_\_\_.”

(3)

6. A bicycle pump holds 20 cm<sup>3</sup> of air when full of air. When 12 cm<sup>3</sup> of air is squeezed out of the pump the pressure of the air left in the pump is 2.5 x 10<sup>5</sup> Pa. Calculate the pressure of the air in the pump when it is full of air.

(3)

7. The pressure of a gas in a sealed syringe is 1.5 x 10<sup>5</sup> Pa. The temperature of the gas is 27 °C. The temperature of the gas is lowered by 10 °C and the volume and mass remain the same. Calculate the new pressure of the gas in the syringe.

(3)