

Name..... Set..... Don.....



Winchester College
Physics

3rd year Revision Test

Thermal and Material Physics

Common Time 2010

Answer all the questions.
Total 40 marks.

Allow 40 minutes.

Remember to show your working where applicable.
Calculators are allowed.

1. Fig. 1 shows a diver 50 m below the surface of the water.

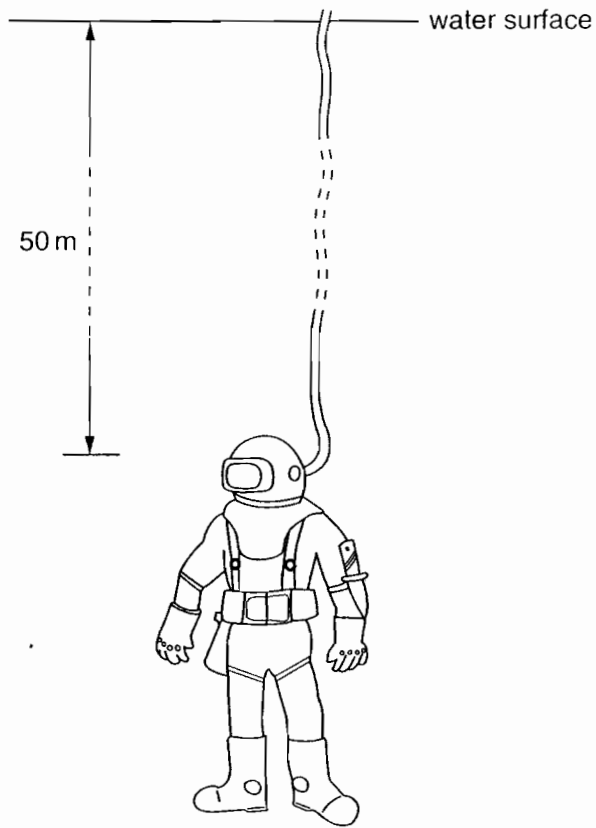


Fig. 1

The density of water is 1000 kg/m^3 and the acceleration of free fall is 10 m/s^2 .
Calculate the pressure that the water exerts on the diver.

pressure = [3]

2. Fig. 2 shows a way of indicating the positions and direction of movement of some molecules in a gas at one instant.

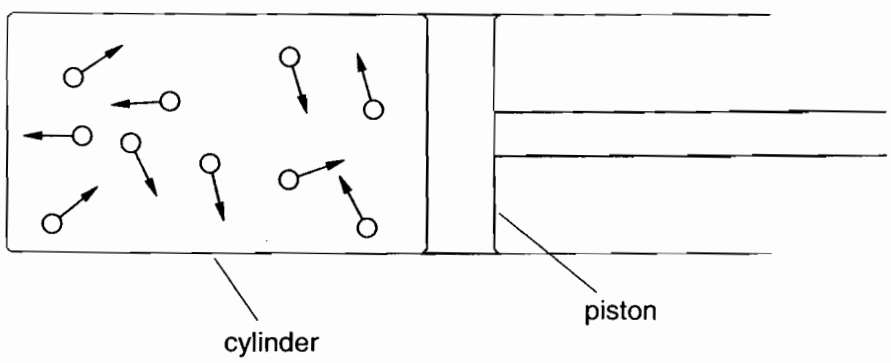


Fig. 2

(a) (i) Describe the movement of the molecules.
..... [1]

(ii) Explain how the molecules exert a pressure on the container walls.
.....
..... [1]

(b) When the gas in the cylinder is heated, it pushes the piston further out of the cylinder.
State what happens to
(i) the average spacing of the molecules,
..... [1]

(ii) the average speed of the molecules.
..... [1]

(c) The gas shown in Fig. 2 is changed into a liquid and then into a solid by cooling.
Compare the gaseous and solid states in terms of
(i) the movement of the molecules,
.....
..... [1]

(ii) the average separation of the molecules.
.....
..... [1]

3. Fig. 3 shows a sealed glass syringe that contains air and many very tiny suspended dust particles.

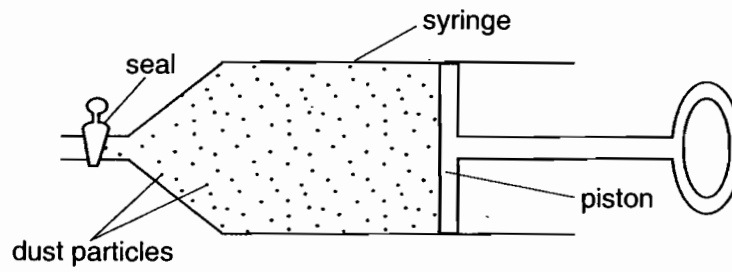


Fig. 3

- (a) Explain why the dust particles are suspended in the air and do not settle to the bottom.

.....
.....
.....
.....[3]

- (b) The air in the syringe is at a pressure of 2.0×10^5 Pa. The piston is slowly moved into the syringe, keeping the temperature constant, until the volume of the air is reduced from 80 cm^3 to 25 cm^3 . Calculate the final pressure of the air.

pressure =[3]

- 4 Fig. 4. shows water being heated by an electrical heater. The water in the can is not boiling, but some is evaporating.

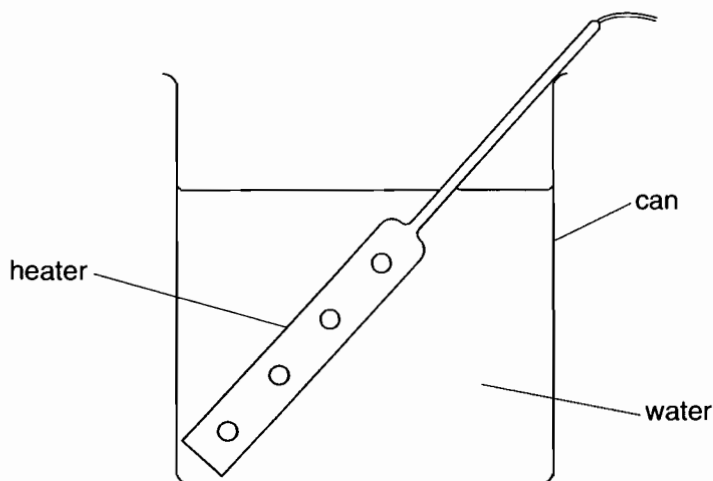


Fig. 4

- (a) Describe, in terms of the movement and energies of the water molecules, how evaporation takes place.

.....
.....
.....
..... [2]

- (b) State two differences between evaporation and boiling.

1
.....
2
..... [2]

- (c) After the water has reached its boiling point, the mass of water in the can is reduced by 3.2 g in 120 s. The heater supplies energy to the water at a rate of 60 W. Use this information to calculate the specific latent heat of vaporisation of water.

specific latent heat = [3]

5 (a) Equal volumes of nitrogen, water and copper at 20 °C are heated to 50 °C.

(i) Which one of the three will have a much greater expansion than the other two?

.....

(ii) Explain your answer in terms of the way the molecules are arranged in the three substances.

.....

.....

.....

[3]

(b) Fig. 5 shows a thermometer with a range of -10 °C to 50 °C.



Fig. 5

Explain what is meant by

(i) the *sensitivity* of a thermometer,

.....

.....

(ii) the *linearity* of a thermometer.

.....

.....

[2]

6. A thermocouple is used to measure the temperature of the inner wall of a pottery kiln.

(a) In the space below, draw a labelled diagram of a thermocouple that could be used for this purpose. [2]

(b) Describe

(i) how you would read the temperature of the wall from the thermocouple,

.....
.....

(ii) how the thermocouple works.

.....
.....
.....

[2]

(c) State two conditions in which a thermocouple is very suitable for temperature measurement.

.....
.....[2]

7. Fig. 6 shows apparatus that a student uses to make an estimate of the specific heat capacity of iron.

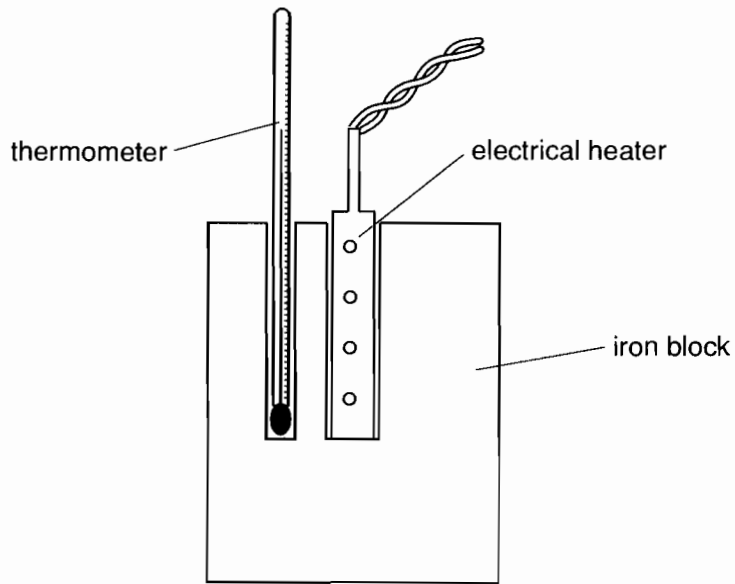


Fig. 6

(a) The power of the heater is known. State the four readings the student must take to find the specific heat capacity of iron.

1.

2.

3.

4. [3]

(b) Write down an equation, in words or in symbols, that could be used to work out the specific heat capacity of iron from the readings in (a).

[2]

(c) (i) Explain why the value obtained with this apparatus is higher than the actual value.

.....
..... [1]

(ii) State one addition to the apparatus that would help to improve the accuracy of the value obtained.

.....
..... [1]

For
Examiner's
Use