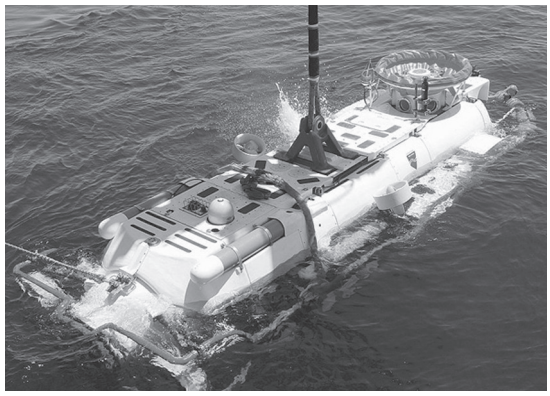
1 The LR5 is a specialist submarine for underwater rescues.



The average density of sea water is 1028 kg/m^3.

(a) (i) State the equation linking pressure difference, depth, density and g.

(1)

(ii) Calculate the increase in pressure as the LR5 descends from the surface to a depth of 700 m.

(2)

increase in pressure = ... Pa

(iii) Atmospheric pressure is 1.0×10^5 Pa.

Calculate the total pressure on the LR5 when it is at a depth of 700 m.

(1)

total pressure = ... Pa

(b) On another descent, the LR5 experiences a total pressure of 41×10^5 Pa.

The entrance to the LR5 is through an access door which has an area of 3.1 m^2.

(i) State the equation linking pressure, force and area.

(1)

(ii) Calculate the force on the outside of the door.

(3)

force = ... N

(c) The LR5 is tested in fresh water.

The density of fresh water is 1000 kg/m^3.

Explain why the pressure on the submarine in the fresh water is less than the pressure in sea at the same depth.

(1)

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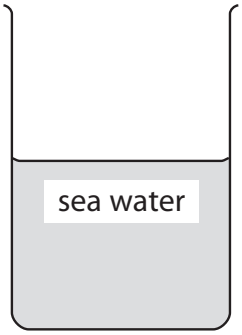
(d) A student is given a sample of liquid labelled sea water.



Describe an experiment that the student could carry out to find the density of the sample.

(5)

(Total for Question 1 = 14 marks)

2 A student places a pile of coins on a table, as shown in photograph **A**.

Photograph **A**

There are 8 coins in the pile.

The weight of each coin is 0.036 N.

The area of each coin is 0.0013 m^2.

(a) (i) State the equation linking pressure, force and area.

(1)

(ii) Calculate the pressure on the table caused by the pile of coins.

(2)

Pressure = ... Pa

(b) The student then spreads the 8 coins out on the table as shown in photograph **B**.

Photograph **B**

(i) Describe how this affects the total force from the coins on the table.

(2)

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(ii) Explain how this affects the pressure on the table caused by the coins.

(2)

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(Total for Question 2 = 7 marks)

2 This question is about temperature and pressure in gases.

(a) A gas is heated in a container which has a constant volume.

The particles in the gas

(1)

- ☒ **A** expand
- ☒ **B** hit the walls of the container harder
- ☒ **C** move closer together
- ☒ **D** have a lower average speed

(b) Describe what happens to the average kinetic energy of particles as the temperature decreases from 10 K towards 0 K.

(2)

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(c) (i) Convert a temperature of 27 °C into kelvin (K).

(1)

temperature = ... K

(ii) The gas in a cylinder has a pressure of 210 kPa at a temperature of 27 °C.

Calculate the new pressure when the temperature of the gas rises to 81 °C.

(3)

pressure = ... kPa

(Total for Question 2 = 7 marks)