Matter Practice Questions

(October 2005)

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8. (a) Two students record the mass and volume for a small cube of copper and a small cube of iron.

The table shows the results.

	Mass (kg)	**Volume (m^3)**
copper	1.125	0.000 125
iron	1.728	0.000 216

(i) Calculate the density in kg/m^3 for copper and iron.

Density of copper = ... kg/m^3

Density of iron = ... kg/m^3

(2)

(ii) Which of the two materials is less dense?

.....

(1)

(iii) Which of the two cubes has less weight?

.....

(1)

(b) How would you find the volume of the metal cubes?

.....

.....

.....

(3)

Q8

(Total 7 marks)

(October 2005)

Leave blank

14. (a) In the 17th century a scientist called Robert Boyle carried out experiments on gases. He found that the relationship

$$p_1V_1 = p_2V_2$$

is true when p_1 and V_1 are the initial pressure and volume of the gas and p_2 and V_2 are the final pressure and volume of the gas.

(i) What two things must remain constant for this relationship to be true?

1 .....

2 .....

(2)

(ii) Some gas has a volume of 1.2 m^3 at a pressure of 120 kPa.
Calculate its volume, in m^3, when the pressure is increased to 250 kPa.

.....

.....

Volume = ... m^3

(2)

(b) (i) Convert a temperature of –273 °C into kelvin.

.....

.....

Temperature = ... K

(1)

(ii) What is special about this temperature?

.....

.....

(1)

(c) Some gas is trapped in a metal cylinder. The temperature outside the metal cylinder increases.
Explain how this affects the particles in the gas and what effect this has.

.....

.....

.....

.....

.....

(3)

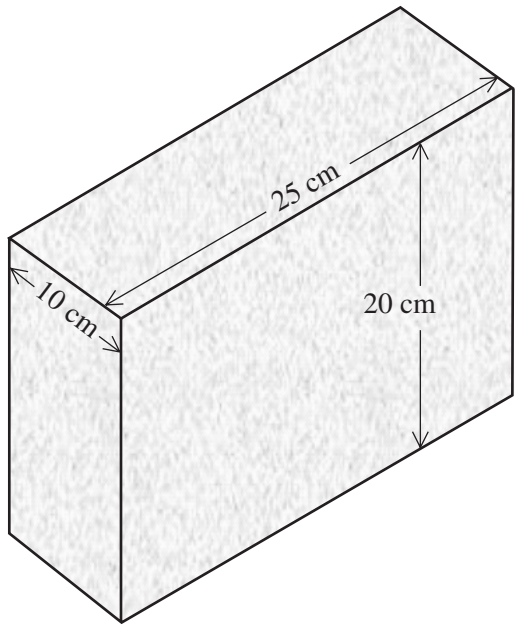
Q14

(Total 9 marks)

(May 2006)

Leave blank

6. The diagram shows the measurements of a building block.



The building block weighs 120 N. It stands as shown.

(a) Calculate the area in m^2 under the building block.

.....

.....

.....

Area = ... m^2

(2)

(b) (i) State the equation which relates area, force and pressure.

.....

(1)

(ii) Calculate the pressure in Pa under the building block.

.....

.....

Pressure = ... Pa

(2) **Q6**

(Total 5 marks)

(May 2006)

Leave blank

14. (a) (i) A student takes a balloon to a swimming pool. The balloon is filled with air at a pressure of 120 kPa. The volume of the balloon is 0.025 m^3. He takes the balloon to the bottom of the pool. The pressure inside the balloon increases by 20 kPa.
Calculate the new volume of the balloon.

.....

.....

New volume = ... m^3

(2)

(ii) State two assumptions you have made in your calculation.

1 .....

2 .....

(2)

(b) (i) Define density.

.....

(1)

(ii) Did the density of the air in the balloon decrease, stay the same or increase when the student took the balloon to the bottom of the pool?

.....

(1)

(iii) Explain your answer.

.....

.....

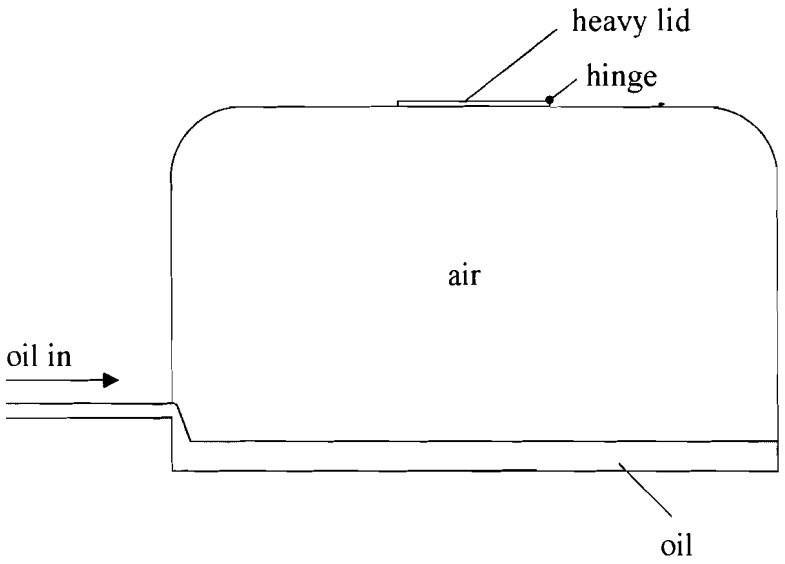
.....

(2) **Q14**

(Total 8 marks)

Leave blank

5. The diagram shows an oil storage tank. It has a heavy, hinged lid. The tank is nearly empty. When oil is pumped in this increases the pressure of the air inside the tank.



(a) What happens to the force on the inside of the lid when the pressure increases?

.....

(1)

(b) Name another force which acts on the lid.

.....

(1)

(c) Name the force which acts at the hinge as the lid opens.

.....

(1)

(d) When the lid opens, some of the air escapes from the tank. What happens to the pressure of the air in the tank?

.....

(1)

(e) On a hot day the temperature increases. What difference, if any, will this make to the speed of the molecules in the air in the tank?

.....

(1) Q5

(Total 5 marks)

Leave blank

6. Read the information in the box.

Water boils at 100 °C and freezes at 0 °C.
Ethanol boils at 78 °C and freezes at –117 °C..

(a) Use these words to complete the table.

gas liquid solid

	at 80 °C	**at –173 °C**
water		
ethanol		

(2)

(b) Describe the movement, if any, of the particles in water and ethanol

(i) at –173 °C

.....

.....

(1)

(ii) at –273 °C.

.....

.....

(1)

(c) What is the temperature at which the kelvin scale starts?

.....

(1)

Q6

(Total 5 marks)

(November 2006)

Leave blank

14. (a) The kelvin temperature of a fixed mass of gas is **not** proportional to one of the following quantities. Place a tick (✓) next to this quantity.

average kinetic energy of its molecules	
celsius temperature	
pressure at constant volume	

(1)

(b) A car handbook recommends that the tyre pressures should be checked. Explain why this should be done when the tyres are cold.

.....

.....

(2)

(c) The pressure in a tyre at a temperature of 290 K is 200 kPa. Calculate the pressure in kPa in the tyre when the temperature is 310 K.

.....

.....

Pressure = ... kPa

(2)

(d) (i) State the relationship between pressure, force and area.

(1)

(ii) A four-wheel car has a weight of 10 000 N. The pressure in each tyre is 200 kPa. Calculate in m^2 the area of each tyre which is in contact with the road. Assume the weight of the car is distributed uniformly.

.....

.....

Area = ... m^2

(2)

Q14

(Total 8 marks)

(May 2007)

Leave blank

10. Use the information in the box to answer the questions.

Absolute zero is −273 °C.

The pressure in a gas cylinder is 850 kPa when the temperature is 20 °C.

$$\frac{p_1}{T_1} = \frac{p_2}{T_2}$$

(a) Convert the temperature 20 °C to the kelvin scale.

.....

Temperature = ... K

(1)

(b) Calculate the pressure in the gas cylinder to the nearest 10 kPa when the temperature rises to 40 °C.

.....

.....

.....

Pressure = ... kPa

(3)

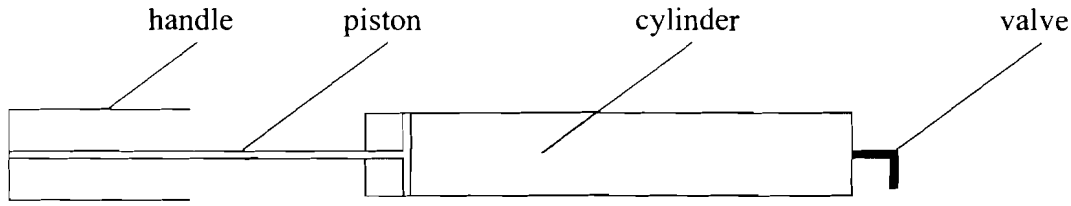
Q10

(Total 4 marks)

(May 2007)

Leave blank

16. The diagram shows the structure of one type of bicycle pump.



(a) Circle **two** words in the box which best describe the motion of the molecules in the air in the cylinder.

backwards	**constant**	**fast**	**forwards**
random	**regular**	**slow**	**steady**

(1)

(b) Explain how the molecules exert a pressure on the inside of the cylinder.

.....

.....

.....

.....

.....

(3)

(May 2007)

Leave blank

(c) (i) The pressure inside the pump is 150 kPa when the volume of air in the cylinder is 90 cm^3. Use the equation

$$p_1V_1 = p_2V_2$$

to calculate the pressure in kPa when the air is compressed to a volume of 50 cm^3.

.....

.....

Pressure = ... kPa

(2)

(ii) What assumptions did you make in order to answer (c)(i)?

1 .....

.....

2 .....

.....

(2)

(iii) Name the unit which is represented by the symbol kPa.

.....

(1)

Q16

(Total 9 marks)