ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

PHYSICS 9188/5

PAPER 5

NOVEMBER 2009 SESSION 1 hour 15minutes

Additional materials:
- Answer paper
- Electronic Calculator and / or Mathematical tables
- Ruler (mm)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Answer **four** questions.

Question 1 is compulsory.
Answer any other **three** from the remaining questions.

Write your answers on the separate answer paper provided.
If you use more than one sheet of paper, fasten the sheets together.
All working for numerical answers must be shown.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
You are reminded of the need for good English and clear presentation in your answers.

Candidates are advised to spend 30 minutes on **question 1**.

This question paper consists of 8 printed pages.

[Turn over

*Answer **question 1** and **any other 3** from the remaining questions.*

1 **(a)** **(i)** State *de Braglie's wave equation.*

(ii) A man of mass 50 kg runs through a door of dimensions 90 × 150 cm at a velocity of 7.9 ms^{-1}.

1. Calculate the wavelength associated with the man.

2. State and explain whether there is a diffraction pattern observed.

3. Explain briefly how the wave nature of particles can be demonstrated. [8]

(b) **(i)** A sealed container of volume 0.8×10^{-3} m^3 contains a gas at a temperature of 47 °C and a pressure of 1.5×10^6 Pa.

Calculate

1. the number of molecules of the gas,

2. the kinetic energy of the molecules when pressure is increased to 2.5×10^6 Pa.

(ii) Give any **two** assumptions made when coming out with the solutions above. [8]

(c) **(i)** Define *magnetic flux* and *magnetic flux density.*

(ii) When using a Hall probe, there is a Hall potential difference. Explain how this arises.

(iii) The Hall potential difference across a chip of width 5.0 mm is 10μV when placed between the poles of a U-shaped magnet. The average drift speed of the charge carriers in the chip is 6.0×10^{-1} mms^{-1}.

Determine the magnetic flux density between the poles of the magnet. [8]

2 (a) State *Kirchoff's laws*. [2]

(b) **Fig. 2.1** shows a circuit for the supply of energy to a load of 6.0 Ω.

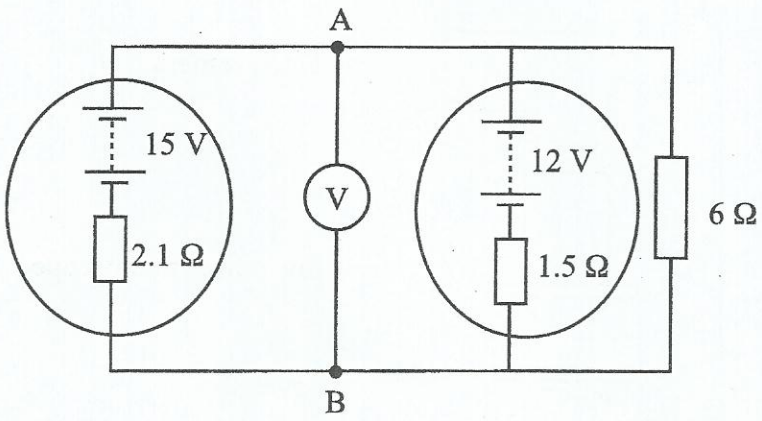

Fig. 2.1

A high resistance voltmeter is connected to the points **A** and **B**.

(i) Calculate the currents through the power supplies and the load.

(ii) Deduce the voltage recorded by the voltmeter.

(iii) Calculate the power dissipated in the load.

[10]

3 (a) (i) Explain what is meant by the term *internal energy of a gas*.

(ii) Describe how internal energy of a gas can be changed.

[3]

(b) **Fig. 3.1** shows apparatus used to observe smoke particles at room temperature.

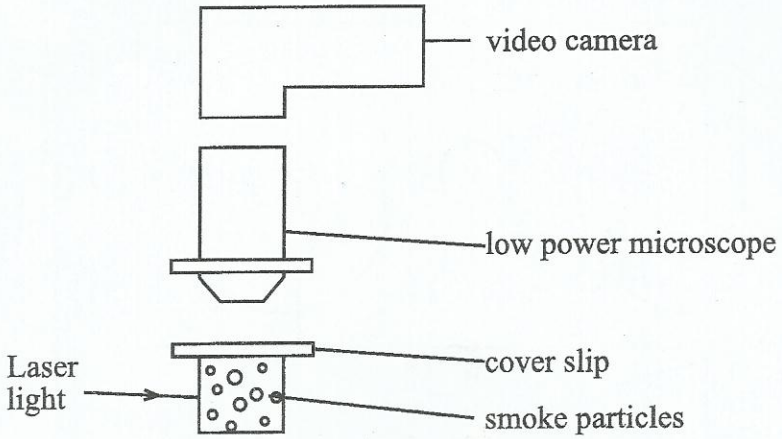

Fig. 3.1

(i) Describe and explain the observations on the television screen when the video taken is played.

(ii) Describe and explain the observations, if the experiment is repeated at 273 K.

[5]

(c) Explain why a pot handle made of copper heats up faster than that of wood.

[4]

4 **(a)** Distinguish between *elastic* and *plastic deformation.* [2]

(b) A brass wire 3.0 m long of cross-sectional area 1.0×10^{-3} cm^2 is stretched 1.0 mm by a load of 0.40 kg. The breaking load of the wire is 125 N.

(i) Calculate the Young Modulus, E, for brass.

(ii) Determine the percentage strain produced in the wire.

(iii) Use the value of E in **(i)** to calculate the force required to produce a 3.3% strain in the same wire.

(iv) State and comment on your assumptions in making calculations in **(iii)**.

[10]

5 **(a)** Explain what is meant by an *output transducer*.

Give **one** example. [2]

(b) The circuit shown in **Fig. 5.1** is used to convert a voltmeter of low input resistance to an ideal one.

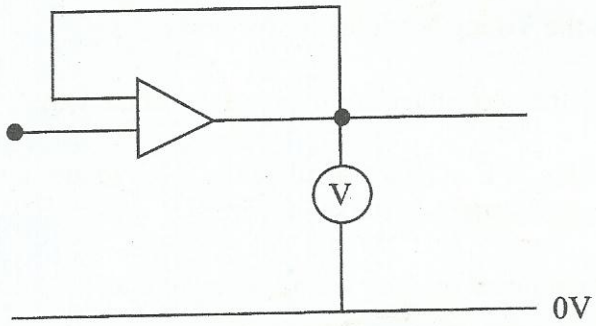

Fig. 5.1

(i) Suggest what is meant by an *ideal voltmeter*.

(ii) State the name given to the operational amplifier when used in this mode and its gain.

(iii) State with a reason the property of the operational amplifier being used in the circuit. [5]

(c) **Fig. 5.2** shows three logic gates connected together.

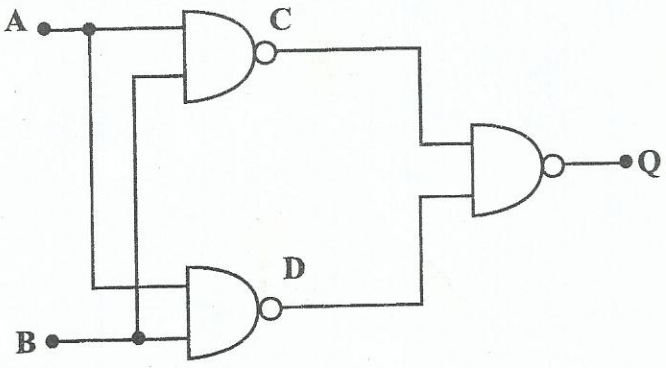

Fig. 5.2

(i) Give the name of the logic gates used.

(ii) Draw the truth-table for the circuit shown.

(iii) Write down the name of a single logic gate that performs the same function as the circuit in **Fig. 5.2**. [5]