PAST GCE QUESTIONS MEETLEARN.COM

2001 Past GCE Advanced Level Paper 2

JUNE 2001

SECTION I

Answer all questions in this section

1. A 100g calorimeter contains 300g of water at room temperature. 50g of ice is added to this calorimeter and the equilibrium temperature recorded is 282.7K. Calculate the room temperature. The specific heat capacity of copper = 380J kg^{-1} K^{-1}, The specific heat capacity of water = 4200J kg^{-1} K^{-1}, the specific latent heat of ice = 3.25 x 10^5 J K^{-1}.

2. In figure 1, the meters labeled M_1 and M_2 each read 1.5A when the switch, K is closed.

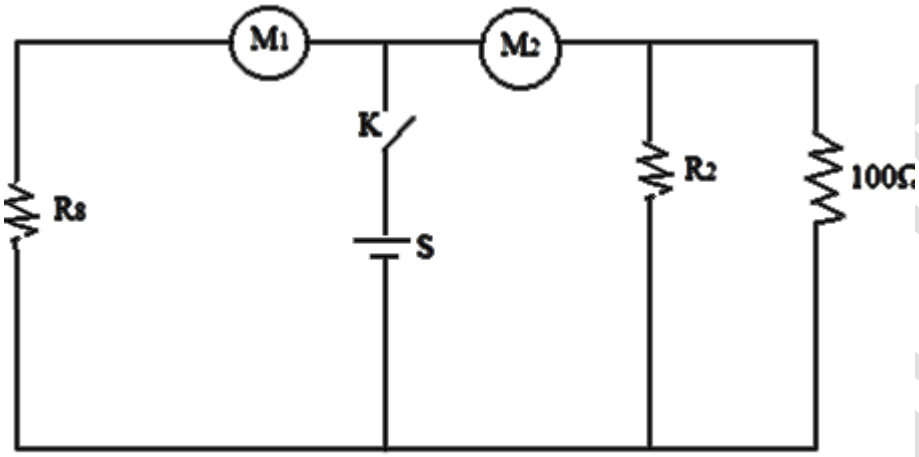

Figure 1

The source S supplies 300W to the resistor R_1, R_2 and 100Ω respectively. Calculate

(i) The potential difference across R_1.

(ii) The value for the resistance R_2

3. A car tyre is normally threaded with wire loops. Dunlop tyres have about 200loops a tyre. A car running on such tyres travels at speed of 16.7m.s^{-1} along a level road such that the magnetic field of the earth makes an angle of 53° with the axis of the tyre at all the times. If the magnetic field is 1.02 x 10^{-5} T, calculate

(i) The induced current through a loop if the type's diameter is 0.65m and its resistance per unit length is 8.0 x 10^{-3}Ωm^{-1}.

(ii) How much power is generated on the tyre due to its motion in the earth's magnetic field?

(iii) What does it suggest to you about the usage of threated car tyres?

4. (a) In an experiment to determine the focal length of a convex lens, f, the magnification, m, was calculated from different image distance, V. The result are displayed in figure 2.

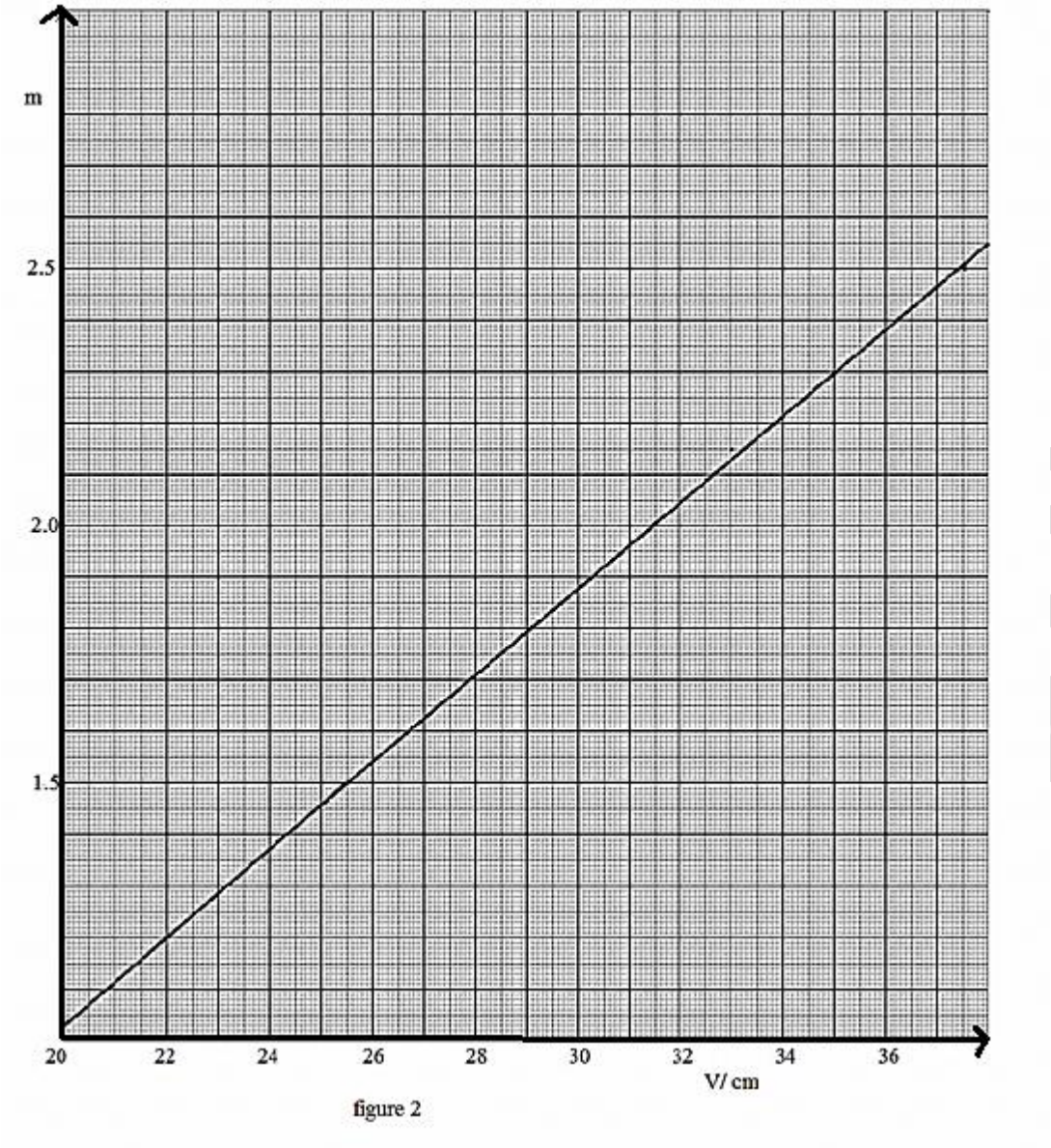

figure 2

Use the graph to determine a value for the focal length, f, of the convex lens.

(b) State any two advantages that the optical fibre has over the copper cable used for the transmission of information.

5. (a) Explain hysteresis curve for rubber.

(b) Explain why in practice car tyres are made with synthetic rubber which has a smaller area of hysteresis as compared to natural rubber.

(c) Sketch on the same axes stress-strain curves for the following materials:

(i) Iron

(ii) Glass

6. Figure 3 shows a basic amplifier circuit with a n-p-n transistor

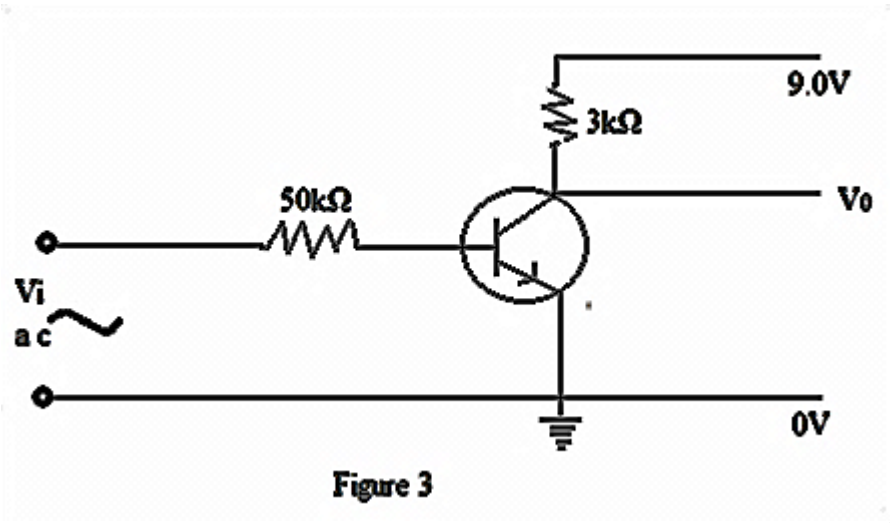

Figure 3

If the voltage V_i is 2.0 V, ac and dc gain for the transistor is 60.
Calculate

(i) The base current

(ii) The collector current

(iii) The output voltage

On the same axis sketch graphs to show how the input voltage and the output voltage vary with time.

SECTION II

Answer 8 (a), (b) and (c) or 8(d), (e), (f)

Either 8(a), (b) and (c)

7. (a) (i) State Coulombs law.

Figure 4 shows how the force, f, varies with the inverse of the square of the separation between equal charges Q placed in the medium

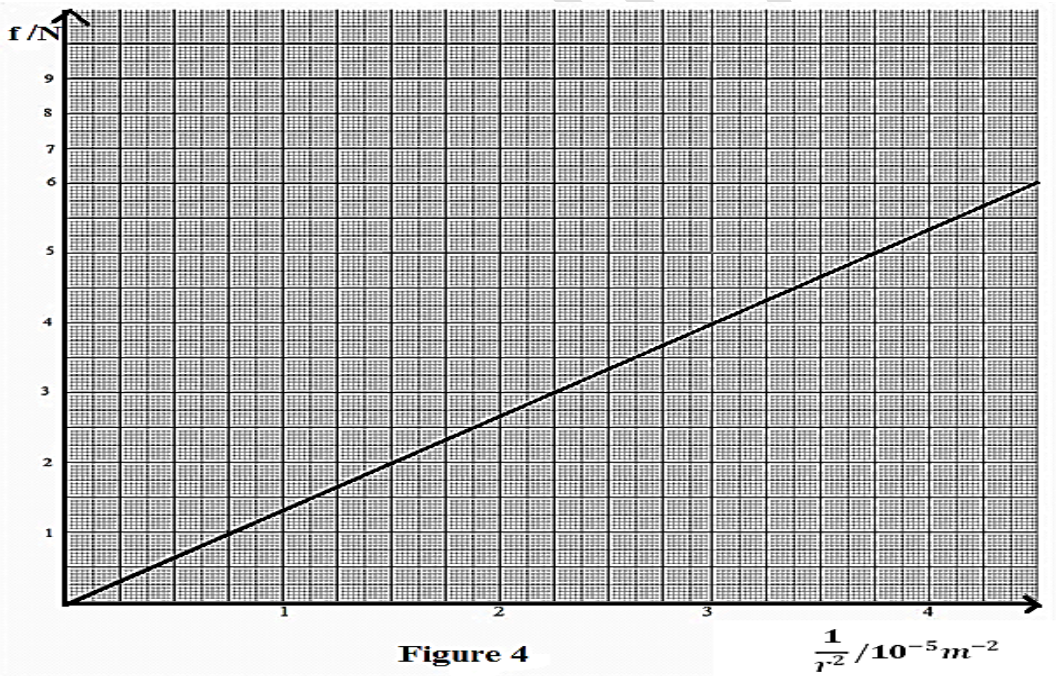

Figure 4

(ii) Use the graph to obtain a value for the permittivity of the medium if Q has a value of 4.4 x 10^{-3}C.

(iii) Hence obtain a value for the dielectric constant.

(b) Two particles carrying charges Q_1=4.0μC and Q_2=-3μC are placed a distance of 5.0 x 10^{-2}m apart.

(i) Sketch the electric field lines between the charges Q_1 and Q_2.

(ii) Calculate the point on the line passing through the two particles at which the resultant field is zero.

(c) explain why birds are often not electrocuted when they land on high voltage lines.

OR 8(d),(e),(f)

(d) (i) State Newton's Law of gravitation.

(ii) When a planet moves in a circular orbit of radius, r, about the sun, the centripetal force is provided by the gravitational attractive force. Show that the periodic time, T, of the planet is given by the expression.

$$r^3 = \frac{Gm}{4\pi^2}T^2$$

$$G - the\ gravitational\ constant$$

$$m - the\ mass\ of\ the\ sun$$

(iii) Calculate the period of rotation of the moon about the earth if the radius of the moon is 3.5 x 10^8m and mass of the earth is 6.0 x $10^{24}kg$.

(e) Figure 5 shows how T^2 varies with r^3 for a planet of mass 7.0 x 10^{26}kg.

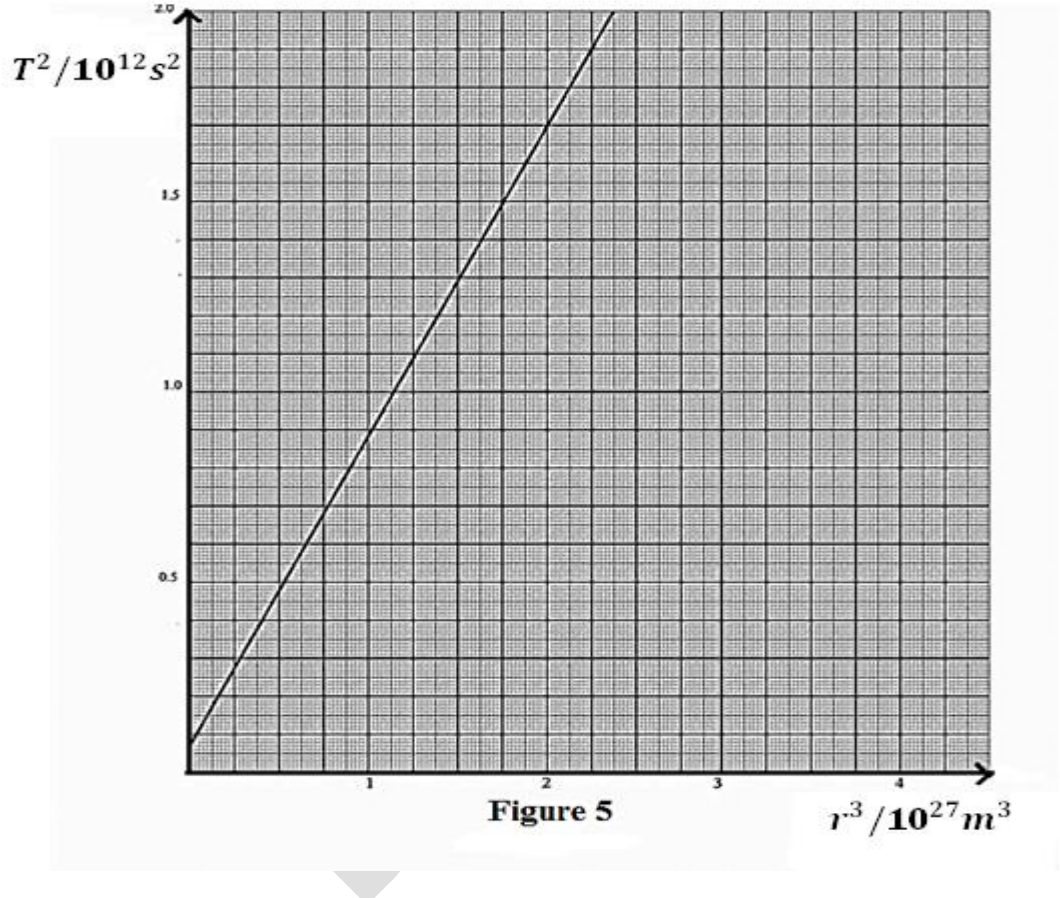

Figure 5

(i) Use this graph to obtain a value for the universal gravitational constant.

(f) The mass of the earth is 80 times that of the moon and the distance from the centre of the moon is 3.5 x 10^5m. Calculate the distance from the centre of the earth, of the point on the line joining the centre of the earth and that of the moon, where the resultant gravitational field of the earth and the moon is zero.

Answer either 9(a),(b) and 9(c) OR9(d),(e) and (f)

8. Either

OR 9(d),(e),(f)

(a) (i) State the Zeroth law of thermodynamics

(i) How does this law lead to the definition of temperature?

(b) What is meant by
(i) Primary energy sources
(ii) Alternate energy sources
Discuss the use of primary and alternate sources of energy in Cameroon.

(c) Sea water is trapped in a bay of area 4.0 x $10^7 m^2$. The difference in levels of the water in the bay between high and low tides is 10m.
(i) Calculate the average power obtainable for a tidal period of 12 hours if the density of sea water is 1100kg m^{-3}.
(ii) Explain the factors which coastlines not depend on tides as a source of energy.

Answer either 10(a),(b),(c) OR 10(d),(e),(f)

Either 10(a),(b),(c)

9. (a) Describe an experiment to investigate how the intensity of α-rays varies with distance from the source of emission.
(b) 8.0 mg of radioisotope of half-life 30minutes is used for 12minutes.
(i) Explain the terms in italics.
(ii) What is the amount of the radioisotope remaining?

(a) The fusion of a uranium nucleus of deuterium with a nucleus of tritium releases energy according to the following equation.

$$^2_1H + ^3_1H \longrightarrow ^4_2H + ^1_0n + \Delta E$$

(i) Calculate the energy ΔE that is released.
(ii) Given that the mass of mole of deuterium is 2.0g, how much energy is released per kilogram of deuterium fuel?

$$mass\ of\ ^2_1H = 3.345 \times 10^{-27} kg$$
$$mass\ of\ ^3_1H = 5.008 \times 10^{-27} kg$$
$$mass\ of\ ^4_2He = 6.647 \times 10^{-27} kg$$
$$mass\ of\ ^1_0n = 1.675 \times 10^{-27}$$
$$Avogadro's\ number = 6.02 \times 10^{23} mol^{-1}$$
$$Speed\ of\ light = 3.0 \times 10^8 ms^{-1}$$

OR 10(d),(e),(f)

10. (d) Describe an experiment to demonstrate ohms law.
(e) Explain the difference between
(i) Ohmic and non-ohmic materials
(ii) Electromotive force (emf) and potential difference.
(f) Determine
(i) The currents $I_1, I_2, and\ I_3$ in figure 6.
(ii) The potential difference between A and B.

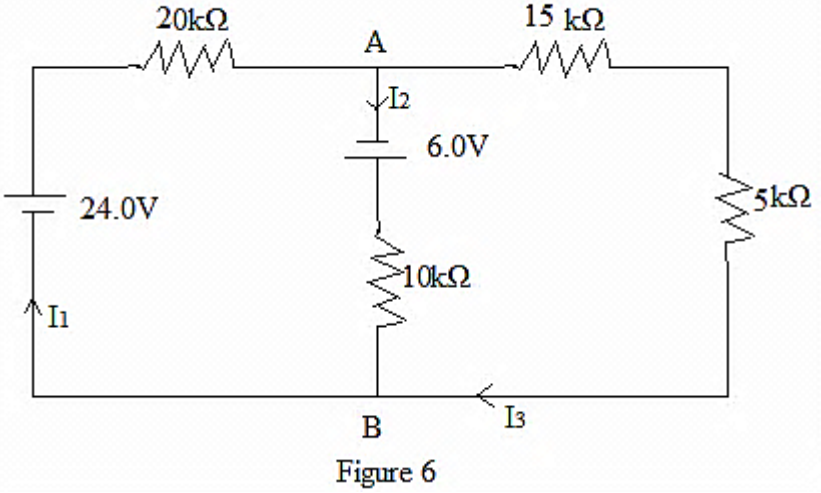

Figure 6