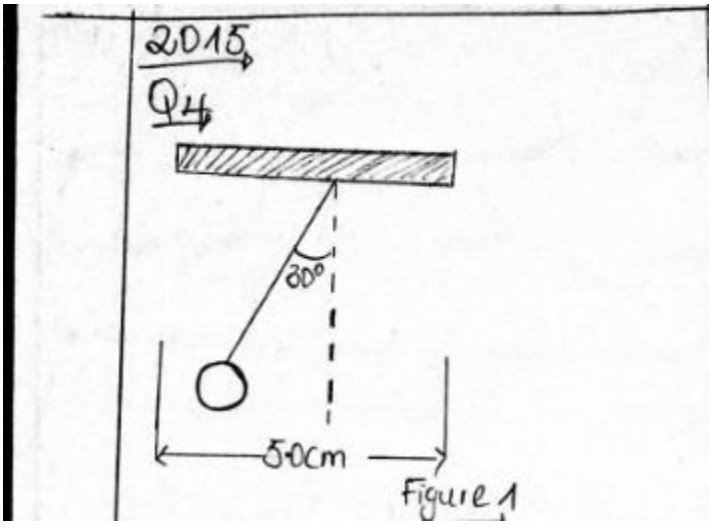
JUNE 2015
SECTION I
1. (a) What is homogeneous equation?
(b) The equation P + hgp + pv2 = k is homogeneous, where P is the pressure, h is the depth, g is the acceleration due to gravity, v the velocity and k is a constant . Determine the base units of k.

(6 marks)

2. A girl swings a stone of mass 100 g at the end of a string in a horizontal circle of diameter 80.0 cm above her head. Her friend observing the action sees a shadow of the notion of the stone on a nearby wall and notice that the stone makes 150 revolutions in 5 minutes. Calculate,
(a) The frequency of the motion
(b) the centripetal force on the stone
(c) Sketch a distance- time graph for this motion of the shadow for two cycles. (6 marks)

3. A quantity of steam at 1000c is passed into a 1.5 kg of pure melting ice in a highly insulated calorimeter so that the heat given out by the steam in condensing is just enough to melt the ice. Determine:
(a) The quantity of steam passed into the ice
(b) The equilibrium temperature attained by the mixture (6 marks)

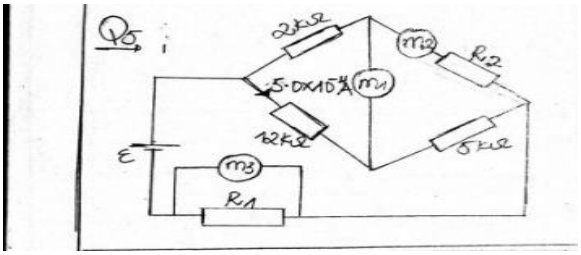
4. Figure 1 shows a small piece of spherical charged metal bob 50 g which is initially hangs vertically between two conducting plates. When a potential difference of 12.0 V is maintained across the plates the thread makes an inclined of 300 to the vertical.



(a) Draw a free body diagram of the bob when the pd is applied
(b) Determine the charge on the bob
(5 marks)

5. Figure 2 shows how resistor may be connected in an electrical circuit. The bridge circuit is balanced when the voltmeter M2 reads 3.0 V.

Determine the



(a) readings of M1 and M2

(b) resistances R1 and R2 and E

ANSWER EITHER a, b and c or d, e and f

6. (a) (i) what is meant by a coherence light source

(2 marks)

(ii) describe how you can determine the wave length of a monochromatic light using Young's double slits. Your account should include a diagram , observation, precautions and how you will use your observation to reach a conclusion

(8 marks)

(b) a car sounding an alarm at a frequency 512Hz is approaching a stationary listener at a speed of 8 m/s.

(i)Explain why the listener has the impression that the frequency of the sound heard is varying.

(2 marks)

(ii) What is the apparent frequency of the horn as perceived by the listener? (3 marks)

(c) An object is placed 20.0cm from a thin convex lens and then a thin concave lens of focal distance 10.0 cm and perpendicularly to the principal axis in each case. Use either ray diagram or otherwise to distinguish between the images obtained in each case when the object is brightly illuminated such that light rays from the object reach the lens parallel to the principal axis.

(5 marks)

OR

d(i) Explain what is meant by a material is elastic? (2 marks)

(ii) Describe an experiment to determine Young's modulus for a copper wire. Your account should include a diagram , observations, precautions , conclusion.

(8 marks)

(e) A toy having a plastic head resting on one end a light string is stretched as shown in figure 3.

(i) Explain why there is a change in the gradient of the graph at E?

(ii) Calculate the maximum elastic potential energy of the toy-spring system

(ii) Explain what happens to the energy of the system when the load is removed and the spring regains it's original length?

(f) The kinetic theory of matter describes the behavior of a gas in terms of the properties of the molecules.

Use this theory to explain
(i) Why a gas in container at room temperature exerts pressure on the walls of the container
(ii) Why the pressure increases while more of the same gas is introduced into the same container at the same temperature

SECTION II
DATA ANALYSIS
7An experiment was performed to investigate how the resistance of the material of a wire varies with the temperature. The following data was recorded

Resistance/ohm	Temperature/^{0} c
330.0	10
340.0	20
350.0	30
360.0	40
370.0	50
380.0	60
389.0	70
400.0	80
410.0	85

Theory suggests that the resistance of the wire is related to the temperature by the expression $R=R_0(1+\beta\emptyset)$ where R_0 is the resistance at a temperature of 0^0c and $\emptyset$ is the temperature and β is a constant
(a)Plot a suitable graph from which β and R_0 could be obtained (8 marks)
(b) Use the graph to determine the value of β and R_0 (9 marks)
(c) Say whether the material is a conductor or semiconductor (2 marks)

SECTION III
OPTIONS
ENERGY RESOURCES AND ENVIRONMENTAL PHYSICS

8 (a) State two advantages of nuclear fusion over nuclear fission as sources of energy (2 marks)
(b) Biomass, solar energy and hydroelectricity are some energy sources from which functional energy can be obtained
(i) what is meant by functional energy.
(ii) Choose any two of the above sources and briefly explain how functional could obtained from them in Cameroon
(5 marks)
(c) The power derived from a wind mill is given the equation $P= \rho Av^3/2$
Where ρ is the average air density, A is the area of the blades and v is average wind speed . One such aero-generator has a blade of diameter 6.0 m. Given that the efficiency of the system is 25% at a wind speed of 13.5 m/s
(i) Calculate the power output of the aero-generato.r Assume the density of the air to be 1.2 kgm^{-3}
(3 marks)
(ii) while is the efficiency of the system less than 100%? (2 marks)
(d) (i) name a substance which responsible for the depletion of the ozone layer (1 mark)
(ii) State an explain the impact of the depletion of the ozone layer on the environment (2 marks)

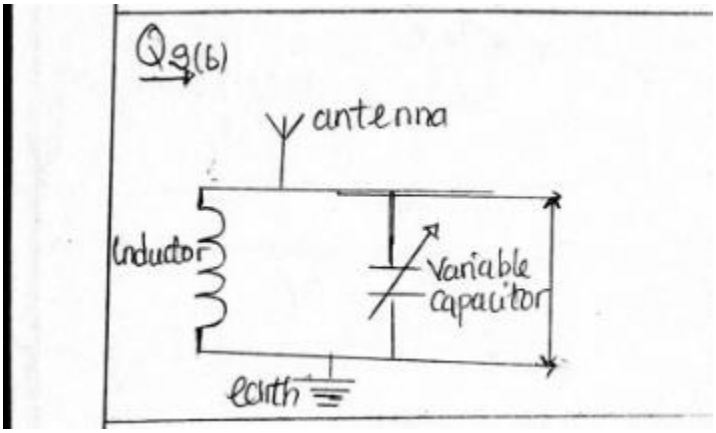
COMMUMICATION

9 (a) A radio station uses a carrier of frequency 200 KHz to transmit **AM** wave.The transmission consists of audio signals within frequency range 50Hz-90Hz

(i) Explain the meaning of the word of the bolded phrase

(ii) Calculate the minimum and the maximum frequency sidebands and bandwidth (4 marks)

(b) Figure 4 shows a simple turning radio circuit



(i) Explain how the turning circuit functions

(ii)Given that the coil has an inductance of 4.0 mH, calculate the value of the capacitance required to tune into the broadcast described in 9(a) above

(4 marks)

(iii) What is the use of the decoder in this circuit

(2 marks)

(c) (i)State three advantages which digital transmission has over analogue transmission

(ii) Explain how several telephone conversation can be transmitted at the same time along a single optical fibre (5 marks)

ELECTRONICS

10 (a) (i)What is meant by thermionic emission? (2 marks)

(ii) distinguish between n-type and p-type semiconductors (2 marks)

(b) you are given two electronic circuit of :

(i) A resistor of 500 Ω and a capacitor connected in series to 9.0 V dc supply

(ii) An inductor and a resistor of 500 Ω connected in series to 9.0 V dc supply

Sketch current-time graphs for these circuit and explain the differences between them (4 marks)

(c) (i) Explain how a transistor is used as a switch (4 marks)

(ii) state in words and in the form of truth table, the action of an Or logic gate with two inputs (3 marks)

MEDICAL PHYSICS

11 (a) (i) Draw a simple diagram of the human eye, showing clearly the parts which enable the eye to form an image of an object.
(3 marks)
(ii) Name any two eye defects, explaining how each defect manifest and explain how each defect may be corrected
(3 marks)
(b) X – rays and ultrasound are techniques used for parts of the human body.
(i) state one part of the body where each techniques would be suitable than the other (2 marks)
(ii) Explain why ultrasound is not likely to replace x- rays completely for medical diagnosis (3 marks)
(c) Explain how the magnetic resonance (MR) scanner produces a visual image of a cross-section of a part of the body of a patient under examination .
(4 marks)