THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

NOVEMBER 1997

031/2

PHYSICS PAPER 2

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

TIME: $2\frac{1}{2}$ Hours.

INSTRUCTIONS TO CANDIDATES

1. This paper consists of FIVE (5) questions.
2. Answer ALL questions in this paper.
3. Show ALL your working and ANSWERS CLEARLY in the Answer Book provided.
4. Where necessary you may use the following constants:

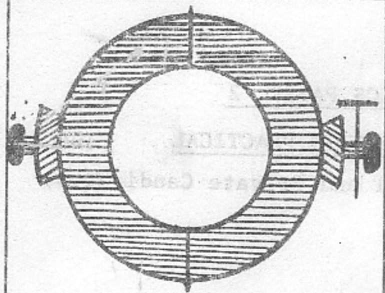
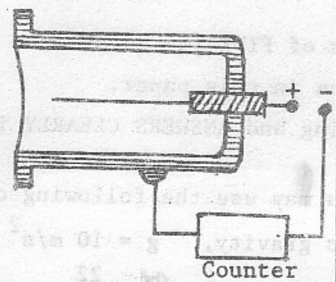
   Acceleration due to gravity, $g = 10\ m/s^2$

   $\pi = \frac{22}{7}$

   The velocity of electromagnetic waves, $c = 3.0 \times 10^8 m/s$.

This paper consists of 6 printed pages.

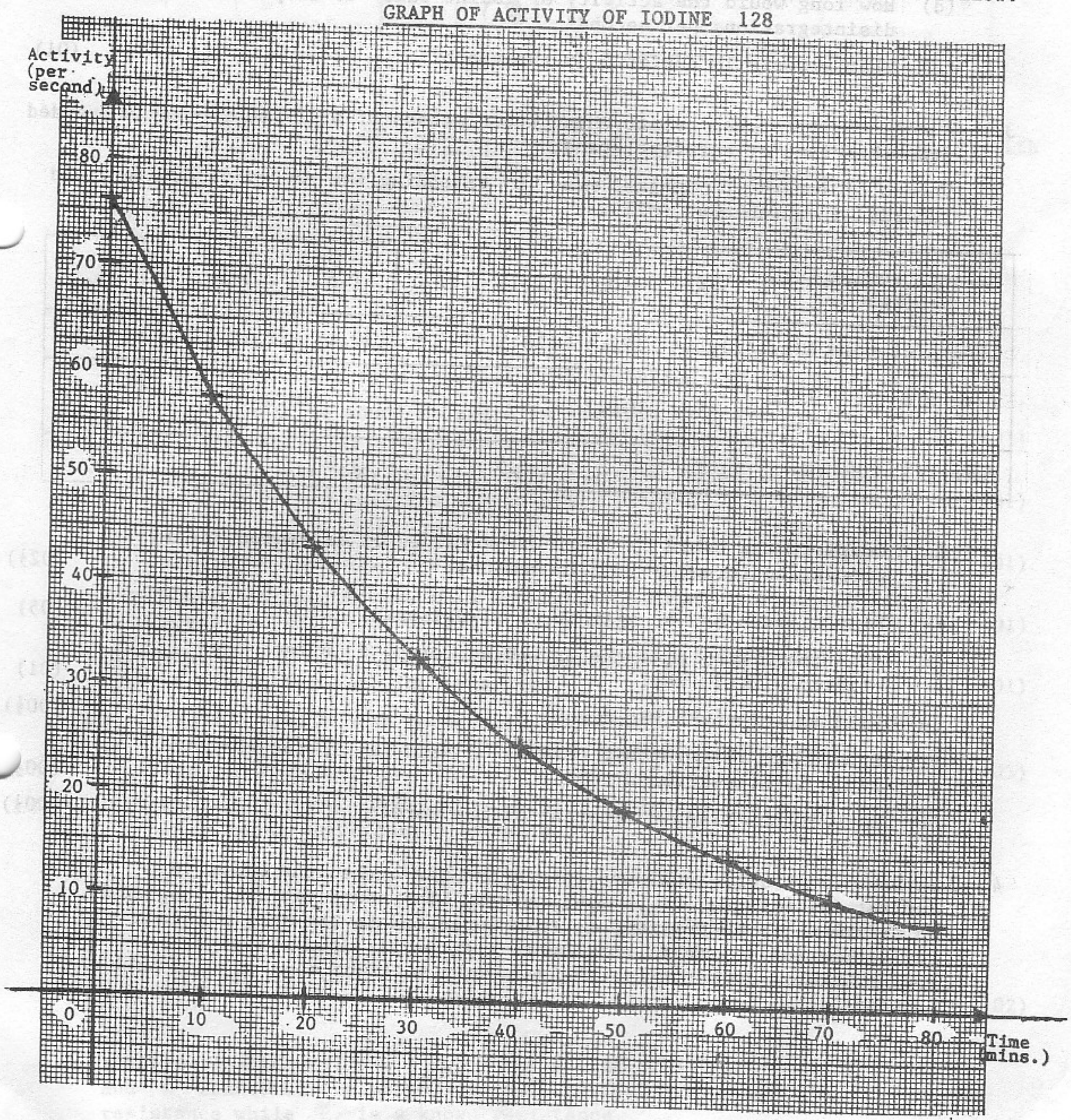
1. Fill in the gaps with the correct response. (10)

Name of device	Sketch	Physical Effects or Principles
(a)		
(b)		
(c) Eureka can/ Overflow can		
(d)		A liquid finds its own level.

Name of device	Sketch	Physical Effects or Principles
(e) Maximum and minimum thermometer		

2. Referring to the graph drawn here under, answer the questions which follow:

GRAPH OF ACTIVITY OF IODINE 128



(a) Deduce the (initial) activity of Iodine 128 when time was zero. (02)

(b) Find the time taken for the activity to drop from:

(i) 60 to 30 disintegrations per second

(ii) 40 to 20 disintegrations per second. (03)

(c) What is the half life of iodine 128? (02)

(d) How long would the activity of iodine take to drop from 300 to 75 disintegrations per second? (02)

(e) What process is depicted by the graph? (01)

3. A cord was stretched by attaching known masses of brass to it when suspended from the clamp of a retort stand.

Values of length L against mass M extending the cord were obtained and recorded in a table as follows:

Mass extending cord M(kg)	0	0.5	0.75	1.0	1.5	2.5	3.0	4.5
Length of cord L(cms)	126.4	127.6	128.3	128.9	130.1	132.5	133.8	137.5
Extension, e = L-Lo (m)	0	0.012				0.061		
Force, F = Mg (N)	0		7.5		15.0			

(a) Complete the table by filling the values of extension, e in metres and force, F = Mg in newtons. (02½)

(b) Plot a graph of F against e (horizontal axis). (05)

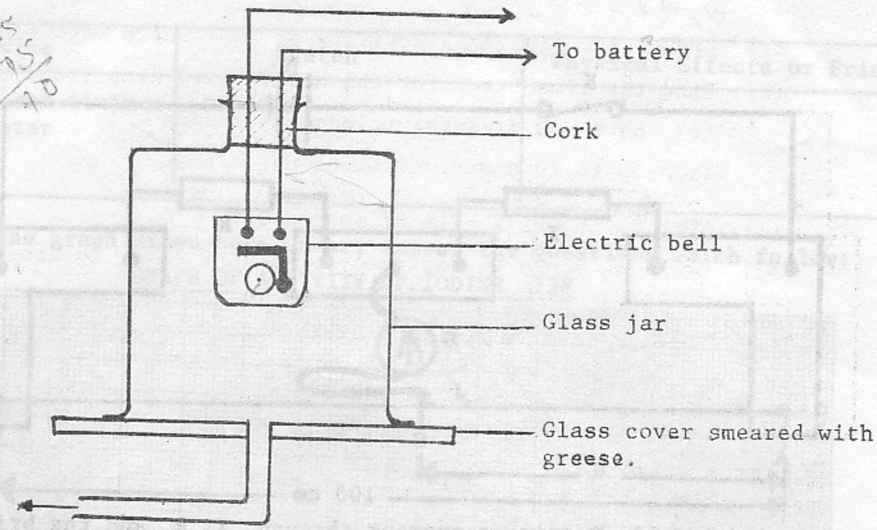
(c) From the graph, does the extending force, F exceed the elastic limit? Why? (01)

(d) Find the slope of the graph. (00½)

(e) Deduce the relationship between F and e if the elastic limit is not exceeded. (00½)

(f) What is the elastic constant of the cord? (00½)

4. An electric bell is enclosed in a glass jar. When the electric current is switched on, the bell rings. The sound can easily be heard in the room. A vacuum pump is then connected to the jar. The air inside the jar is sucked out. When all the air inside the jar is gone and there is vacuum in the jar, only a slight sound of the bell can be heard.



Write an account for this experiment by answering the following questions:

(a) Why cann't the sound be heard in the room when there is no air in the jar? (01)

(b) If you cannot hear the bell when there is vacuum in the jar, how can you be sure that it is still ringing? (01)

(c) A slight sound of ringing can be heard even when there is a vacuum in the jar. Explain how this happens. (01)

(d) How would you improve this apparatus to make it less easy for sound to pass from the bell to the jar? (01)

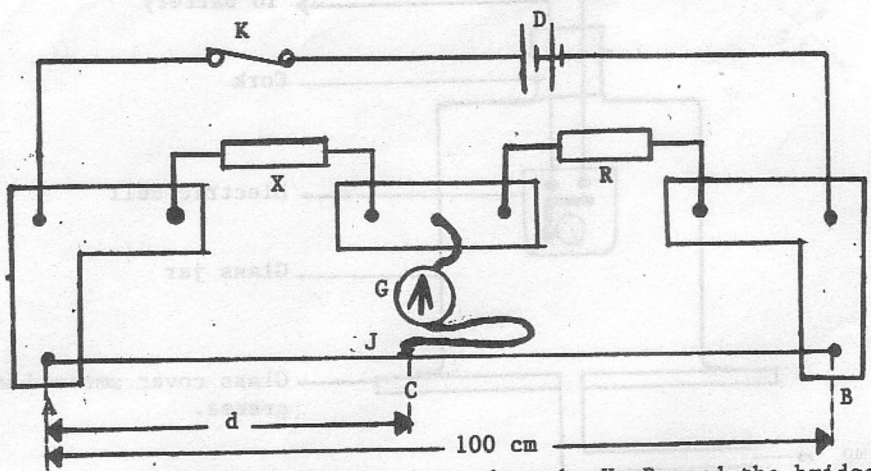
(e) What do you expect to hear when the pump is disconnected and air is slowly let back into the jar? (01)

(f) Can two people hear each other speak while they are on the Moon or some other place in space where there is no atmosphere? How can they make it possible to speak to each other? (03)

Explain why the alternative mode of communication works in an environment which has no atmosphere.

(g) The distance between Mars and Earth is about 2,100,000,000 km. When the American Astronauts were orbiting around Mars early June 1997, they could communicate straight with their counterparts stationed at PASADENA, (NASA centre) in California. How long does it take to transmit a radio signal from MARS to NASA centre? (02)

5. The figure which follows shows a metre bridge with two resistances X and R connected for comparison purposes. X is an unknown resistance while R is a known resistance.



The dry cells D drive a current through X, R and the bridge wire AB. K is a switch, G and J are respectively a galvanometer and jockey.

A balance point C is found for different Values of resistance R. Values of length d = AC were recorded for corresponding values of R as shown in the table which follows:

R (Ω)	1	2	5	7	8
d (cm)	75	60	37.5	30	27.3
$\frac{100}{d}$					

(a) Complete the table by calculating the values of $\frac{100}{d}$ (02$\frac{1}{2}$)

(b) Plot a graph of R against $\frac{100}{d}$ (horizontal). (05)

(c) Find the slope S of the graph. (00$\frac{1}{2}$)

(d) Determine the intercept, Ro on the R axis. (00$\frac{1}{2}$)

(e) Deduce the value of X (01)

(f) Suggest a suitable title for this experiment. (00$\frac{1}{2}$)