THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2

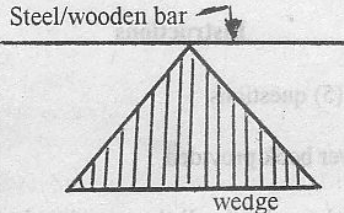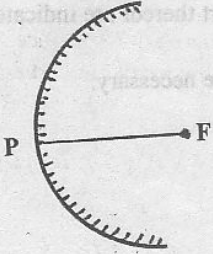**PHYSICS PAPER 2**
ALTERNATIVE TO PRACTICAL

TIME: 2½ hours

22 January 1999 A.M.

Instructions

1. Candidates must answer ALL FIVE (5) questions

2. Write ALL your answers in the answer book provided

3. Wherever calculations are involved, show clearly all the steps involved

4. The marks allocated to each question or part thereof are indicated in brackets

5. The following constants may be used where necessary:
   Acceleration due to gravity, g = 9.8 m/s²
   $$\pi = \frac{22}{7}$$

1. Fill in the gaps with the correct response.

Name of device	Sketch	(i) Physical effects/ Principle (ii) Application (uses)	
(a) Micrometer screw gauge		(i) (ii)	(02)
(b) ……………………………	Steel/wooden bar wedge	(i) (ii)	(02)
(c) ……………………………	P F	(i) (ii)	(02)
(d) Galvanometer		(i) (ii)	(
(e) Geiger Muller Tube		(i) (ii)	(02)

2. A 360 W electrical heater and a thermometer were immersed in 1.0 litre of pure water in a copper calorimeter. Using a stop watch, the temperature was recorded against time and tabulated as shown below:

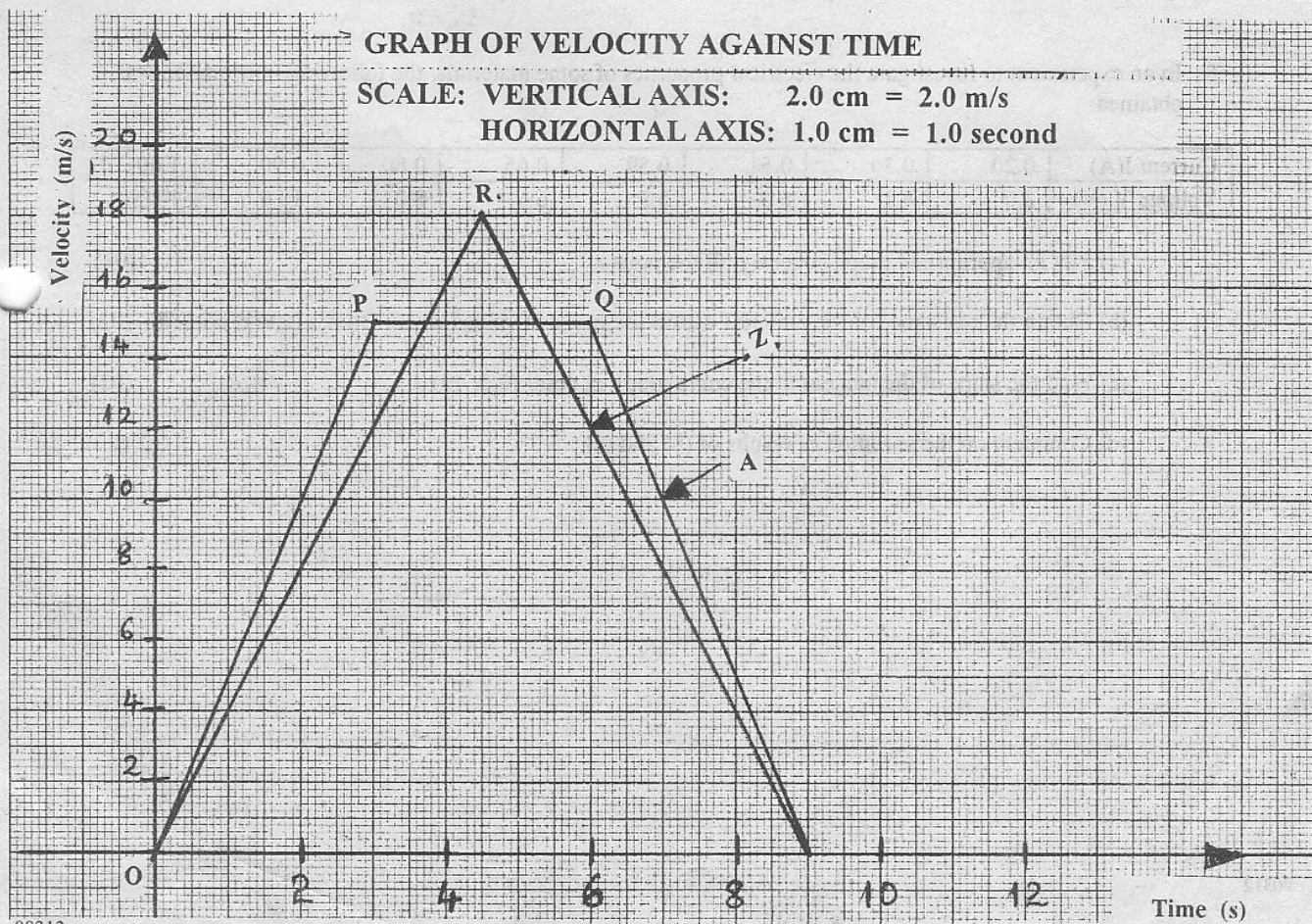| Temperature (^{0}C)	30	35	40	45	50	55	60
Time (s)	180	240	300	360	420	480	540

(a) Plot a graph of temperature (vertical axis) against time (horizontal axis). Make sure that both axes start at the origin.   (04)

(b) From the graph, find the temperature when time was 0s (Zero Second).   (00½)

(c) What is the room temperature?   (00½)

(d) Find the slope, S of the graph.   (02)

(e) If the specific heat capacity of water C_w is given by the equation:

C_w = Power supplied by heater
⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯
m_wS

where m_w is the mass of water, determine the specific heat capacity of water.

(f) (i) Give one reason why the value of the specific heat capacity obtained is greater than the expected value.
(ii) State one precaution you would take when carrying out this experiment.   (01)

3. Two sprinters, Ali and Zeph, were competing in a 100m race. Both athletes started running from their starting points when a pistol was fired. Using graphs A and Z for the motion of Ali and Zeph respectively, answer the questions which follow.

GRAPH OF VELOCITY AGAINST TIME

SCALE: VERTICAL AXIS: 2.0 cm = 2.0 m/s
          HORIZONTAL AXIS: 1.0 cm = 1.0 second

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(a) Find the acceleration of the motion of Ali and that of Zeph during the first 2 seconds. (02)

(b) What is the physical significance of: (i) Point R and (ii) Portion PQ? (02)

(c) Find the deceleration of each of the motions of Ali and Zeph during the last 3 seconds before each stopped moving. (02)

(d) If both Ali and Zeph stopped moving after 9.0 seconds from the start, how far is each sprinter from the starting point? (02)

(e) Discuss briefly the energy changes which took place during Ali's motion. (02)

4. The count rate for a radioactive sample was recorded using a GM counter for a number of days and the results were tabulated as follows:-

Time (days)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5
Count rate (counts per second)	200	150	120	95	75	64	53	45	36	30	26	23	18	15	13	12

(a) Plot a curve of count rate/activity (counts/s), against time (days). (05)

(b) Use the curve plotted to find the half-life of the radioactive sample. (03)

(c) Write an equation of the process represented by the graph. (02)

5. In an experiment to investigate the electrical properties of some materials, the following information was obtained.

Current I(A)	0.20	0.39	0.51	0.59	0.65	0.80	0.90	1.00
Voltage V (V)	2.0	4.1	5.0	5.9	6.6	8.0	10.0	13.0

(a) Plot an appropriate graph covering all the points. (04)

(b) Obtain the resistance of the material within the range of values where Ohm's Law is obeyed. (02)

(c) Find the slope of the tangent to the curve/graph at point (0.9, 10). (02)

(d) Comment on the variation of results of (b) and (c). (02)