Name: ..... adm no: .....

Date.....Signature.....

ALLIANCE HIGH SCHOOL
END OF YEAR PHYSICS FORM 3 2015 EXAMINTION
2½ hours

Kenya Certificate of secondary Education

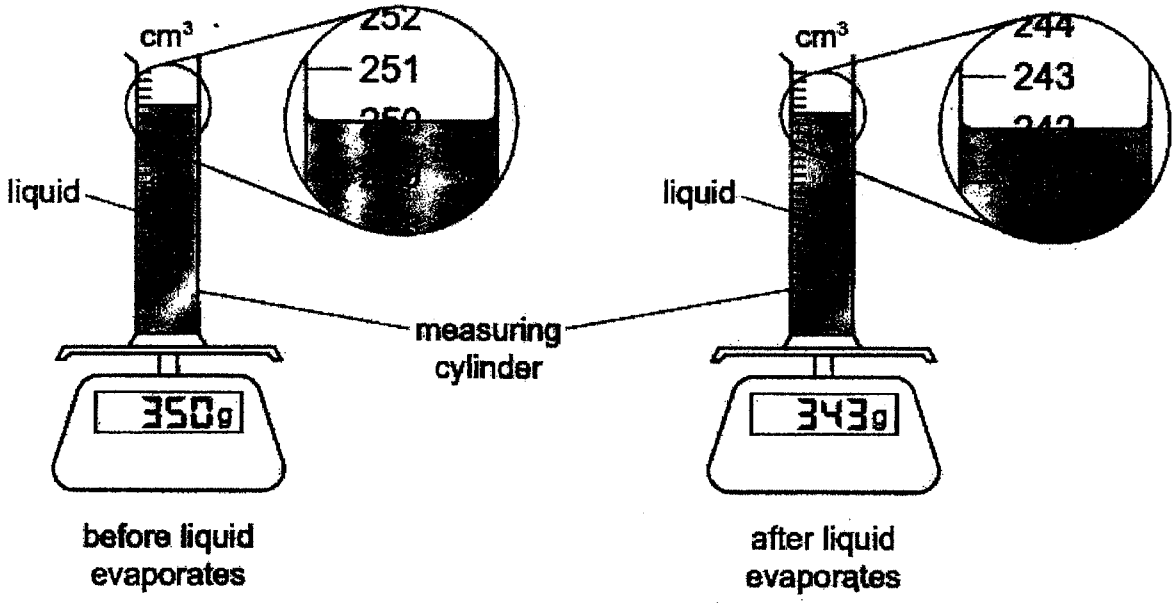
(a)Write your name, index number and class in the spaces provided above.
(b) Sign and write the date of examination in the spaces provided above
(c).This paper consists of **THREE** Sections: **A, B** and **C.**
(d) Answer **ALL** the questions in section **A, B** and **C** in the spaces provided.
(e).ALL working **MUST** be clearly shown.
(f).Mathematical tables and non programmable silent electronic calculators may be used.
(g)This paper consists of 14 printed pages
(h) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

FOR EXAMINER'S USE ONLY

Section	Question	Maximum Score	Candidate's Score
A		58	
B		28	
C		14	
	Total Score	100	

SECTION A: 58 marks

1. A measuring cylinder containing liquid is placed on a top-pan balance. The apparatus is left overnight and some of the liquid evaporates. The diagrams show the readings.



Determine the density of the liquid (3marks)

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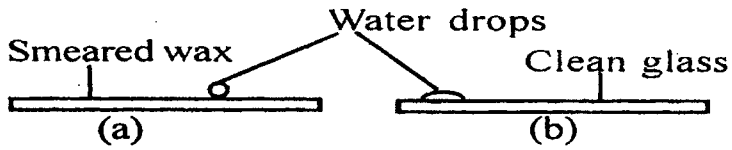
2. The figure below shows water drops on two surfaces. In (a) the glass surface is smeared with wax while in (b) the glass surface is clean.



Explain the difference in the shapes of the drops. (2marks)

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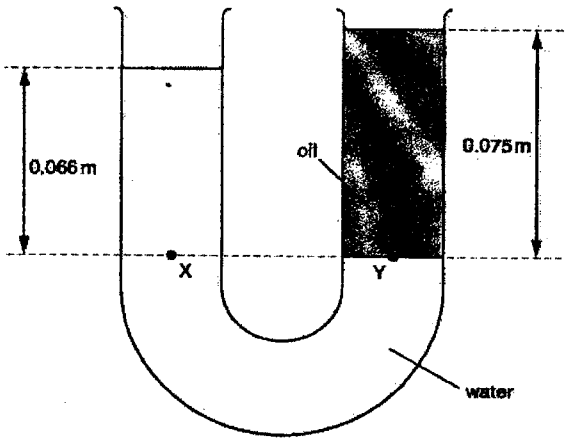
3. A U-shaped tube, of constant cross-sectional area, contains some water of density 1000 kg/m^3. Oil that does not mix with water is then poured into the right-hand side of the tube. The figure shows the levels of the water and the oil when equilibrium is reached



Points X and Y are at the same horizontal level. X is 0.066 m below the top surface of the water. Y is 0.075 m below the top surface of the oil. The pressure caused by 0.066 m of water at X is equal to that caused by 0.075 m of the oil at Y. Determine the density of the oil. (3marks)

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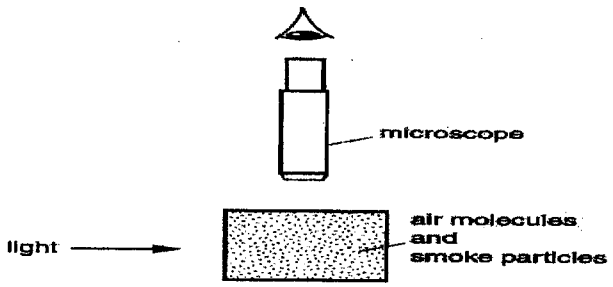
4. The apparatus in the figure is being used to view the movement of some smoke particles trapped in a box.



Describe what is seen when the smoke is viewed through the microscope. (1mark)

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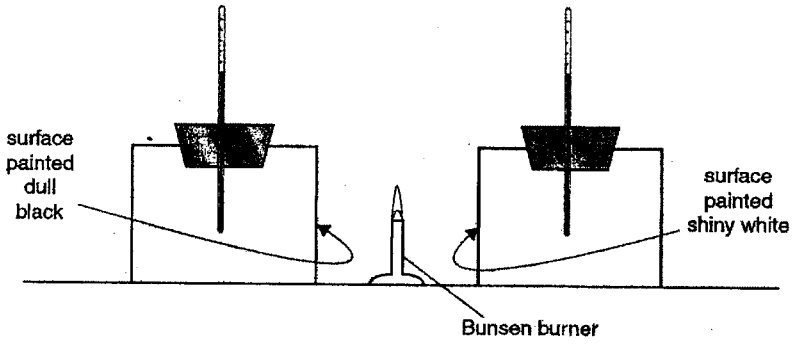
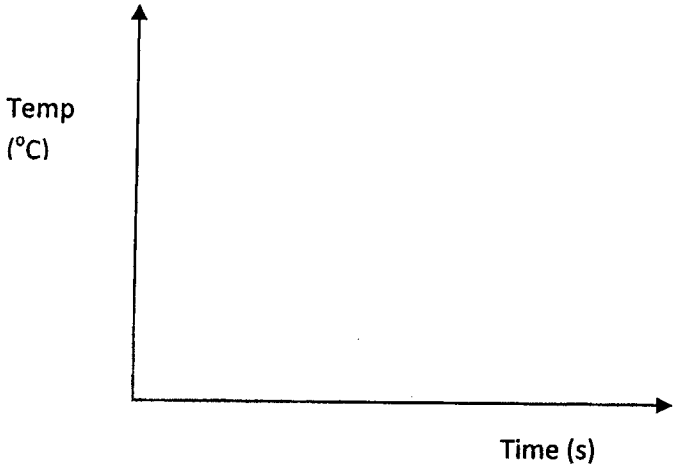
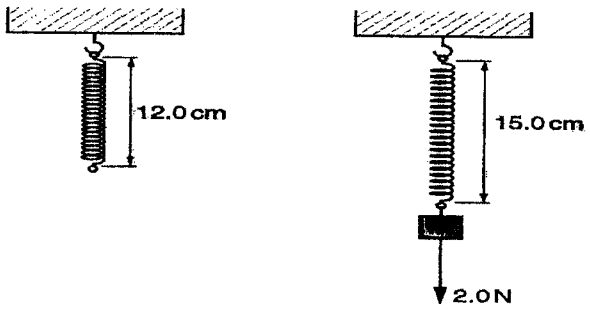
5. The figure below shows some apparatus designed to compare the ability of two surfaces to absorb infra-red radiation



The containers, which are identical, are painted on the outside. One is dull black, the other is shiny white. Both are filled with water, initially at the same temperature. A Bunsen burner is placed equidistant between the cans as shown and left on for 30min.On the axes below sketch graphs to show the variation of temperature with time for the two surfaces (2marks)



6. A student hangs a spring vertically from a hook, as shown in Figure below.



With no load, the spring is 12.0 cm long. With a load of 2.0 N on the end of the spring, its length is 15.0 cm. Calculate the spring constant (3 marks)

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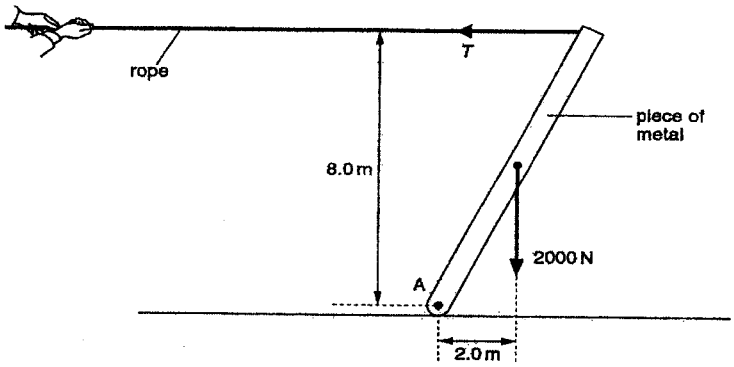
7. The figure below shows a system for raising a heavy piece of metal into a vertical position.



A man pulls on the rope with a horizontal force T. The piece of metal has a weight of 2000 N and is freely pivoted at A. The system is in equilibrium. By taking moments about A, calculate T. (3 marks)

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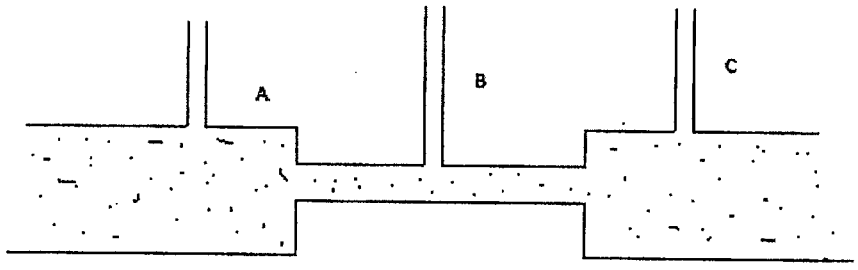
8. The figure below shows water flowing through a pipe of varying cross sectional area.



On the diagram show the water levels in the arms A, B, and C. (3 marks)

9. A horizontal force of 24N is applied on a wooden block of mass 4kg placed on a horizontal surface. The frictional force between the block and the surface is 4N. Determine the acceleration of the block. (3 marks)

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10. An oil drop of volume $0.15mm^3$ forms a film of an approximate radius of 14cm when dropped on the surface of water. Calculate the thickness of the oil film. (3marks)

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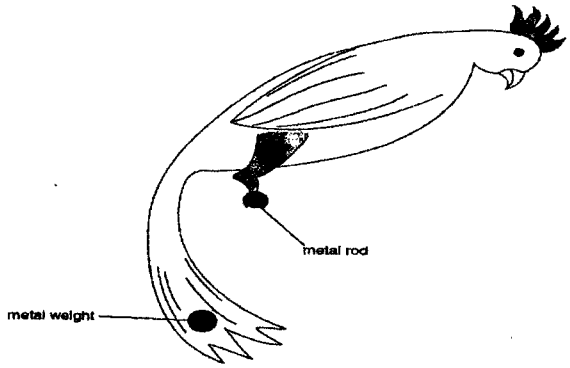
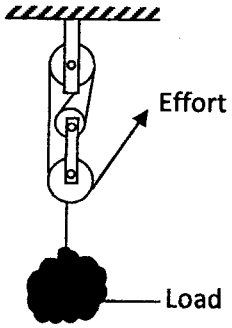
11. The figure below shows a child's toy. It is made out of wood, in the shape of a bird. The toy includes a metal weight stuck to the tail. When placed on a metal rod, the toy balances in equilibrium.



On the figure mark with the letter X a possible position for the centre of gravity of the toy (1mark)

12. The figure shows a pulley system.



i) State the velocity ratio of the machine. (1mark)

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ii) Explain what happens to the mechanical advantage of the machine as the load is increased gradually. (1mark)

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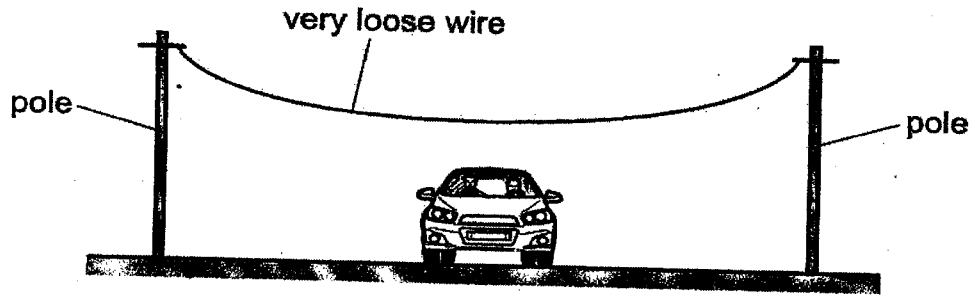
13. A telephone engineer connects a wire between two poles when the weather is very cold.

He makes the wire very loose. The wire passes over a road.



The weather changes and it becomes very hot. What could happen to the wire and why? (1mark)

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14.a) Two gear wheels have 80 teeth(driven) and 20 teeth (driving) and lock with each other. They are fastened on axles of equal diameters such that a weight of 150N attached to a string round one axle will just raise 450N on the other axle. Calculate

(i) M.A

(3 marks)

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(ii) V.R

(3 marks)

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(iii) Efficiency of the machine

(3 marks

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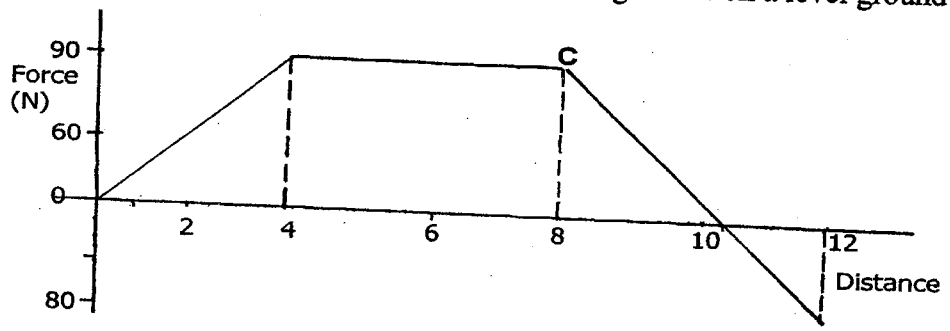
(b). Figure below shows a force distance graph for a car being towed on a level ground



Calculate the total work done (3 marks)

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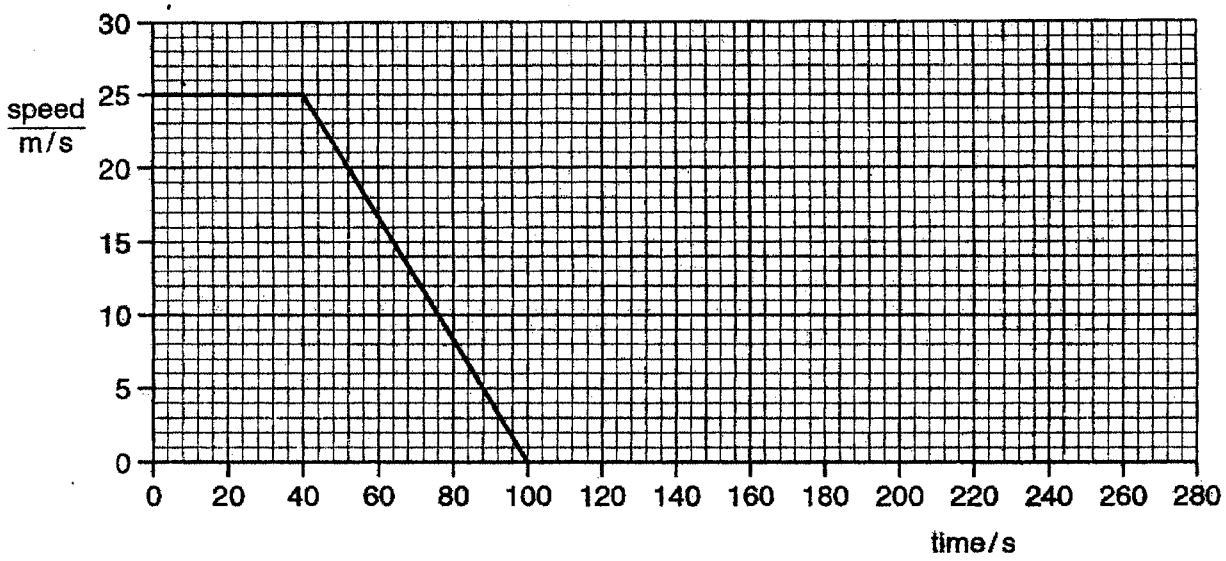
15.(a) The figure below shows a graph of speed against time for a train. After 100 s the train stops at a station.



(i).For the time interval between 0 s and 100 s, calculate the distance travelled by the train.(3mks)

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(ii) The train stops for 80 s, then accelerates to 30 m / s with an acceleration of 0.60 m /s^2. It then travels at constant speed. Complete the graph for the interval 100 s to 280 s, (1mark)

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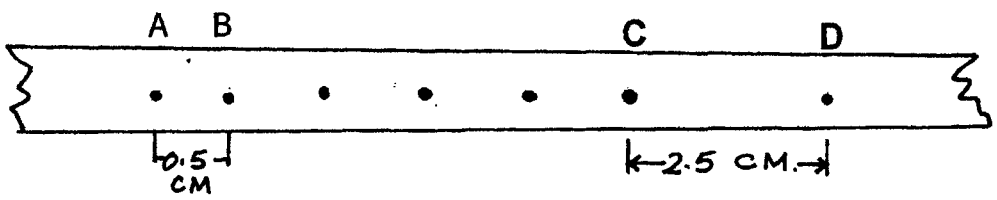
(b).The figure below shows the motion of a trolley on a ticker timer. The ticker has frequency of 50HZ



Calculate the acceleration of the trolley during the motion (3marks)

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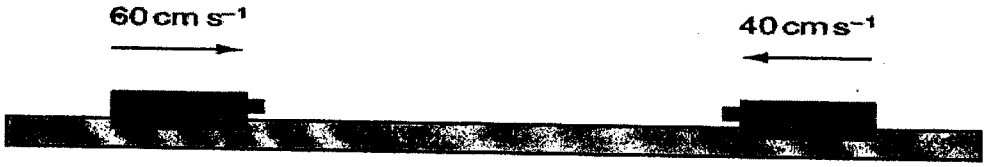
(c).Two equal masses travel towards each other on a frictionless air track at speeds of 60 cm s^{-1} and 40 cm s^{-1}. They stick together on impact.



Determine the velocity of the masses after impact (3 mark

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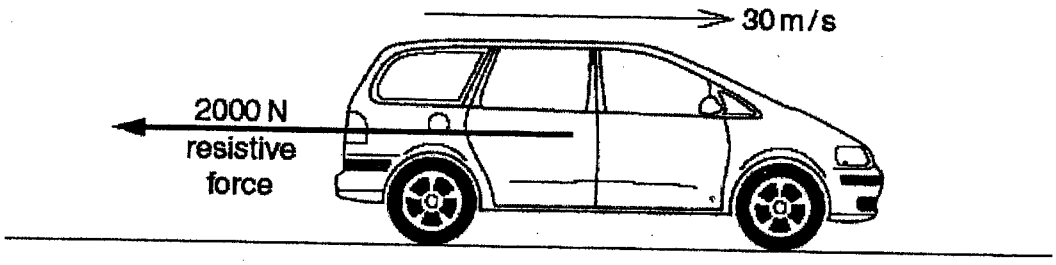
(d).A car of mass 900 kg is travelling at a steady speed of 30 m / s against a resistive force of 2000 N, as illustrated in the figure.



(i) Calculate the kinetic energy of the car. (3 marks)

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(ii) What is the minimum power that the car engine has to deliver to the wheels (3marks)

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16.(a) A gas occupies a volume of 4000 litres at a temperature of 37^0C and normal atmospheric pressure. Determine the new volume of the gas if it heated at constant pressure to a temperature of 67^0C (normal atmospheric pressure P= 1.01 x 10^5 Pa) (3marks)

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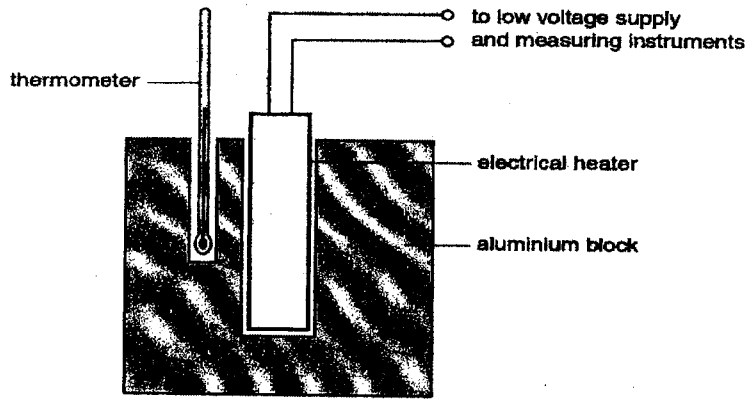
(b).A student in a laboratory uses the apparatus shown below to determine the specific heat capacity of aluminum.



The readings obtained in the experiment are given below.
Mass of aluminum block = 0.930 kg
Initial temperature of block = 13.1 °C
Final temperature of block = 41.3 °C
Electrical energy supplied = 23 800 J
(c).Use the readings above to calculate the specific heat capacity of aluminum. (3marks)

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SECTION B (28 marks)

17. You are provided with two iron bars X and Y one is magnetized and the other is not. **Explain** how you would identify the magnetized bar. (2marks)

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18. A ray of white light is incident on a triangular glass prism. **Draw** a ray diagram to illustrate the dispersion of white light by prism. Show red and violet rays. (2 marks)

19. Calculate the critical angle for material whose refractive index is 1.4. (3 marks)

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20. State and explain the observation made on a positively charged gold leaf electroscope when a burning candle is brought near its cap. (2marks)

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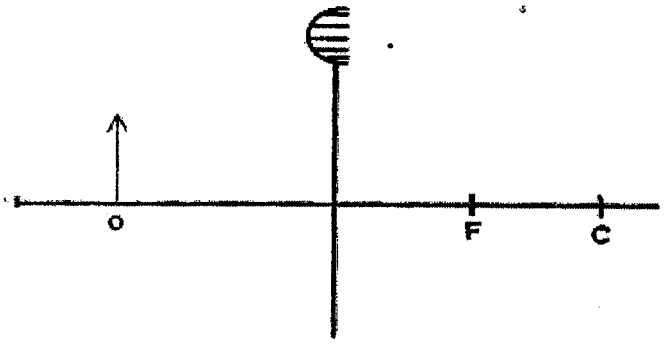
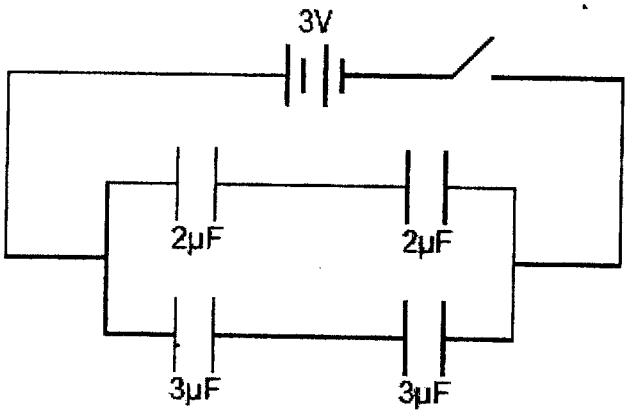
21. Figure below shows a vertical object O placed in front of a convex mirror.



On the same diagram **draw** the ray to locate the image formed. (2marks)

22. Four capacitors were connected in a circuit as shown in the figure below



. Determine (a) the effective capacitance of the combination of the capacitors when the switch is closed. (3marks)

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b) The quantity of charge in the capacitors when they are fully charged. (3 marks)

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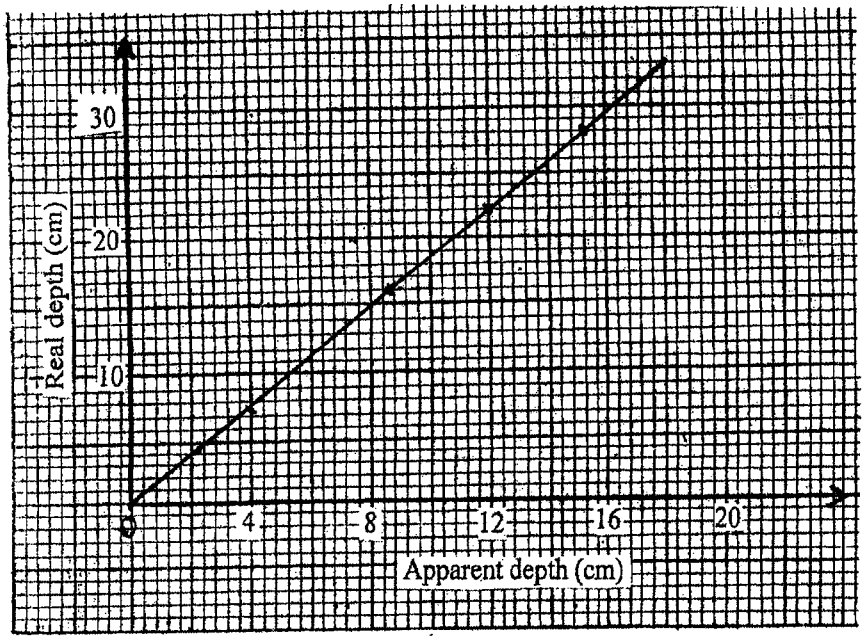
23. In an experiment to determine the refractive index of a material using real and apparent depth method, a graph of real depth against apparent depth was draw as shown below.



Use the graph to determine the refractive index of the material (3 marks)

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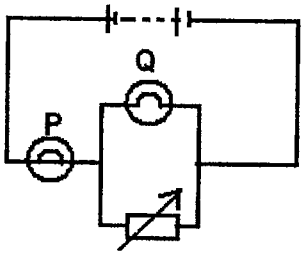
24. Figure below shows a circuit which contains a battery, a rheostat and two identical lamps. **State** and **explain** what will be observed to the brightness of the lamps if the resistance of the rheostat is increased. (1mark)



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25. (a) Distinguish between a transverse and a longitudinal wave (2marks)

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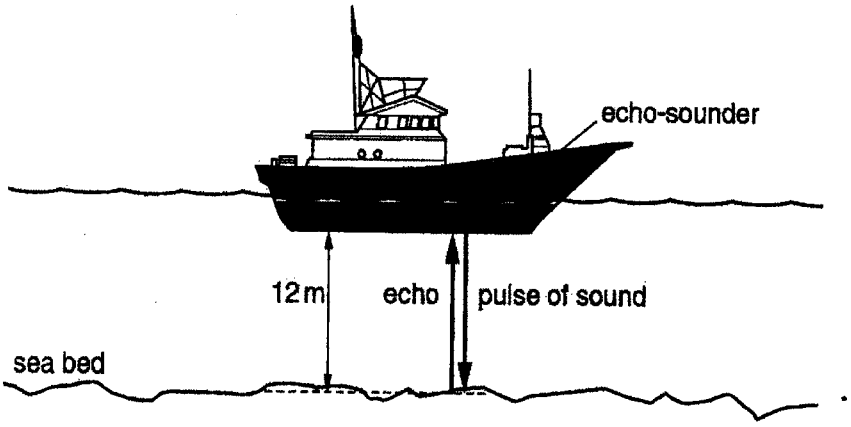
(b). An echo-sounder sends out a pulse of sound to determine the depth of the sea bed. It measures the time between sending out the pulse and receiving its echo. The **figure below** shows a boat using an echo-sounder.



The sea bed is 12 m below the echo-sounder. Given that the speed of sound in water is 1300m/s to calculate the time between the sending out of the pulse and receiving its echo. (3marks)

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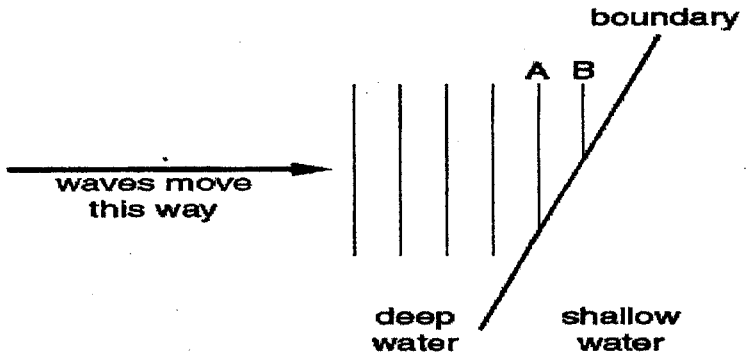
(c).The figure below shows identical waves moving towards the boundary at an angle.



On the figure, draw carefully the remainder of waves A and B, plus the two previous waves this reached the shallow water. (2marks)

SECTION C 14 mks

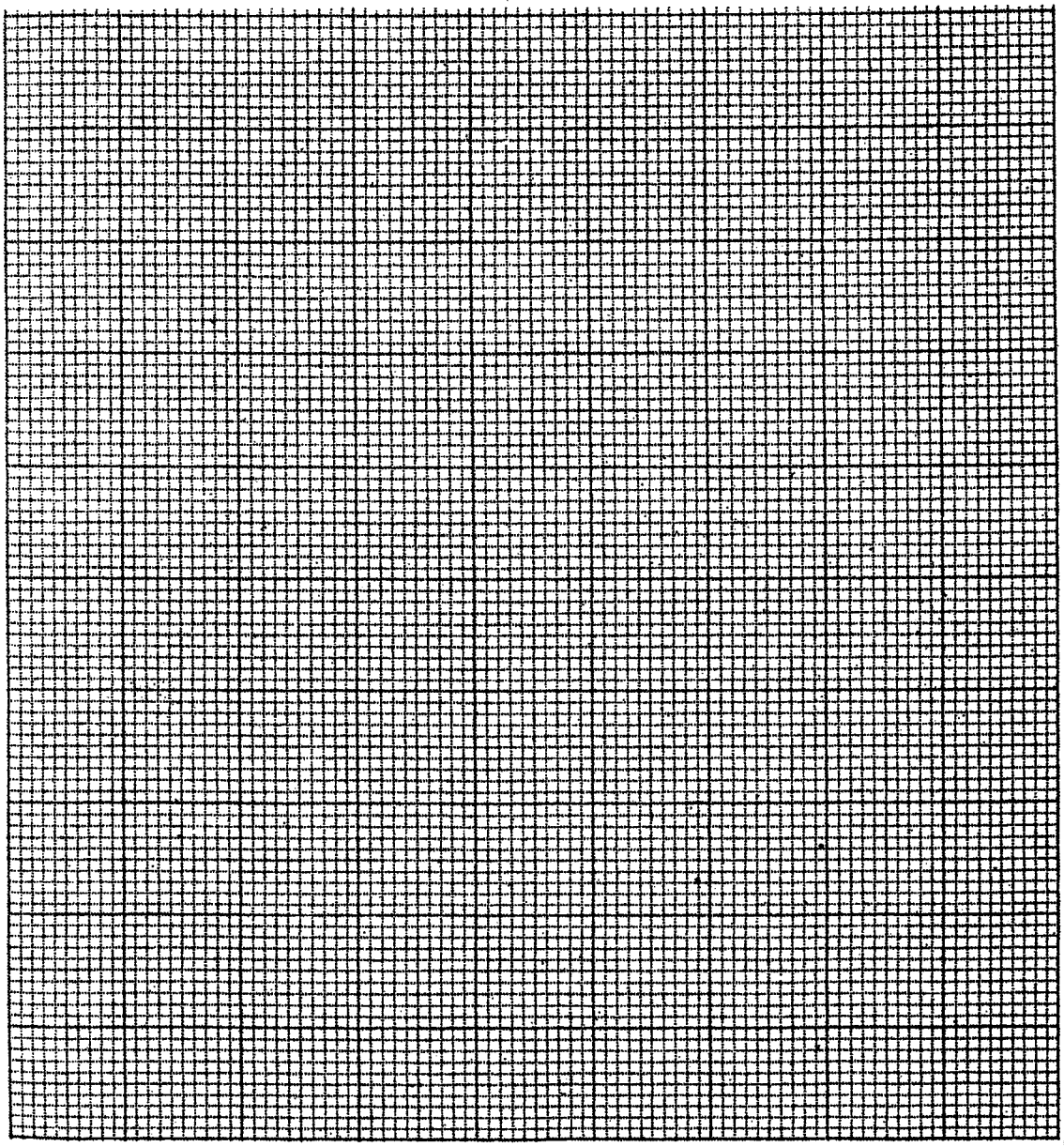
- The set up below was used determine the data in table complete the table.

Table 1

Distance d (cm)	70	60	50	40
time t for 20 oscillations (s)	**24.02**	**25.11**	**26.14**	**26.99**
Period $T = \frac{t}{20}$ (s)				
T^4 (s^4)				
d^2 (cm^2)				

(3mks)

(a)(i) Plot a graph of T^4 (y-axis) against d^2 (5mks)



(ii) Determine the slope S of the graph (3 mks)

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(iii) Given that $S = \frac{-4\pi^2}{K^2}$, determine the value of K (3 mks)

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