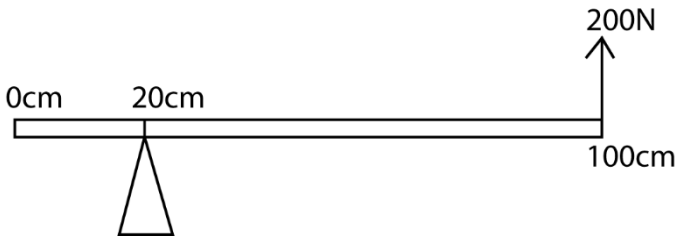
UCE physics 2014 paper 2

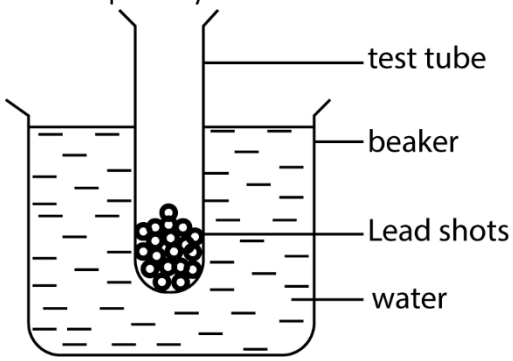
1. (a)(i) Define moment of force. (01mark)
   (ii) Describe a simple experiment to verify principle of moments. (05marks)
   (iii) A uniform metre rule is pivoted at 20cm mark as shown the figure below



When a force of 20oN acts on it at 100cm mark, the meter rule remains in a horizontal position. Find the weight of the meter rule. (03marks)

(b) State Archimedes principle. (03marks)

(c) A test tube is partially filled with lead shown in the figure below



The length of the tube submerged and the level of water in the beaker are noted.
State what happens to the length of the tube submerged and the level of water in the beaker when

(i) Some lead shots are removed from the test tube (02marks)

(ii) The temperature of water is increased. (02marks)

(d) Explain you observation in (c)(i) (02marks)

2. (a) (i) What is force? (01marks)
   (ii) State the units of force. (01mark)

(b) A block of wood is placed on a rough table and pulled horizontally using a string attached to it. Draw a labelled sketch diagram showing the forces acting on the block. (02marks)

(c) Describe an experiment to demonstrate surface tension in a liquid. (03marks)

(d) A parachutist falling with a constant vertical velocity of $16ms^{-1}$ is being blown by with horizontally at $12ms^{-1}$.

(i) Find the resultant velocity of the parachutist. (04marks)

(ii) if the parachutist jumps from a height of 500m directly above the ground target, find the horizontal distance by which the parachutist will miss the target on landing. (02marks)

(e) Explain why a ship of iron and steel floats on water. (03marks)

3. (a)(i)What is virtual image? (01mark)

(ii) Under what conditions is a virtual image formed by a concave mirror? (01marks)

(b) Describe how the focal length of a concave mirror can be determined. (04marks)

(c) An object 2.0cm tall is placed 8cm in front of a convex lens of focal length 12cm. construct a ray diagram to determine the

(i) position of the image (03marks)

(ii) magnification produced. (02marks)

(d)(i)What is meant by refractive index of a material? (01mark)

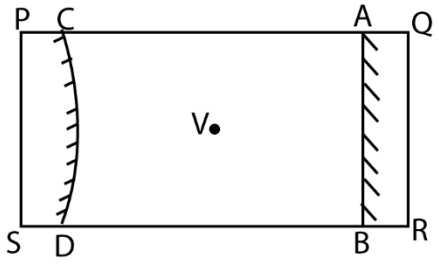
(ii) Explain how dispersion of white light takes place in a glass prism. (04marks)

4. (a) Define the Hertz as applied to waves. (01mark)

(b)(i) Explain what is meant by resonance. (02mark)

(ii) Describe an experiment to measure the speed of sound in air using a resonance tube. (05marks)

(c) The figure below shows a point vibrator, V, of frequency 30Hz used to produce water ripples of speed 60cms-1 in a ripple tank PQRS. If AB and Cd are straight and convex barrier respectively.



(i) Sketch wave forms showing the incident and reflected wave forms at the barriers. (03mark)

(ii) Find the distance between two successive crests of the wave produced by the vibrator. (03marks)

(d) (i) What is an echo? (01mark)

(ii) State one practical use of echoes. (03marks)

5. (a) Define specific latent heat of vaporization. (01mark)

(b) Describe how to determine the specific latent heat of vaporization of steam. (06marks)

(c) A copper calorimeter weighs 0.1kg when empty and 0.3kg when partially filled with water at 40^0C. a mass of 0.005kgof steam is passed into the calorimeter until a final steady

temperature is reached. Neglecting heat loses to the surrounding, calculate the final temperature of the calorimeter and its contents. (04marks)
(Specific latent heat of vaporization of steam = 2.26 x 106Jkg^{-1}; specific heat capacity of copper = 400Jkg^{-1}K^{-1})

(d)(i) What is saturated vapour? (01mark)

(ii)Use kinetic theory of matter to explain how evaporation causes cooling. (04marks)

6. (a) What is a volt? (01mark)

(b) A lamp is marked 240V, 60W. Explain what this means. (02marks)

(c) (i) Use a diagram to show how three identical cells, each of e.m.f 1.5V and internal resistance 0.1Ω can be arranged to give minimum e.m.f. (02marks)

(ii) Calculate the current flowing in the circuit of the arrangement in (c)(i), if two resistors of resistance 4Ω and 5Ω are included in series in the circuit. (06mark)

(d) (i) State any two sources of e.m.f. (01mark)

(ii) With the aid of a labelled diagram, describe how an accumulator can be charged fully. (04marks)

7. (a) What is meant by

(i) Magnetic saturation(01mark)

(ii) Magnetic screening (01mark)

(b) (i) Describe the domain theory of magnetism. (03mark)

(ii) Use the above theory to explain demagnetisation

(c) Draw magnetic field lines due to

(i) a bar magnet placed horizontally with its axis in the magnetic meridian and its north pole pointing south. (02marks)

(ii) a bar of unmagnetised iron placed along the axis of earth's field.

(d) (i) State how a galvanometer can be used to measure large current.)(01marks)

(ii) A galvanometer gives a full scale deflection for a current of 0.1A, and its resistance is 0.5Ω. Determine the value of the resistance necessary to convert it into a voltmeter which reads up to 100V. (04marks)

8. (a) (i) What are cathode rays? (01marks)

(ii) Describe how cathode rays are produced in a cathode ray tube. (04marks)

(b) with reference to an X-ray tube, explain

(i) why the tube has to be evacuated. (03marks)

(ii) why the tungsten target embedded in copper block. (02marks)

(iii) How the penetrating power of X-rays can be varied. (03marks)

(c)(i) what is radioactivity? (01mark)

(ii) Describe one use of radioactivity. (02marks)