KCSE 2011 PHYSICS
PAPER 1
MARKING SCHEME

1. Stable – center of gravity is within base of lorry or line of action of weight is within the base

2. Upthrust

3. $F = Ke$ **OR** $F = Ke$

          $= 125 \times 0.2$ $\dfrac{125 \times 20}{100}$

               $= 25N$ $= 25N$

4. Cooling/reduced temperature
    Aluminium contracts more faster than steel

5. P – cool layers from top descend and are replaced by hot layers **OR** there is complete convection currents in P

6. 80m/s

7. Surface tension at x is reduced/weakened/broken
    Higher surface tension at y pulls the boat

8. Speed of molecules increases/k.e increases/molecules move faster
    Molecules hit walls more frequently/with greater momentum/more collision per unit time

9. Air aped/velocity is higher at contraction
    Pressure drops, higher pa pushes the petro either
    Pressure drops or (atmospheric pressure) pushes the petro

10. Smaller/weaker intermolecular forces in liquids than solids or smaller cohesive in liquids than in solids

11.

    Figure 8
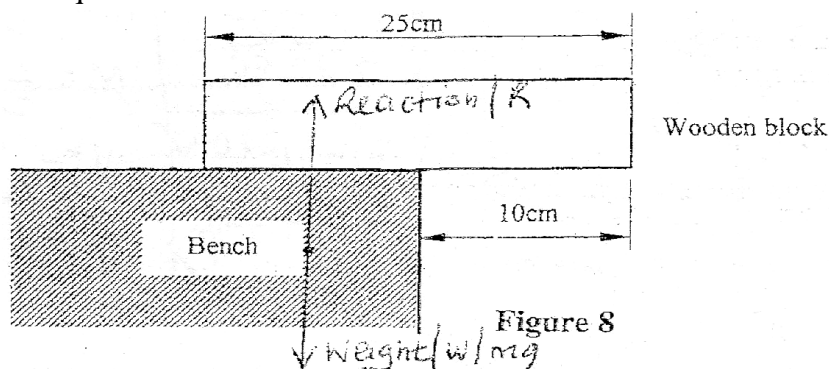
12. Sum of clockwise moments = Sum of anticlockwise moments
    OR $F_1d_1 = F_2d_2$

          $20 \times 2.5 = F \times 10$ or $F \times 15 = 20 \times 2.5$

              $F = 5N$ $F = 3.33N$ (must be in three sig. fig

13. $s = ut + \frac{1}{2}at^2$ **OR** $v = u + at$ **OR** $v = u + at$ **OR** $s = \frac{1}{2}(u+v)t$

    $9 = 0 + \frac{1}{2} \times a \, 3^2$ $s = \frac{1}{2}(u + v)t$ $v = 3a$ $9 = \frac{1}{2} \times 3v$

    $a = 2m/s^2$ $V = 6m/s$ $v^2 = u^2 + 2as$ $v = 6m/s$

                                $a = \dfrac{v - u}{t}$ $9a^2 = 0 + 2a9$ $v = u + at$

                                          $a^2 = 2a$ $6 = 0 + a \times 3$

                             $a = 0$ or 2 $a = 2m/s^2$ $= \dfrac{6 - 0}{3}$

                                                        $a = 2m/s^2$

                                $= 2m/s^2$

14. Identical jets/same speed
    Pressure at same level is equal/pressure is transmitted equally throughout the liquid

15. (a) (i) Arrow horizontal line and straight line
        (ii) Potential energy/potential/P.E
    (b) (i)
    P.E = K.E

$Mgh = ½ mv^2$ OR	$s = ½ gt^2$ OR	$v^2 = u^2 + 2gs$ OR	$K.E = ½ mv$
$V = \sqrt{2 \times 10 \times 0.1}$	$t = \sqrt{\dfrac{2s}{g}}$	$v^2 = 2gs$	$m = ½ mv$
$= (\sqrt{2})$		$v = \sqrt{2gs}$	$v^2 = 2$
$V = 1.41 m/s$	$t = 0.1414$	$v = \sqrt{2 \times 10 \times 0.1}$	$v = \sqrt{2}$
	$V = u + at$	$= 1.1414 m/s$	$= 1.1414 m/s$
	$V = 0 + 10 + 0.1414$		
	$= 1.1414 m/s$		

   (ii) $t = \dfrac{mv^2}{r} + mg$

   $= \dfrac{0.005 \times 2}{8} + 0.005 \times 10$

   $= 0.0625N$

   (c)   Used to do work against/air resistance/viscous drag/air friction or converted to heat energy

16. (a) (i)
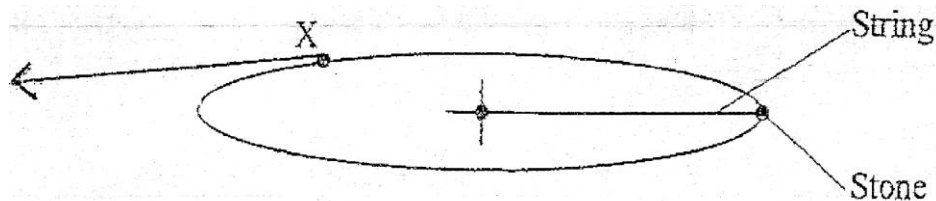
            NB: tangent can be drawn facing the other side/must be straight (ruler used) and if extended should not cut the circle
        (ii) 2m/s
        (iii) Obeys Newton's first law of motion/due to its inertial/no external force acting on it/centripetal force is zero (does not act on it)
    (b) N > F
        M does not act on the trailer
    (c) (i) F = Ke
            $= 25 \times \dfrac{30}{100}$ $= 0.75N$
            F = ma
            0.75 = 2a
            $a = 0.375 m/s^2$
        (ii) Force in the spring decreases as it recovers its original length
            No force on the trolley after contact with wall b lost

17. (a) (i) Water vapour/steam
    (ii) Vapour pressure at boiling point exceeds prevailing/external pressure

    (b) (i) P = mgh
        $= 13600 \times 10 \times \dfrac{61.8}{100}$
        $= 840 \times 10^3 N/m^3$ or $84040 N/m^2$
        (ii) Reading of Bp at P = 84×10^3 is 96 ± 1^0c

    (c) (i) $M_w C_w D0 + Mcccdo = 0.08 \times 4200 \times (27.7 - 20) + 0.05 \times 400 \times (27.7 - 20)$
        $= 2741.2J$
        (ii) Heat lost by metal = Heat gained by water + calorimeter
        $0.1 \times 71.3 \times C = 2741.2$
        $C = \dfrac{2741.2}{7.13}$ = 384.46J/kgk
        (384J/kgk)

    (d) Metal cooling is the process of transferring or metal carrying some hot water into the cold water

18. (a) Measure the length of the threaded part
    Divide the length by number of threads/pitches divide by number of peaks – 1
    (b) VR = $\dfrac{2\pi r}{Pitch}$
        $= \dfrac{2 \times 2 \, 3.142 \times 0.25}{0.001}$ = 1571.43
    (c) (i) K.E = heat + sound or K.E → heat, sound or K.E → heat, sound (light)
        (ii) K.E = work done against friction   or   F = ma
        $\frac{1}{2} mv^2 = Fd$ $v^2 = u^2 + 2as$
        $\frac{1}{2} \times 0.006 \times 800^2 = F \times 0.15$ $0 = 800^2 + 2 \times 0.15a$
        F = 12800N $a = \dfrac{640000}{0.3}$
        $= 2133333.3 \ (2.13 \times 10^6)$
        $F = ma = 2.133 \times 10^{64} \times \dfrac{60}{1000}$

19. (a) Upthrust = weight or
    Weight of fluid displaced = weight of the body or
    Its density is less than that of the fluid
    (b) Ship has a large air space/hollow or
    Average density of the ship is less than density of water
    Upthrust of ship is equal to weight of the ship
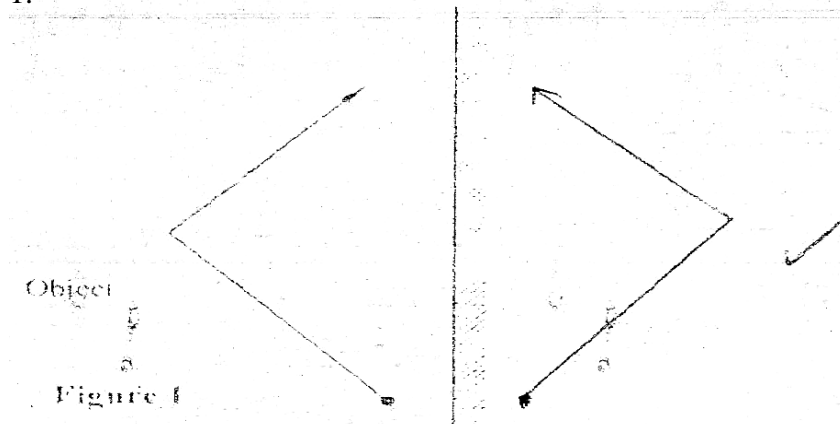   (c) (i) Upthrust = $W_1 - W_2$
        = 0.60 – 0.28
        = 0.32N

(ii)   RD = $\frac{\text{Weight of substance}}{\text{Weight of equal volume}}$ = $\frac{\text{Weight of cork}}{\text{Upthrust}}$

= $\frac{0.08}{0.32}$ = 0.25

(d)   To sink, water is allowed into ballast tanks
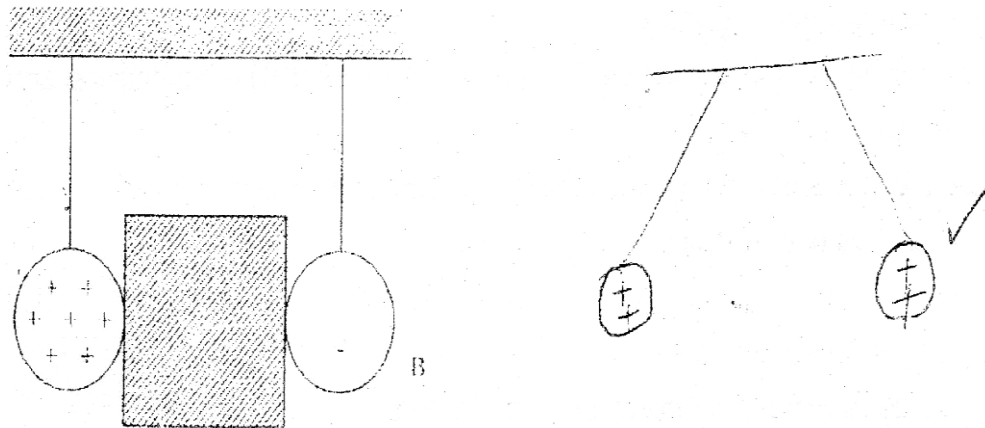
To float, pumps are used to expel water from ballast tanks

KCSE 2011 PHYSICS
PAPER 2
MARKING SCHEME

1.

Object

Figure 1

2.

3. Mica raised the capacity hence low P.d, since $v = {}^Q/_C$ is constant or capacity increased; mica has high permittiny

4. A – Carbon/graphite
   B – MnO_4 and powered carbon

5. MnO_4 is a depolarized/oxidizing agent/oxidized H_4 to water react with hydrogen

6. Hammering causes dormains/diposes to vibrate/disposes become excited or distorted. As they settle some face N – S direction due to earth magnetic field

7. S closed current flows in the solenoid magnetism soft iron core attracts the soft iron armature closing the contacts, causing current to flow in the motor/motor keeps moving continuously/contact are made/motor switched on.

8. Steel would remain permanently magnetized causing current in motor to remain on.

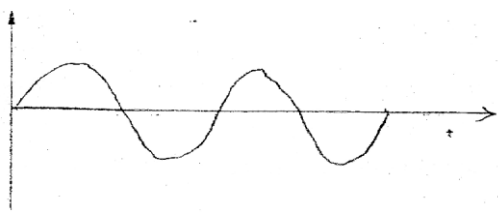9. $2.5\lambda = 10 \times 5$ $\lambda = 20cm$
   $4 \times 5 = 20cm$

10.

Figure 7
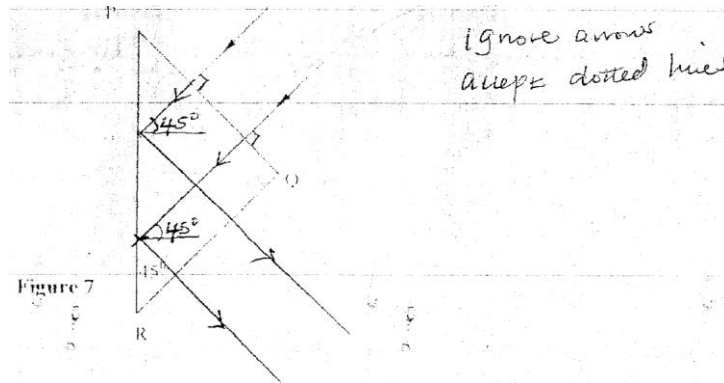
11. $P = \dfrac{V^2}{R} = \dfrac{6^2}{4} = 9W$ or $P = I^2R$
                                                     $= (^6/_4)^2 \times 4 = 9W$

12. Radio, Micro, Yellow, Gamma

13. High voltage leads to low current hence low power loss (I^2R) or minimize energy losses or power loss

14. Minimum frequency of incident radiation cause photo electrons/electron emission/discharge/remove electrons.

15. (a)   (i)   Does not obey ohm's law
               The current is not directly proportional to p.d or
               Graph is not a straight line through the origin

      (ii)   Tangent at $I = 1.5A$
            $R = \dfrac{9.2 - 4.8}{3.6 - 0.1} = 1.26\Omega \pm 0.1$
            Tangent at $I = 3.5A$
            $R = \dfrac{9.6 - 7.2}{5.4 - 1.5} = 0.56 \pm 0.1$

      (iii)   R decreases as I increases
      (iv)   change (increases) in temperature

   (b)   (i) $V_t = 1.6 \times 3 = 4.8V$
      (ii) $E = I(R + r)$
            $4.8 = 0.32(11.4 + r)$
            $r = \dfrac{1.5 - 11.4}{3} = 1.2\Omega$

16. (a)   Points where rays cause and parallel principal axis converge – convex lens seem (appear) to diverge from concave lens after striking the lens

   (b)   (i)
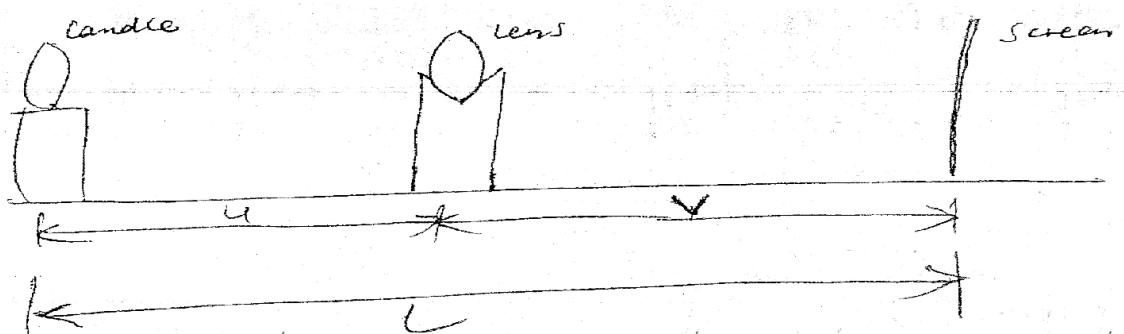
(ii)   Candle placed at a distance from lens distance between the screen and the lens adjusted until a sharp image is focused on the screen.

(iii)   Distance of candle and lens (u) is measured

Distance of screen from lens (v) is also measured

(iv)   Values of v and u are substituted in the formula $F = \frac{uv}{u+v}$ $(\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

Or use the graph of $\frac{1}{v}$ and get reciprocal

(c) $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$ or $m = \frac{v}{u}$

$\frac{1}{v} = \frac{1}{20} - \frac{1}{30}$ $= \frac{-12}{30}$

        V = -12cm   = 0.4 (ignore –ve sign)

17.   (a)   Production of e.m.f when magnetic flux linking the coil is changed

    (b)   (i)   P – brushes/graphite brush

                  Q – slip rings/complete rings

        (ii)

        (iii)   Increase in the number of turns

                  Increase speed of rotation

                  Increase strength of field

                  Increase number of coils

                  Size of coils/area of coils

    (c)   (i) $V_s = 200 \times 0.5 = 100V$

        (ii) $\frac{NP}{NS} = \frac{VP}{VS}$ $VP = \frac{100}{10} \times 1 = 10V$

        (iii) $\frac{VP}{VS} = \frac{IS}{IP}$ $\frac{10}{10} = \frac{0.5}{IP}$ IP = 0.5V

18.   (a)   Cathode rays have charges but e.m does not have

            Cathode rays are particles that have mass but e.m rod are waves or

            Cathode rays travel at speed depending on accelerating voltage e.m rod travel at speed of light

    (b)   (i)   M – grid

                  N – accelerating anode or Anode

        (ii)   Cathode rays heated by filament

                  Electrons are released from cathode by thermal emission

        (iii)   (I)   Across Y – Y plates/horizontal plates

               (II)   Across X – X plates/vertical plates

        (iv)   To reduce collisions hence ionization with air

                  Molecules in the tube

                  Prevent ionization of air molecules

(c)

amplitude ✓
frequency ✓

Figure 11

    (i)   5 x 2 = 10V
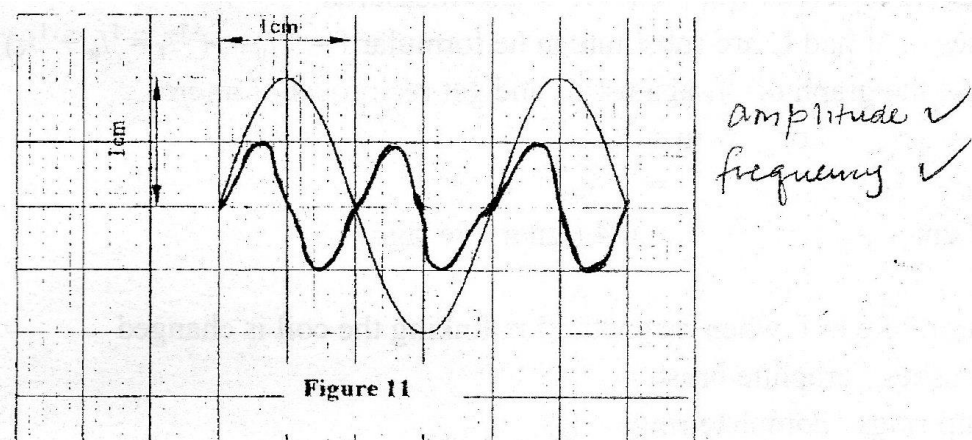
19.   (a)   Alpha radiation

             Short range with increased ionization hence thick track and measure/high ionization.

    (b)   Number of half life   = $\dfrac{19.15}{3.83}$ = 5

    (c)   Semi-conductor in which impurities have been added to change conductivity or pure semi-conductor having been doped.

             Impure semi-conductor

    (d)   By connecting it in forward biased mode i.e. P to the +ve and n to -ve

    (e)

Figure 13

KCSE 2011 PHYSICS
PAPER 3
MARKING SCHEME
Question 1
Part A
You are provided with the following
A voltmeter
A resistance wire labeled P mounted on a metre rule
A resistance wire labeled Q mounted on a piece of carton
2 dry cells and a cell holder
6 connecting wires each with a crocodile clip at one end
Proceed as follows
(a) Place the dry cells in series in the cell holder. Measure and record the total e.m.f. E of the cell (1mk)

$E_0 = 3.0 \pm 0.2$

   2.8 to 3.2

(b) Connect the circuit as shown in figure 1
O is a point on P at the 50cm mark of the metre rule. A and B are points on P

(c) Adjust the positions of the crocodile clips A and B on P such that $AO = OB = X - 2.5cm$. Close the switch. Read and record the potential difference (V) across AO in table 1

(d) Repeat part (c) for other values of X shown in table 1 and complete the table.

(e) On the grid provided plot a graph of I/V (y axis) against 1/X (X axis)

$\frac{I}{V}$ (V⁻¹) against $\frac{V}{X}$ (cm⁻¹)
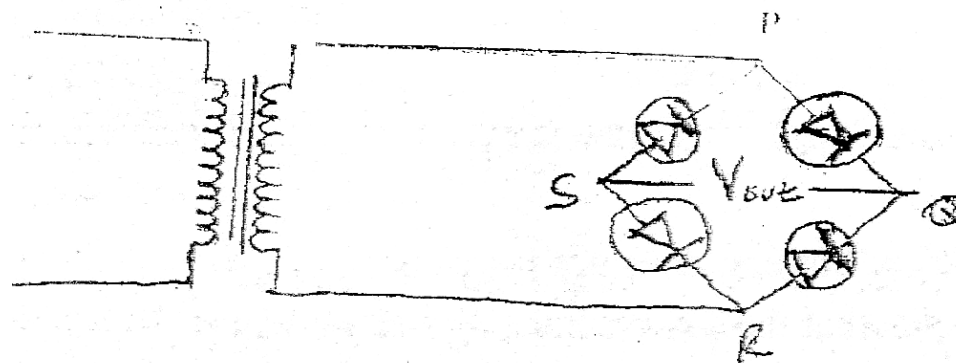
(f)   Determine the slope S of the graph   (3mks)
        Correct interval
        Correct evaluation to nearest whole number
        Accuracy 31 to 37 nearest whole number
(g)   Use the slope to determine the constant h, given that $h = 8/E_0S$ (9mks)
        Correct substitution of E_0 and S
        Evaluation to 3 decimal places or exact (ignore units)

Part B
You are provided with the following
A soft drawing board
A semicircular glass block
Three drawing pins
A white paper
A liquid labeled L
A dropper
Proceed as follows
(a)   Place the white paper on the drawing board. Place the semicircular glass block on
        the paper and trace its outline using a pencil
(b)   At the centre of the straight edge of the outline mark a point O. Also mark a point
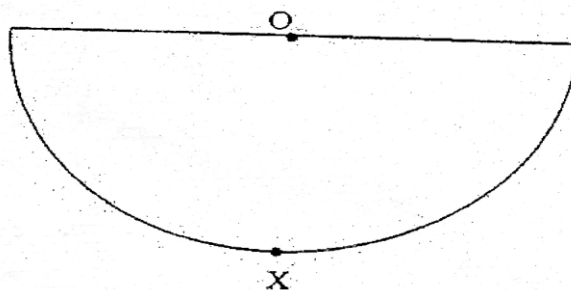   X approximately at the centre of the curved edge of the outline as shown in figure
        2

Figure 2

(c)   Place the semicircular glass block on the outline. Push a drawing pin vertically
        through O into the drawing board. Ensure the pin is in contact with the glass
        block. Using a dropper, place two to three drops of liquid L on the pin so that the
        liquid flows down the pin forming a thin film between the pin and the vertical
        face of the glass block.
(d)   View the image of the pin from point X until the image of the pin just disappears
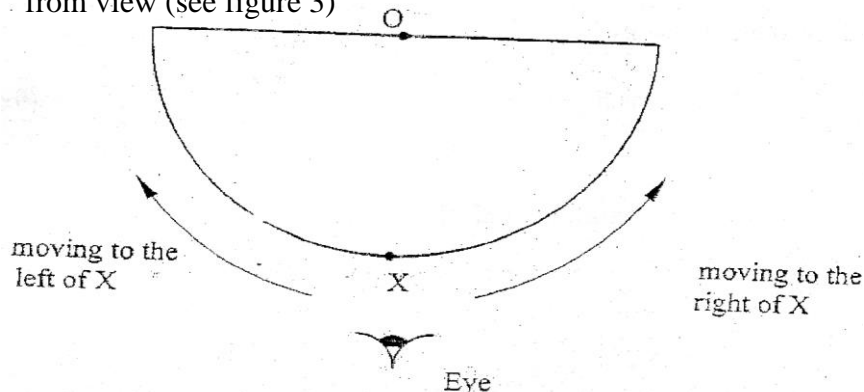   from view (see figure 3)

Figure 3

Using a second pin locate and mark a point N on the curved outline at the point where the image just disappears

(e)   Repeat part (d) with the eye moving to the left side of X. Locate and mark the point M on the curved outline where the image just disappears from view

(f)   Draw the lines OM and ON on the outline

(g)   (i)   Measure and record MON
                 $= 137^0 - 157^0$
        (ii)   If MON = 2A, determine q given that Sine A = $^2/_3$q
                 Correct evaluation of q to 2 decimal places or exact

Question 2
Part A
You are provided with the following
100ml glass beaker
A weighing balance (to be shared)
A liquid labeled L
A measuring cylinder
Proceed as follows

(a)   Measure and record the mass M of the empty beaker
        M_1

(b)   Measure and pour 2ml of liquid L into the beaker. Measure and record the mass of the beaker + liquid L
        M_2
        Accept candidates value of M_1 and M_2 such that $M_1 – M_2 = 1.6 \pm 0.1$

(c)   Determine the density d of the liquid   (2mks)
        Don't mark (c) if M_1 and M_2 are missing

Part B
You are provided with the following
A retort stand, boss and clamp
2 boiling tubes
A thermometer
Some distilled water in a beaker labeled W
Some liquid in a beaker labeled L
A large beaker containing some water
A measuring cylinder
A stopwatch
A tripod stand and wire gauze
A cardboard with a hole in the middle
A burner

Proceed as follows

(d)   Clamp one boiling tube on the retort stand. Measure and pour 45ml of the distilled water W into the boiling tube. Set up the apparatus as shown in figure 4
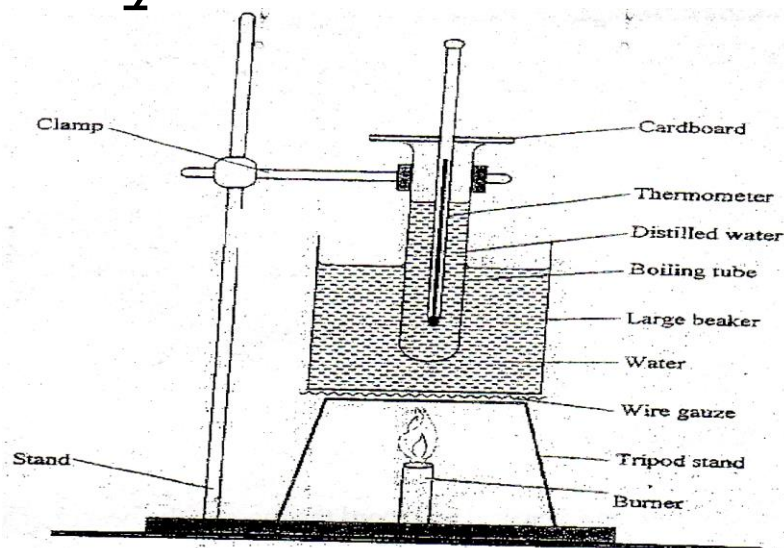
Figure 4

(e)   Heat the water in the large beaker until the temperature of the distilled water reaches 85^0C. Remove the boiling tube from the hot water by lifting up the retort stand and placing it away from the burner.

(f)   Stir the water in the boiling tube using the thermometer. Record in the table 2 the temperature of the distilled water at intervals of 30 seconds starting at 80^0C until it drops to 60^0C. *(Stir the distilled water before taking any reading)*

(g)   Using the second boiling tube repeat the procedure in (d), (e) and (f) using 45ml of liquid L instead of distilled water. Record your results in the same table

(h)   Using the same axes on the grid provided, plot a graph of temperature (Y axis) against time for:

     (i)   Distilled water W

     (ii)   Liquid L

         (Label the graphs of L and W)
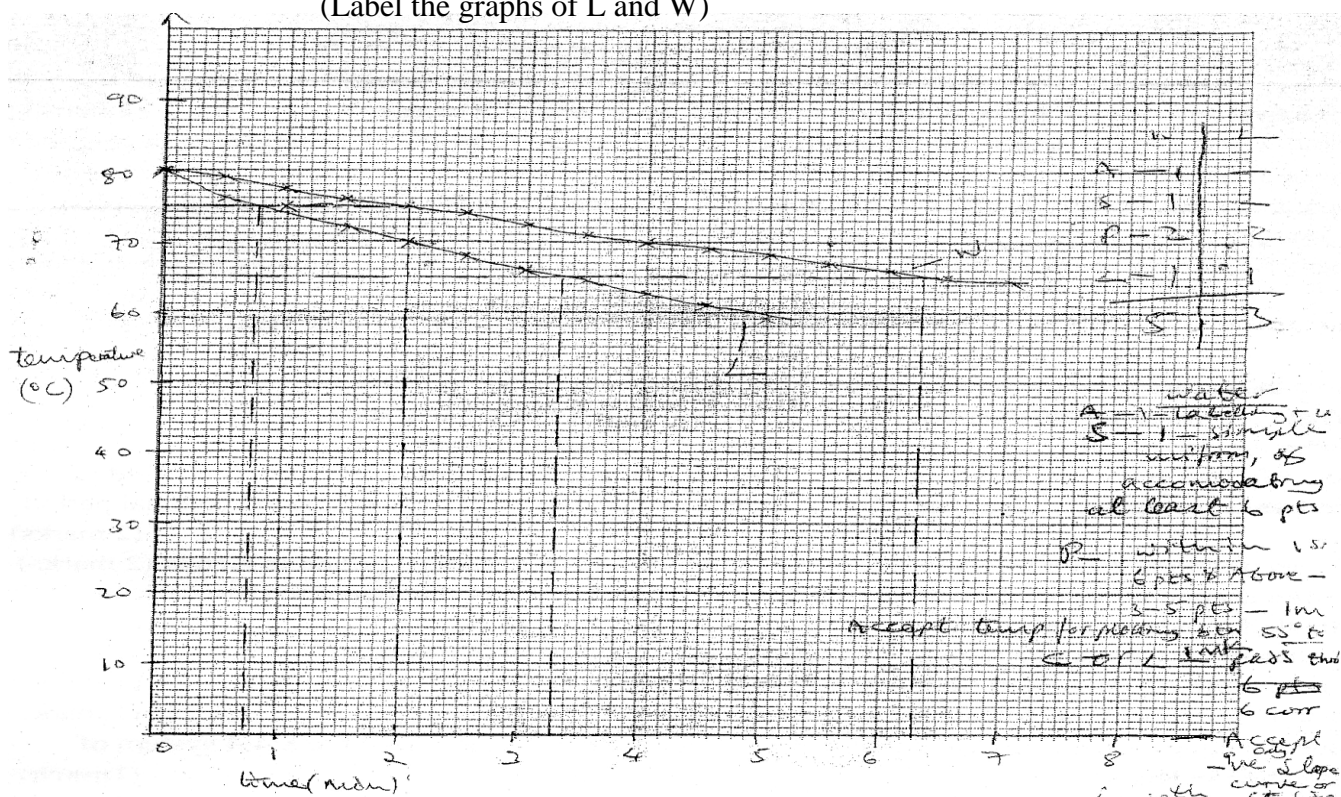
(i) From the graph determine;
  (i) The time t taken for the distilled water to cool from 75^0C to 65^0C (1mk)
       t_W = minutes
  (ii) The time t taken for the liquid L to cool from 75^0C to 65^0C
       t_L = minutes
       Both time to come from candidate's work/graph within

(j) Determine the constant r given that $r = \dfrac{4.2\ t_L}{dt_W}$ where d is the density of liquid L in Part A   (2mks)
    Correct substitution in right = 1mk
    Correct evaluation to 1 decimal place