Question 1 **[10]**

You are provided with the following materials:

- ✓ a metal bob,
- ✓ a thread (twine thread),
- ✓ a clamp stand,
- ✓ a pair of vernier callipers,
- ✓ a pair of split corks,
- ✓ a metre scale and
- ✓ a stop clock.

Using the materials provided, perform the experiment and write the result such that the conclusion can be drawn as stated below.

You are expected to provide information on the following components of your experiment in the format given below:

(i) Aim of the experiment
(ii) Hypothesis
(iii) Theory (only working formula and meaning of variables)
(iv) Procedure
(v) Observations (*Show your first set of readings to the Visiting Examiner*.)
(vi) Graph
(vii) Calculation
(viii) Result
(ix) Conclusion: "The difference between the standard value of acceleration due to gravity 'g_E' and acceleration due to gravity 'g_P' of this place is……."

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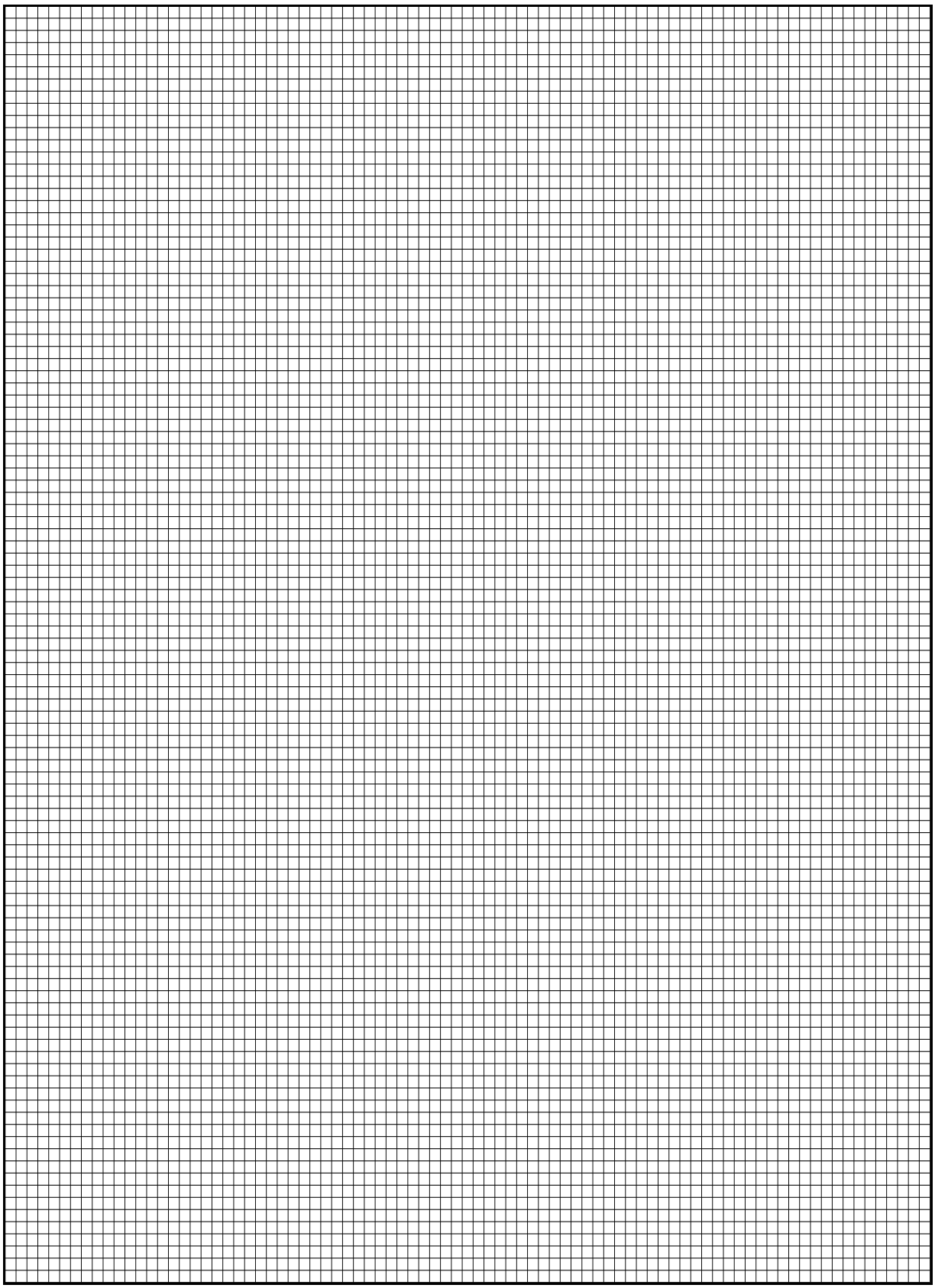


Question 2 **[10]**

Find the stronger magnet by comparing the magnetic moments of two bar magnets marked A and B using a deflection magnetometer.

You are provided with the required materials and the detailed procedure to carry out this experiment. Follow the procedure correctly and perform the experiment. **DO NOT** copy the theory, materials required and procedure of the experiment. You are expected to present only your findings.

Theory:

According to the tangent law,

$B_A = B_H \tan\theta_1$

Therefore ratio of magnetic moment of two magnets can be obtained by taking the ratio of tangent of angle of deflection i.e.

$\frac{M_A}{M_B} = \frac{\tan\theta_A}{\tan\theta_B}$ ---------- **Equation (i)**

Here,

M_A = Magnetic moment of magnet A

M_B = Magnetic moment of magnet B

$\tan\theta_A$ = Tangent of deflection angle of magnet A

$\tan\theta_B$ = Tangent of deflection angle of magnet B

Materials required:

- ✓ one deflection magnetometer
- ✓ two bar magnets marked A and B
- ✓ one half metre scale

Set-up:

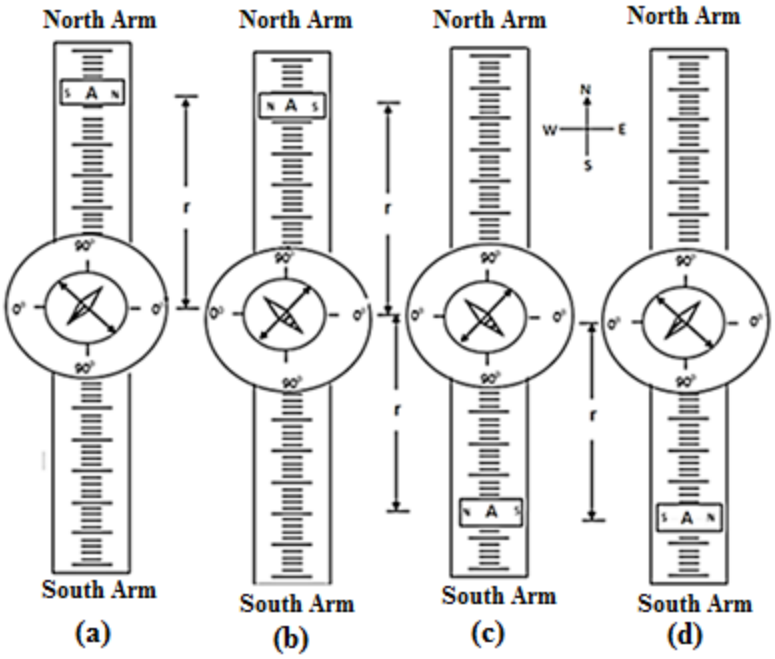


Figure 1: Tan B Settings of magnetometer

Procedure:

(i) Place the magnetometer on a horizontal table and turn the arms of the magnetometer perpendicular to the length of the aluminium pointer so that the arms are in north-south direction.

(ii) Without disturbing the adjustment, rotate the compass slowly until the aluminium pointer points at 0° - 0°. This position of magnetometer is called Tan B setting.

(iii) Measure and record the length of magnet A and magnet B.

(iv) Place magnet A of magnetic moment M_A on North arm of magnetometer with its axis along the east- west direction as shown in *Figure 1 (a)*: Tan B Setting of magnetometer.

(v) Adjust the distance of the magnet A from the centre of magnetometer so that the
deflection lies between 30° and 60°.

(vi) Measure the distance between the centre of the magnet and the centre of the magnetometer as 'r'. Take the readings of both ends of the pointer as θ_1 and θ_2. Draw a table to record the values of 'r', θ_1 and θ_2. Name the table as Table 2: Tan B setting.

(vii) Reverse the polarity of the magnet as shown in *Figure 1 (b)* keeping it at same distance 'r'. Note the readings of both the ends of the pointer as θ_3 and θ_4 in
Table 2: Tan B Setting.

(viii) Take magnet A to the second arm (South arm) of the magnetometer as shown in *Figure 1 (c)* and place it exactly at the same distance 'r' as given in step (vi).

(ix) Take the readings of both the ends of the pointer as θ_5 and θ_6 and record in Table 2: Tan B Setting.

(x) Reverse the polarity of the magnet as shown in *Figure 1 (d)* and place it at same distance 'r'. Note the readings of both the ends of the pointer as θ_7 and θ_8 in
Table 2: Tan B Setting.

(xi) Find the mean of these eight readings of deflection angle to obtain the value of θ_A.

(xii) Remove magnet A and replace with magnet B on North arm of the magnetometer at the same distance 'r'. Take the readings of both ends of the pointer as θ_1 and θ_2 and record the values in Table 2: Tan B Setting.

(xiii) Repeat steps (vii) to (x).

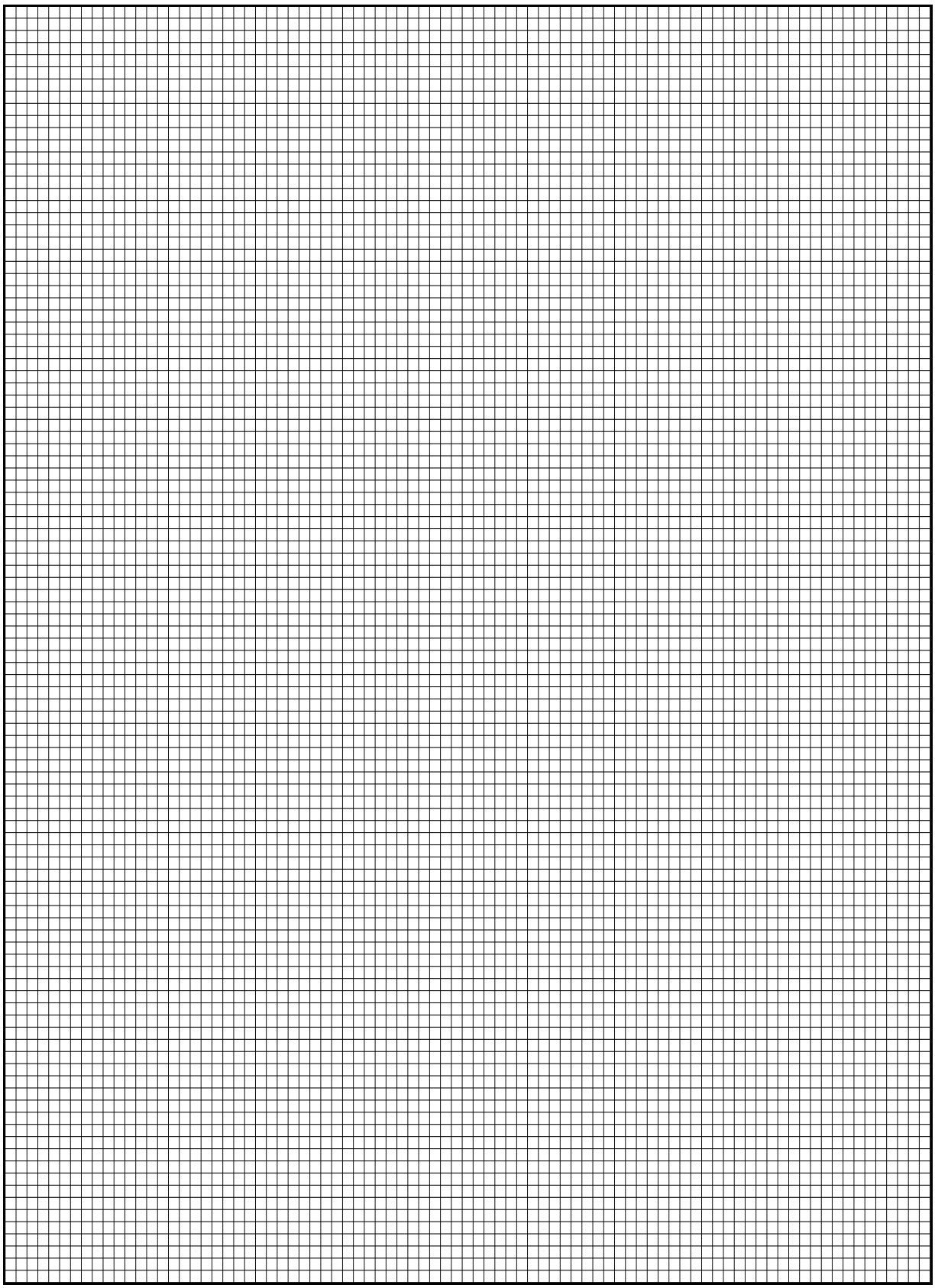
(xiv) Find the mean of these eight readings of deflection angle to obtain the value of θ_B.
Show your readings to the Visiting Examiner.

(xv) Repeat the experiment to get four more sets of readings (θ_A and θ_B) by taking different values of 'r' such that the deflection lies between 30° and 60°.

(xvi) Calculate the ratio of magnetic moment using equation (i) and record it in Table 2: Tan B Setting.

(xvii) Calculate and note the mean ratio of magnetic moments of the two bar magnets.

(xviii) Write the result of your experiment and deduce the conclusion.



for Rough Work

Question 1 **[10]**

You are provided with two bar magnets marked A and B of equal length. The magnetic moment of each magnet is denoted by M_A and M_B respectively. Find the stronger magnet by comparing the magnetic moment of these two magnets by equal distance method using Tan A setting. Take at least five sets of observations using deflection magnetometer.

You are expected to provide information on the following components of your experiment in the format given below:

(i) Aim of the experiment
(ii) Hypothesis
(iii) Theory (only working formula, meaning of variables and labelled diagram)
(iv) Procedure
(v) Observations (*Show your first set of readings to the Visiting Examiner*.)
(vi) Calculation
(vii) Result
(viii) Conclusion

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Question 2 **[10]**

Carry out an experiment to determine the value of acceleration due to gravity at a place.

You are provided with the required materials and the detailed procedure to carry out this experiment. Follow the procedure correctly and perform the experiment. **DO NOT** copy the materials required and procedure of the experiment. You are expected to present only your findings.

You are provided with the following materials:

- ✓ a metal bob,
- ✓ a thread (twine thread),
- ✓ a clamp stand,
- ✓ a pair of vernier callipers,
- ✓ a pair of split corks,
- ✓ a metre scale and
- ✓ a stop clock.

Follow the procedure correctly and perform the experiment.

Set-up: *Figure 1:* Experimental arrangement of simple pendulum

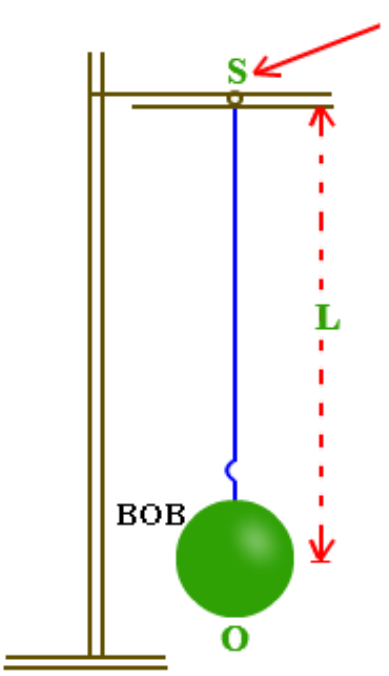


Figure 1(a)

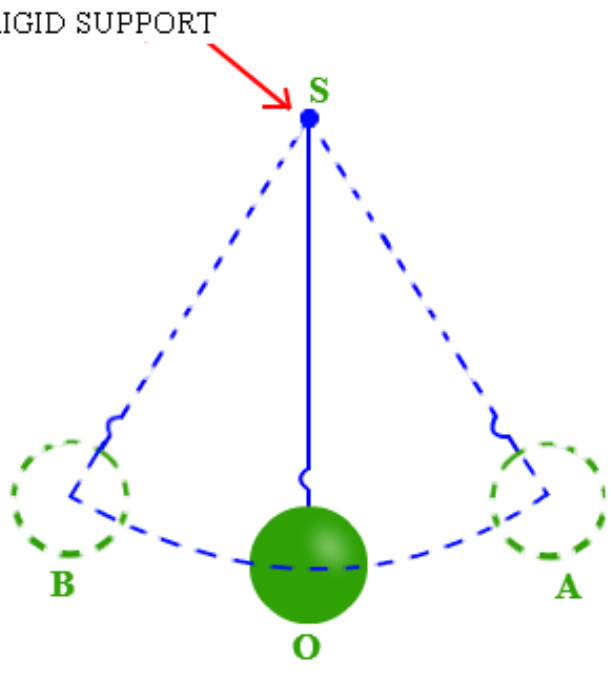


Figure 1(b)

Procedure:

(i) Measure the diameter 'd' of the bob using vernier callipers and calculate its radius'r'.

(ii) Obtain two more values of 'r' by measuring the diameter at different positions on the surface of the bob. Calculate the mean value of 'r'. Tabulate all the readings and name the table as Table 2.1: Radius of bob.

(iii) Set-up the apparatus as shown in *Figure 1(a)* and take the length (l) of the thread from the point of suspension till the base of the hook of the bob equal to 100 cm.

(iv) Calculate the value of effective length, $L = l + r$ of the pendulum.

(v) Pull the bob to one side making a small angle from its equilibrium position and

set the pendulum in motion. Note the total time taken 't' to complete 20 oscillations and record it in a table. Name the table as Table 2.2: Oscillation of simple pendulum. *Show your readings to the Visiting Examiner*.

(vi) Repeat the **steps (iv)** and **(v)** for length l = 90 cm, 80 cm, 70 cm and 60 cm. Record the value of effective length L and corresponding values of time taken (t), for 20 complete oscillations in Table 2.2: Oscillation of simple pendulum.

(vii) Calculate the corresponding values of time period, $T = \frac{t}{20}$ for all the five sets of
readings and record in Table 2.2.

(viii) Draw a graph of *L versus T²*.

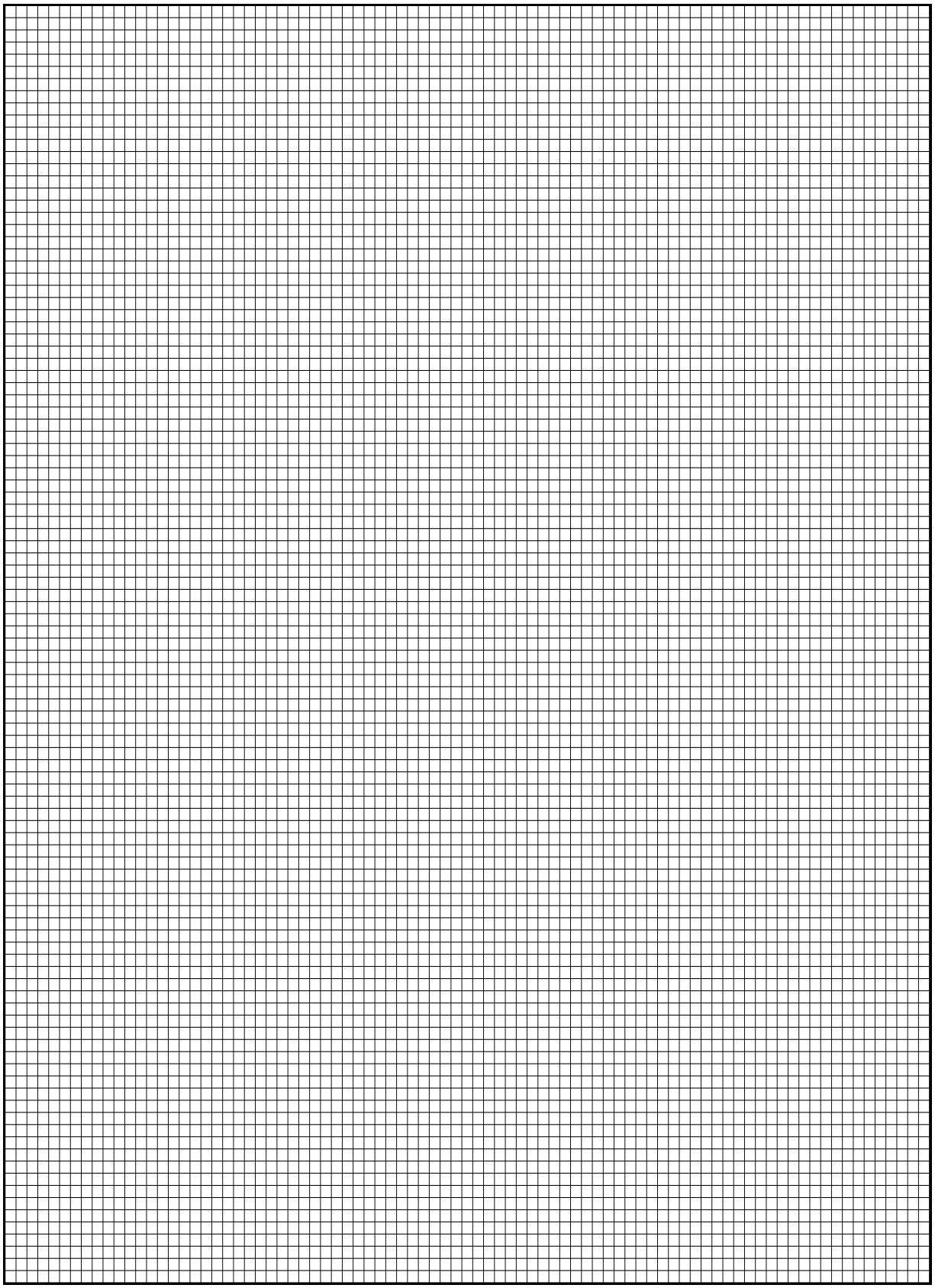
(ix) From the graph read and note $'p'\ \left(value\ of\ T^2\ when\ L_1 = 75\,cm\right)$ and $'q'\ \left(value\ of\ T^2\ when\ L_2 = 100\,cm\right)$

(x) Calculate acceleration due to gravity g, using the formula $g = \frac{100\pi^2}{q - p}$

(xi) Complete the result given below and deduce the conclusion.

Result: From the above experiment acceleration due to gravity was found to

be……



for Rough Work

for Rough Work

Question 1 **[10]**

You are provided with the following materials:

- ✓ a spiral spring with a pointer fixed just above its hook,
- ✓ a clamp stand,
- ✓ a metre scale,
- ✓ a set of slotted weights and
- ✓ a stop clock.

Using the materials provided, perform the experiment to determine the force constant of the spring.

You are expected to provide information on the following components of your experiment in the format given below:

(i) Aim of the experiment
(ii) Hypothesis
(iii) Theory (only working formula and meaning of variables)
(iv) Procedure
(v) Observations *(Show your first set of readings to the Visiting Examiner.)*
(vi) Graph
(vii) Calculation
(viii) Result
(ix) Conclusion

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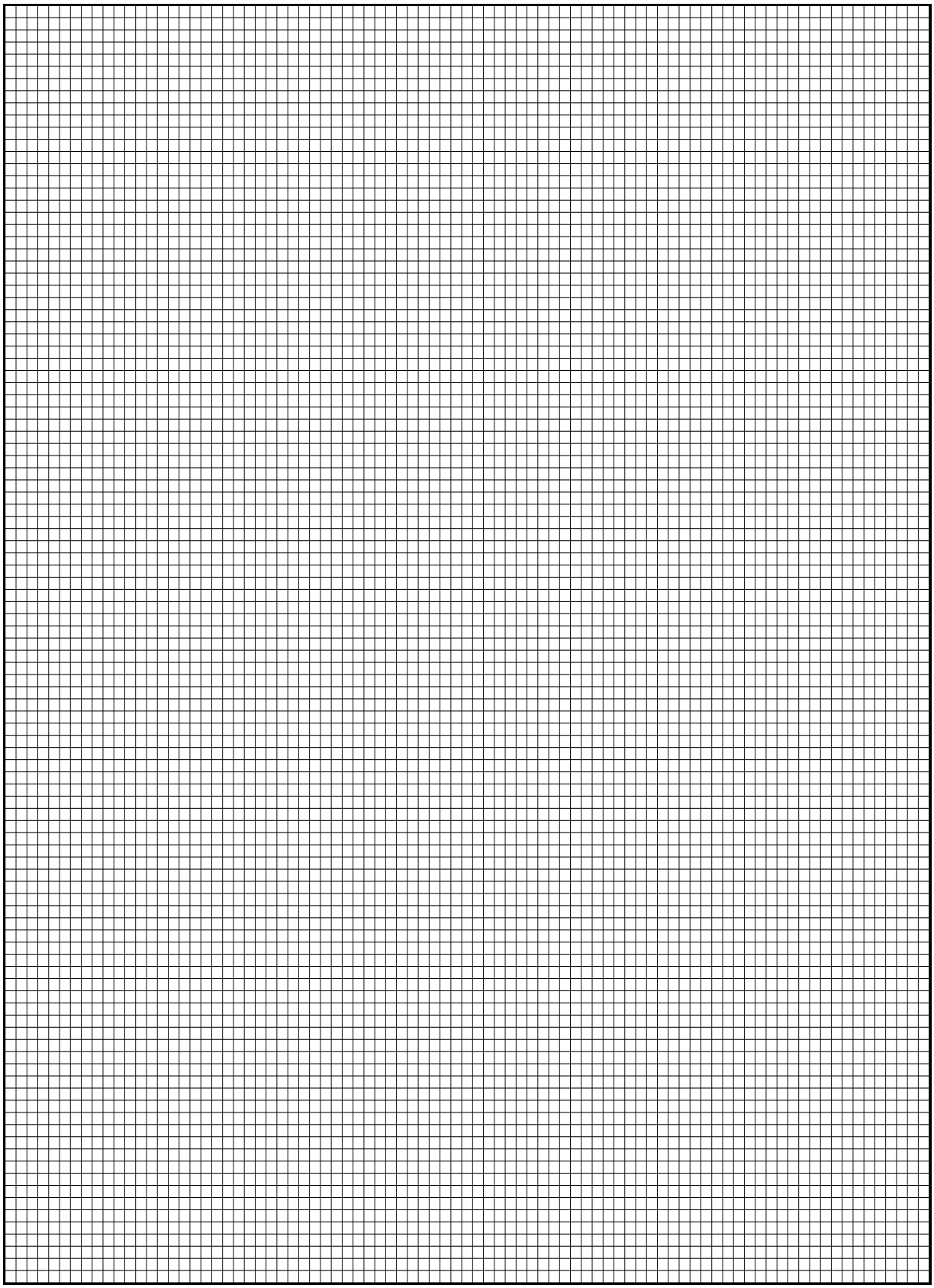

Question 2 **[10]**

Find the stronger magnet by comparing the magnetic moments of two bar magnets marked A and B using a deflection magnetometer.

You are provided with the required materials and the detailed procedure to carry out this experiment. Follow the procedure correctly and perform the experiment. **DO NOT** copy the theory, materials required and procedure of the experiment. You are expected to present only your findings.

Theory:

According to the tangent law,

$B_A = B_H \tan\theta_1$

Therefore ratio of magnetic moment of two magnets can be obtained by taking the ratio of tangent of angle of deflection i.e.

$\frac{M_A}{M_B} = \frac{\tan\theta_A}{\tan\theta_B}$ **---------- Equation (i)**

Where,

M_A = Magnetic moment of magnet A

M_B = Magnetic moment of magnet B

$\tan\theta_A$ = Tangent of deflection angle of magnet A

$\tan\theta_B$ = Tangent of deflection angle of magnet B

Materials required:

- ✓ one deflection magnetometer
- ✓ two bar magnets marked A and B
- ✓ one half metre scale

Set-up:

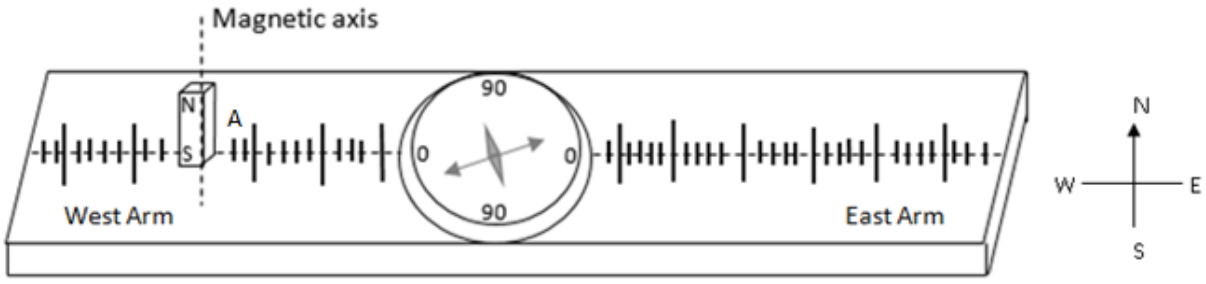

Figure 1: Tan C position of magnetometer

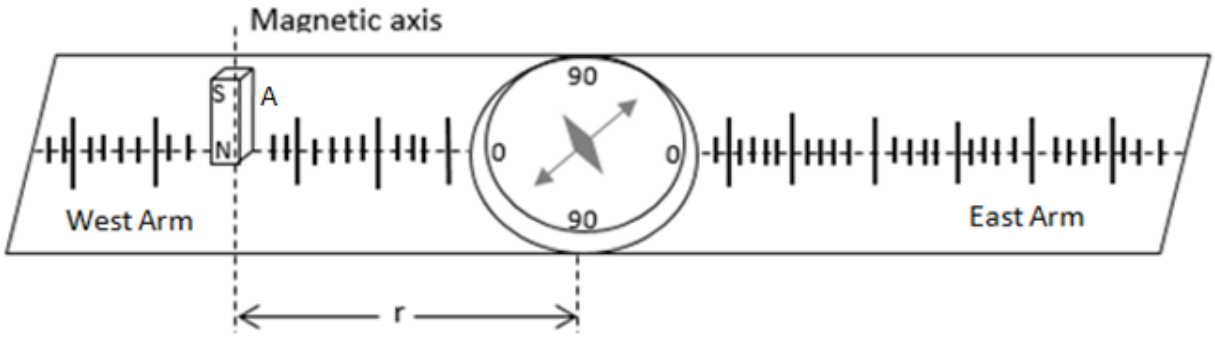

Figure 2 (a)

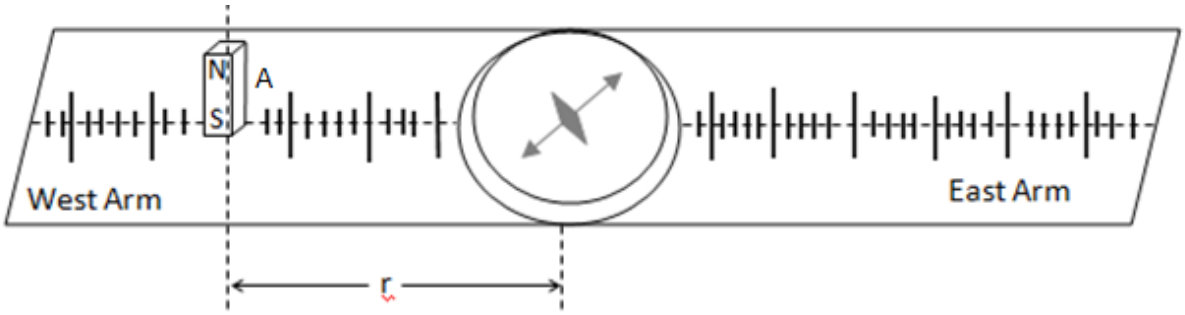

Figure 2 (b)

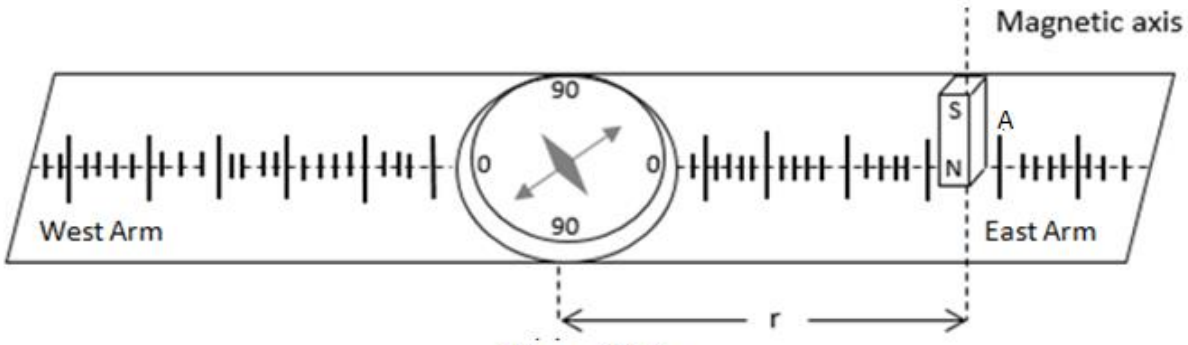

Figure 2 (c)

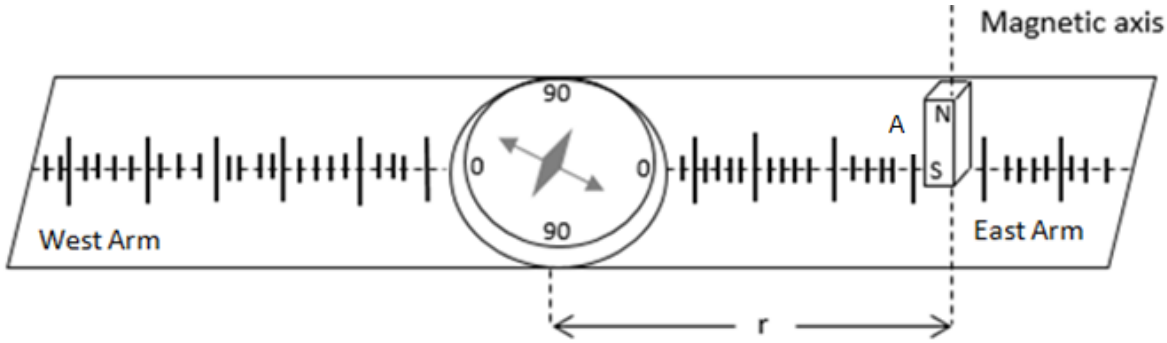

Figure 2 (d)

Note: *The diagrams are not drawn up to the scale.*

Procedure:

(i) Place the magnetometer on a horizontal table and turn the arms of the magnetometer parallel to the length of the aluminium pointer so that the arms are in east-west direction.

(ii) Without disturbing the adjustment, rotate the compass slowly until the aluminium pointer points at 0° - 0°.

(iii) Measure and record the length of magnet A and magnet B.

(iv) Place magnet A of magnetic moment M_A vertically such that it stands on its pole on west arm of magnetometer with its axis perpendicular to the east-

west direction as shown in *Figure 2(a)*. This position of magnetometer is called Tan C setting.

(v) Adjust the distance of bottom end of the magnet A from the centre of magnetometer so that the deflection lies between 30° and 60°.

(vi) Measure the distance between the centre of bottom end of the magnet and the centre of the magnetometer as 'r'. Take the readings of both ends of the pointer as θ_1 and θ_2. Draw a table to record the values of 'r', θ_1 and θ_2. Name the table as Table 2: Tan C setting.

(vii) Reverse the polarity of the magnet as shown in *Figure 2 (b)* keeping it at same distance 'r'. Note the readings of both ends of the pointer as θ_3 and θ_4 in Table 2: Tan C Setting.

(viii) Take the magnet A to the second arm (east arm) of the magnetometer as shown in *Figure 2 (c)* and place it exactly at the same distance 'r' as in Step (vi).

(ix) Take the readings of both ends of the pointer as θ_5 and θ_6 and record in Table 2: Tan C Setting.

(x) Reverse the polarity of the magnet as shown in *Figure 2 (d)* and place it at same distance. Note the readings of both ends of the pointer as θ_7 and θ_8 in Table 2: Tan C Setting.

(xi) Find the mean of these eight readings of deflection angle to obtain the value of θ_A.

(xii) Remove magnet A and replace with magnet B on west arm of the magnetometer at the same distance 'r'. Take the readings of both ends of the pointer as θ_1 and θ_2 and record the values in Table 2: Tan C Setting.

(xiii) Repeat Step (vii) to Step (x).

(xiv) Find the mean of these eight readings of deflection angle to obtain the value of θ_B. *Show your first set of readings to the Visiting Examiner.*

(xv) Repeat the experiment to get four more sets of readings (θ_A and θ_B) by taking different values of 'r' such that deflection lies between 30° and 60°.

(xvi) Calculate the ratio of magnetic moment using equation (i) and record it in Table 2: Tan C Setting.

(xvii) Calculate and note the mean ratio of magnetic moments of the two magnets.

(xviii) Write the result of your experiment and deduce the conclusion.