**MOMENTS – THE TURNING EFFECT OF A FORCE**

**Skills: ORR**

**AIM:** To investigate the turning effect of a force using levers.

**APPARATUS and MATERIALS:**

* A meter rule with hole at 50cm
* Masses – 3-4 different pieces (10g, 20g, 50g, 100g)
* Pieces of yarn/string
* Modelling clay
* Metal hooks (4-5)
* scissors
* retort stand and clamp

**DIAGRAM:**





Diagram showing how to set up ruler on the retort stand to investigate moments.

**INSTRUCTIONS:**

1. Tie the string through the central hole of the ruler and suspend it from a clamp on the retort stand.
2. Use a piece of modelling clay to balance the ruler as necessary.
3. Hang a 20g mass (which exerts a force of 0.2N) on the left side of the ruler at 10cm (0.1m) from the fulcrum.
4. Add another 10g mass (force 0.1N) to the ruler at a point that will allow the ruler to balance again.
5. Take the masses off, and try other ones at different distances from the fulcrum. In each case you must make the ruler balance.
6. Record your results (masses and distances) in the table and calculate the moments.

*Rewrite your method into past tense in the space below or on a separate page.*

**METHOD**:

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**RESULTS:**

Table showing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Left side** | **Right side** |
| **Force f1****(newtons)** | **Distance – d1****(meters)** | **Moment****f1 x d1** | **Force f2****(newtons)** | **Distance – d2****(meters)** | **Moment****F2 x d2** |
| 0.4 N | 0.1m | 0.4N x 0.1m = 0.04Nm | 0.1N | 0.4m | 0.1N x 0.4m = 0.04Nm |
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**Note the units in the table are Newtons and meters; your masses are in grams and centimeters. You must convert them.**

**Calculations:**

Force due to gravity that pulls a mass of 1kg is approximately 10N.

So 1000g exerts 10N of force

So 1g = 10/1000 = 0.01N

Therefore the force exerted by a 40g mass = 0.4N

Sample calculations:

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**DISCUSSION:** *Write your responses in full sentences on a separate page –* ***use paragraphs.***

1. What is a moment of a force?
2. What relationship can you determine from your table of results?
3. Can a lighter mass (force) be used to move a heavier mass (force)?
4. How or when will the moment of a force be useful to you in real life?

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**CONCLUSION:** *State what you found out in this experiment?*

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**MARKSCHEMES –**

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| **ORR CRITERIA** | **Mark** |  |
| **Observations**(accurate) | Significant changes notedOriginal and final conditions comparedControl noted OR diagram | **3** |  |
| **Recording**Tables | Title – above, in capitals - 1Column & row headings (with units) - 1Enclosed and neat -1 | **3** |  |
| **Reporting** | Format - **all** sections present – 1Aim present - 1Acceptable language and expression – grammar – 1 and spelling – 1 | **4** |  |