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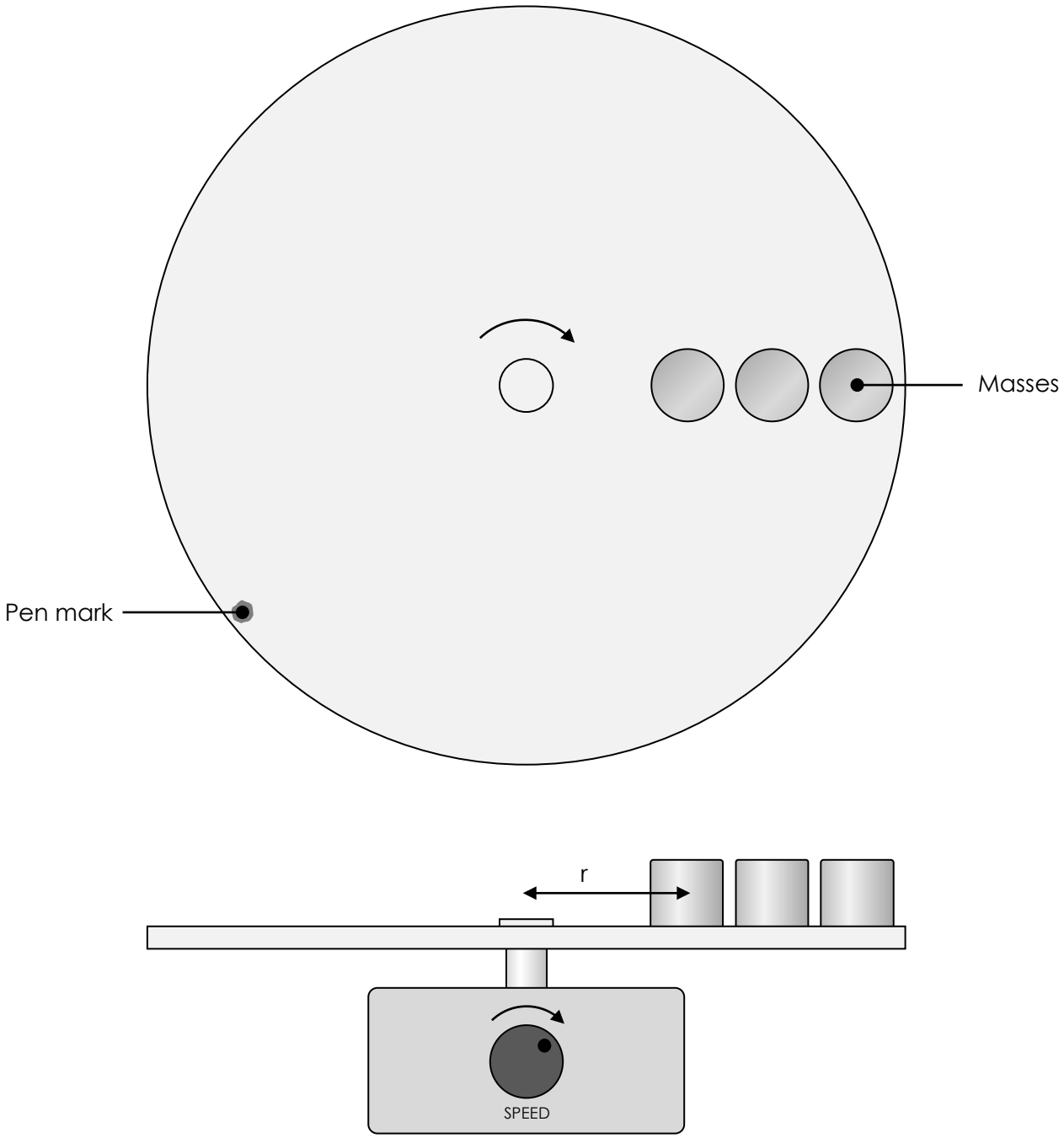
1. An investigation is carried out to examine the forces acting on objects as they move in a circular path.

   A rotating turntable, show below, has small 50 g masses placed at different points. The speed of the motor is adjusted until a mass starts moving outwards and falls off the turntable.



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The speed of the turntable is adjusted until a 50 g mass starts sliding off. The speed is then kept constant as the time for ten complete rotations is recorded - a permanent marker was used to make a mark on the outer part of the turntable to help with counting ten rotations.

The following data was recorded:

Starting distance from centre r / m	Time for ten complete rotations t_{10} / s	Time period for one rotation T / s	Velocity of mass when it started sliding v / m s^{-1}	Velocity^2 v^2 / m^2 s^{-2}
0.160	5.81			
0.120	4.92			
0.080	4.05			

a. In the table above, calculate the **time period** for one rotation

The instantaneous linear velocity can be calculated by using the equation: $v = 2\pi r / T$

b. Calculate the **velocity** when each mass started sliding off the turntable

c. Finish the table with values for **velocity squared**

d. **Plot** a graph of v^2 against r

e. Describe the **relationship** between v^2 and r

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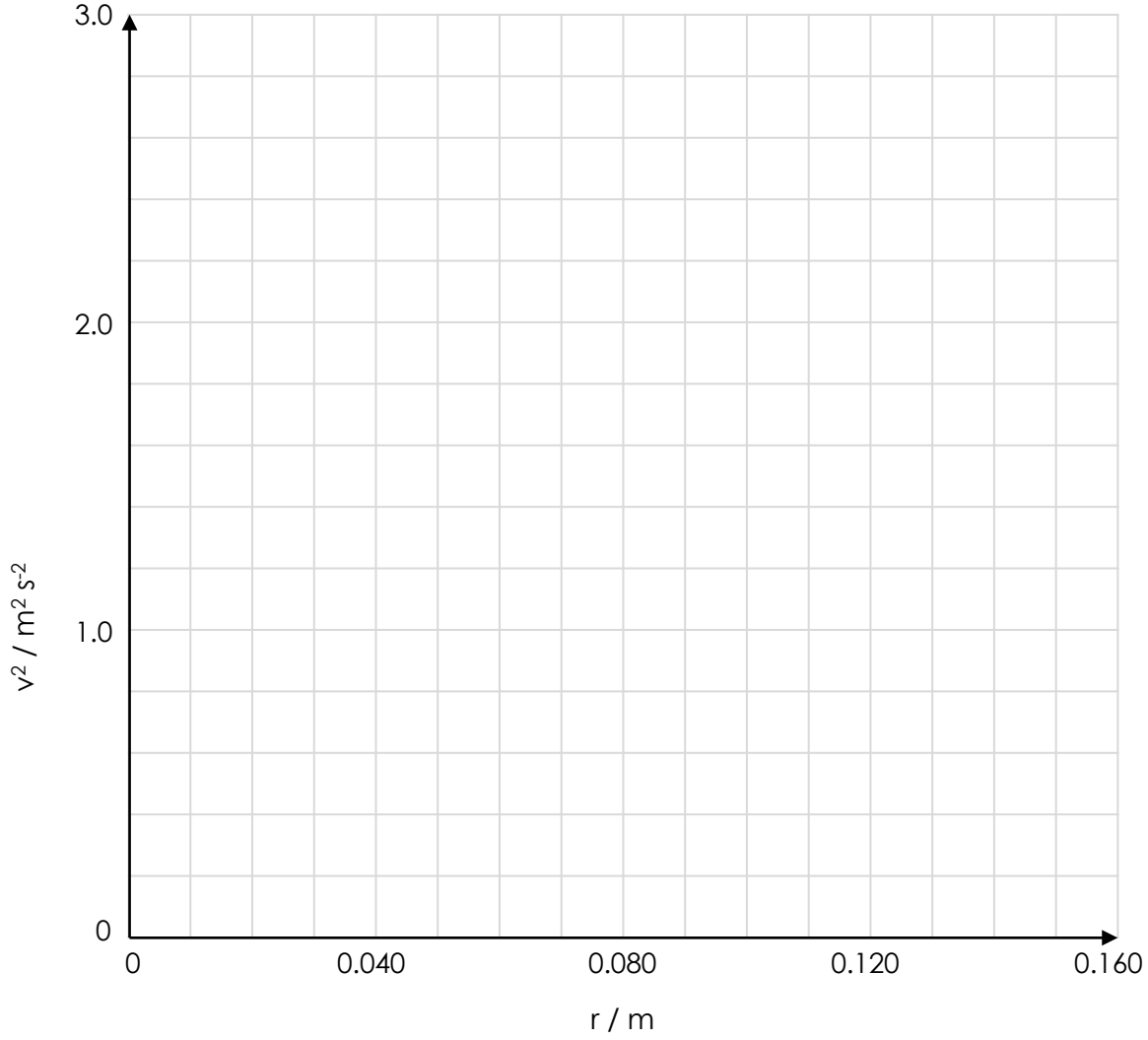

The equation for the size of the centripetal force is: $F = mv^2 / r$

f. Explain why the mass starts to slide off the turntable as it gets **faster**

g. Use the gradient of your graph to calculate the size of the maximum **frictional force** between the turntable and the 50 g masses