(ii) Estimate the percentage uncertainty in your value of x.

percentage uncertainty = ... [1]

(b) (i)
- Pull magnet A down through a short distance.
- Release the magnet. The magnet will oscillate.
- Determine the period T_1 of these oscillations.

T_1 = ... s [2]

(ii)
- Reverse magnet B in the G-clamp so that its S pole is at the top.
- Adjust the position of the wooden rod until x has the same value as in **(a)(i)**.
- Determine the period T_2 of the oscillations of magnet A.

T_2 = ... s [1]

(iii) Calculate $T_2 - T_1$.

$T_2 - T_1$ = ... s [1]

[Turn over

(c)
- Reverse magnet B so that its N pole is at the top.
- Adjust the position of the wooden rod until x is approximately 10 cm.
- Measure and record x.

x = ...

- Repeat **(b)** using this value of x.

T_1 = ... s

T_2 = ... s

$T_2 - T_1$ = ... s
[3]

(d) It is suggested that the relationship between T_1, T_2 and x is

$$T_2 - T_1 = \frac{k}{x^3}$$

where k is a constant.

(i) Using your data, calculate two values of k.

first value of k = ...

second value of k = ...
[1]

(ii) Justify the number of significant figures that you have given for your values of *k*.

.....

.....

..... [1]

(iii) Explain whether your results in **(d)(i)** support the suggested relationship.

.....

.....

.....

..... [1]

(e) (i) Describe four sources of uncertainty or limitations of the procedure for this experiment.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

[4]

(ii) Describe four improvements that could be made to this experiment. You may suggest the use of other apparatus or different procedures.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

[4]

[Total: 20]