□ PHYS1050 / □ PHYS1250
Ref. (Staff Use)___________

Laboratory Worksheet
Experiment NE03 - Faraday's Law of Induction
Department of Physics
The University of Hong Kong

Name: ____________________ **Student ID:** ____________________ **Date:** ______________________

Data Log

Experiment 1: Average induced e.m.f.

Table 1.1 Value of magnetic field strength between the magnetic poles

	Value		Average value
	1st trial	2nd trial	
Magnetic field strength (T)			

Table 1.2 Amplitude and time duration of first peak of induced e.m.f.

	1st trial	2nd trial	Average value
Amplitude of first peak (V)			
Difference in time from the beginning to the end of the first peak. (s)			

Experiment 2: Lightly damped oscillation

Table 2.1 Mass of coil wand

	Value
Mass of coil wand without the resistor(g)	78.825
Mass of coil wand with the resistor(g)	91.136

Table 2.2 Properties of the coil wand

	Value
Distance from the pivot point to the center of mass. (m)	

Table 2.3 Energy of the pendulum

	Value
Initial angle	
Final angle	
Initial height	
Final height	
Sum of energy dissipated by the resistor and energy lost to friction and air resistance, eddy current and power loss of the resistance in the coil	
Total Potential Energy lost **(Refer to gravitational potential energy vs. time graph)**	
Energy dissipated by the resistor = Area of Power vs. Time graph	

Table 2.4

2nd trial - Properties of damping curve due to friction and air resistance, eddy current and power loss of the resistance in the coil

	1st complete motion	2nd complete motion	3rd complete motion	Average value
Period(s)				
	1st peak, A_o	**2nd peak,** A_1	**3rd peak,** A_2	
Amplitude (Degree)				

Discussion

Experiment 1: Average induced e.m.f.

Table 1.3 Calculate the average induced e.m.f.

	Value
Number of turns of wire in the coil. N (Copy from the coil wand)	
Diameter of the coil (m) d	
Radius of the coil (m) r	
Area of the coil (m^2) A	
Change of magnetic field strength during first peak (T) ΔB (Calculate from Table 1.1)	
Difference in time from the beginning to the end of the first peak (s) Δt (Calculate from Table 1.2)	
Theoretical average induced e.m.f. (V) $\overline{\xi_{induced}} = -NA_{\perp}\frac{\Delta B}{\Delta t}$	
Measured average induced e.m.f. from the voltage vs. time graph. (V)	

1. **By using Table 1.3, calculate the percentage difference of the experimental value and theoretical value of induced e.m.f. Account for the difference.** (Hints: Consider all physical quantities of $\overline{\xi_{induced}} = -NA_{\perp}\frac{\Delta B}{\Delta t}$ and the sharp of the voltage vs. time curve)

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2. **Sketch the shape of the voltage vs. time graph below. Identify on the graph where the coil is entering the magnet and where the coil is leaving the magnet.**

3. **Why is the sign of the e.m.f. of the second peak opposite to the sign of the first peak?** (Hints: direction of motion and polarities of magnet)

Experiment 2: Lightly damped oscillation

4. **Using the data in Table 2.4 to complete the following table.**

From	**Table 2.4**
Average period	

5. **Using the data from Table 2.2 and equation (11), calculate the experimental acceleration due to gravity. Given that the theoretical acceleration due to gravity of the Earth is** $9.81 ms^{-2}$ **Account for the discrepancy between the experimental and theoretical values.**(Hints: Consider the shape and mass distribution of the coil wand and the simple pendulum in Figure 5;)

6. Using the data in Table 2.4 to complete the following table.

Amplitude ratio	Table 2.4
$\frac{A_o}{A_1}$	
$\frac{A_1}{A_2}$	
$\frac{A_2}{A_3}$	
$\frac{A_3}{A_4}$	

Is $\frac{A_o}{A_1} = \frac{A_1}{A_2} = \frac{A_2}{A_3} = \frac{A_3}{A_4}$ **correct as predicted by equation (16)?**