PHYS 232C Tables, figures, and calculations for lab

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Contents

Lab 1 Fluids

Procedure

Part II

Figure 1. Experimental setup

Data

Part I

Table 1. Density of water (includes m_c, m_{cw}, V)
Figures: None

Part II

Tables 2-4. Archimedes' principle, objects 1-3 (includes relevant dimensions and force measurements)
Figure 2. Sample plot of force vs time with mean.
Figure 3. Plot of V vs F_B with linear fit.

Calculations

I. Part I

1. Density of water
2. Relative errors for m_c, m_{cw}, V
3. Error propagation for density of water

II. Part II

4. Volumes for objects 1-3
5. Density of water
6. Error propagation for density of water

Lab 2 Bernoulli's law

Procedure

Figure 1. Experimental setup

Data

Tables

Table 1. H, D, d, three values per experiment
Table 2. $\overline{H}$, $\overline{D}$, average over all experiments
Table 3. $\overline{d}$, T, a_0, t_0, y_0, one value per experiment

Figures

Figure 2-5. Plots of y vs t with (t_0, y_0) labeled and fit to find T and a_0.
Figure 6. Plot of T vs $1/d^2$ with linear fit. Give predicted value of slope with error in figure caption. See calculation 4.
Figure 7. Plot of $a_0^{1/4}$ vs d with linear fit. Give predicted value of slope with error in figure caption. See calculation 5.

Calculations

1. Derivation of y as a function of t
2. Derivation of T as a function of d for small d
3. Derivation of $a_0^{1/4}$ as a function of d for small d
4. Predicted slope of T vs $1/d^2$ graph with error
5. Predicted slope of $a_0^{1/4}$ vs d graph with error

Lab 3 Specific heat capacity

Procedure

Figure 1. Experimental setup

Data

Tables

Below we indicate the inner cup, water, and unknown metal as c, w, and m, respectively.
Table 1. $m_c, m_w, m_m, T_{wi}, T_{mi}, T_{fH}, T_{fL}$, proposed substance, needed for each metal

Figures

Figure 2-4. Plots of T vs t with (t_i, T_{wi}) labeled and fits to find T_{fH} and T_{fL}, needed for each metal.

Calculations

1. Derivation of formula for heat capacity of unknown metal
2. Relative errors
3. Heat capacity of unknown metal (one sample calculation)
4. Error propagation on heat capacity (one sample calculation)

Lab 4 Mechanical equivalent of heat

Procedure

Figure 1. Experimental setup

Data

Tables

Table 1. m, M, D_1, D_2, N
Table 2. R_0, T_0, R_i, T_i, R_f, T_f, $R_{f,\text{exp}}$, $T_{f,\text{exp}}$

Figures

Figures. No figures needed in data section

Calculations

1. Derivation of formula for J
2. Calculation for J
3. Relative errors
4. Calculation for σ_J
5. Sample linear interpolation to find T_0 from R_0

Lab 5 Discovering electricity

Data

Data consists of qualitative observations.

Calculations

None.

Lab 6 Coulomb's law

Procedure

Figure 1. Experimental setup

Data

Table 1. l, m, w, r (m from lab handout)
Figure 2. Plot of $\ln \tan\theta$ vs $\ln r$ with fit to determine $\bar{n} \pm \sigma_n$.

Calculations

1. Derivation of formula for $\ln \tan\theta$ vs $\ln r$.
2. Derivation for x and $\tan\theta$ in terms of measured quantities.
3. Calculation for q and q/e.
4. Calculation for F_E/F_G.

Lab 7 Equipotentials and the electric field

Procedure

Figure 1. Experimental setup

Data

Tables

Table 1. Charge distribution, location, Δs, ΔV, E

Figures

Figure 2-4. Plot of charge distribution with (labeled) equipotentials and electric field lines. Indicate location where electric field strength calculated. (To be referenced in Table 1.)

Calculations

1. Sample calculation of electric field strength.

Lab 8 EMF and Ohm's law

Procedure

Figure 1. Resistors in series: Experimental setup
Figure 2. Resistors in parallel: Experimental setup

Data

Tables

Table 1. Resistors in series: $\Delta V_{\text{bat}}, R, R_{\text{s}}, I_0, I_{\text{s}}$ with error estimates
Table 2. Resistors in parallel: $\Delta V_{\text{bat}}, R, R_{\text{p}}, I_0, I_{\text{p}}$ with error estimates

Figures

None

Calculations

I. Resistors in series

1. Derive formula for r and $\mathcal{E}$
2. Relative errors
3. Calculation for r and σ_r
4. Calculation for $\mathcal{E}$ and $\sigma_{\mathcal{E}}$

II. Resistors in parallel

5. Derive formula for r and $\mathcal{E}$
6. Relative errors
7. Calculation for r and σ_r
8. Calculation for $\mathcal{E}$ and $\sigma_{\mathcal{E}}$

Lab 9 RC and LR circuits

Procedure

Figure 1. *RC* circuit: Experimental setup
Figure 2. *RL* circuit: Experimental setup
Figure 3. *RLC* circuit: Experimental setup

Data

Tables

Table 1. *RC* circuit: $R, C, \tau, \tau_{\text{meas}}$
Table 2. *RL* circuit: $R, L, \tau, \tau_{\text{meas}}$
Table 3. *RLC* circuit: $R, L, C, \tau, \omega, \tau_{\text{meas}}, \omega_{\text{meas}}$

Figures

Figure 4-6. *RC* circuit: Plot of voltage vs time with fit to find τ_{meas}
Figure 7-9. *RL* circuit: Plot of voltage vs time with fit to find τ_{meas}
Figure 10. *RLC* circuit: Plot of voltage vs time with fit to find τ_{meas} and ω_{meas}

Calculations

I. *RC* circuit

1. Derive formula for voltage as function of time
2. Relative errors
3. Calculation for τ and σ_τ

II. *RL* circuit

4. Relative errors
5. Calculation for τ and σ_τ

III. *RLC* circuit

6. Relative errors
7. Calculation for τ and σ_τ
8. Calculation for ω and σ_ω