BOĞAZİÇİ UNIVERSITY

Physics Department

Fall '26

Duration: 30 minutes

PHYL102 Applied Exam 1
EMPIRICAL EQUATIONS - PART 2

Name & Surname: _____ **Student ID:** _____

Lab Section: _____ **Table #:** _____ **Date:** _____

ATTENTION: Complete this exam YOURSELF! Correct answers without valid calculations get **NO** credit. Be careful about units and significant figures (sf). Use parentheses in the tables to indicate units. Use only a scientific calculator.

REFERENCE FORMULAS:

- Empirical Equation: $T = AD^n$
- Average Diameter: $D_{ave} = \frac{D_i + D_o}{2}$
- One Period: $T = \frac{t}{5}$

Q-1) Data-Taking (1.2 pts): *Measure inner (D_i) and outer (D_o) diameters for 3 rings. Hang them and measure time (t) for 5 oscillations.*

Description	Symbol (unit)	Ring 1	Ring 2	Ring 3
Inner Diameter	D_i ( )			
Outer Diameter	D_o ( )			
5 Periods	t ( )			

Q-2) Calculations (1.4 pts): *Calculate average diameter (D_{ave}) and one period (T). Take the logarithm of both to plot* $\log T$ *vs.* $\log D_{ave}$.

Description	Symbol (unit)	Ring 1	Ring 2	Ring 3
Average Diameter	D_{ave} ( )			
One Period	T ( )			
Logarithm of D_{ave}	$\log D_{ave}$			
Logarithm of T	$\log T$			

Space for Q-2 Calculations (if needed)

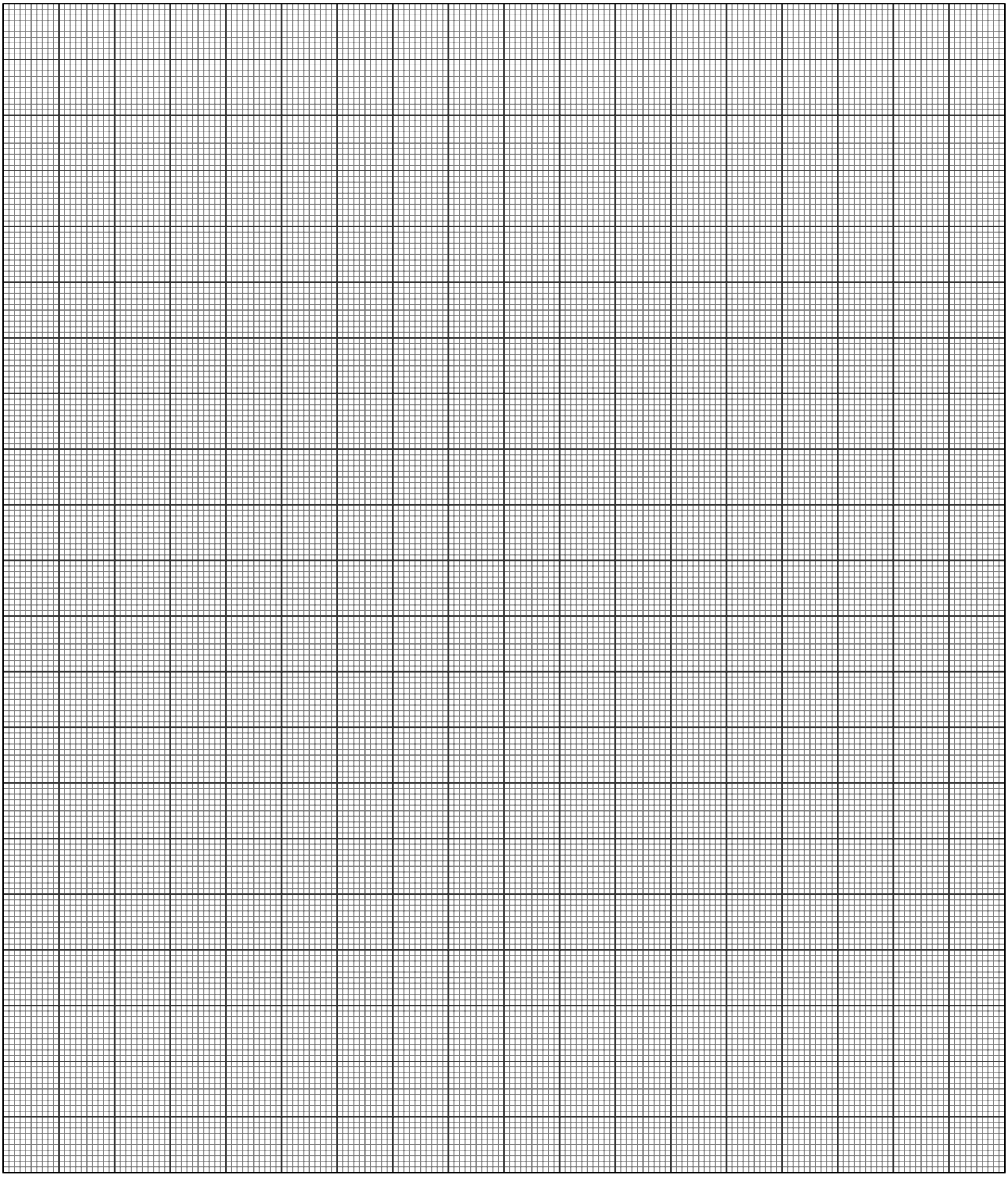
TOTAL SCORE

/ 6

PHYL102 Applied Exam 1: EMPIRICAL EQUATIONS
Graph Sheet ($\log T$ vs. $\log D_{ave}$) **Fall '26**

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Q-3) Graph (0.7 pts): *Plot $\log T$ vs. $\log D_{ave}$ below. Label title and axes, show scales properly, plot a best-fit line, mark two slope points (SP_1, SP_2 other than data points) and show the y-intercept. (Note: y-axis may start with a negative number!)*



Q-4) Give coordinates of the two SLOPE POINTS chosen on the graph (0.4 pts):

SP_1 : (_____ ; _____) SP_2 : (_____ ; _____)

PHYL102 Applied Exam 1: EMPIRICAL EQUATIONS
QUESTIONS & EXTRA CALCULATION SHEET

Fall '26

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Q-5) Read the y-intercept of the line from the graph (0.2 pts): | **y-intercept =**

Q-6) Express n and A in terms of slope points (SP_1, SP_2) and y-intercept (0.6 pts):
(Show your algebraic derivation in the space below! No numerical calculation in Q-6.)

Symbolic n =	**Symbolic A =**

Q-7) Calculate numerical n and A, and give their dimensions (1.0 pt): *(Accuracy of n is important!)*

n =	**dimension of n =**
A =	**dimension of A =**

Q-8) Calculate D for $T = 1.0$ seconds (0.5 pts): | D **(for $T = 1.0$ s) =**

NOTE: Use the space below for your algebraic derivation (Q-6) and numerical calculations (Q-7, Q-8).
NO points will be awarded for final answers in the boxes above lacking valid supporting calculations below.

Space for Derivations & Numerical Calculations (Show all steps for Q-6, Q-7 and Q-8 clearly):