Problem E1. Rolling cylinder *(7 points)*

Part A. Critical slopes *(1 points)*

For critical slope α_0, directly measured quantities and calculations:

The critical slope $\alpha_0 =$

For critical slope α_2, directly measured quantities and calculations:
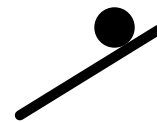
The critical slope $\alpha_2 =$

Part B. Rolling speed *(3 points)*

Rolling distance for average speed $l_t =$

rolling height h (mm)	rolling time, 1st segm.: t_1 (s)	speed, 1st segm.: v_1 (mm/s)	rolling time, 2nd segm.: t_2 (s)	speed, 2nd segm. (mm/s)	rolling time, long t_l (s)	average speed: v_l (mm/s)

The critical slope $\alpha_1 =$

Part C. Force as a function of speed *(2.3 points)*

Formula used to calculate the force:

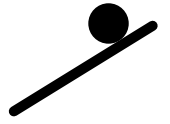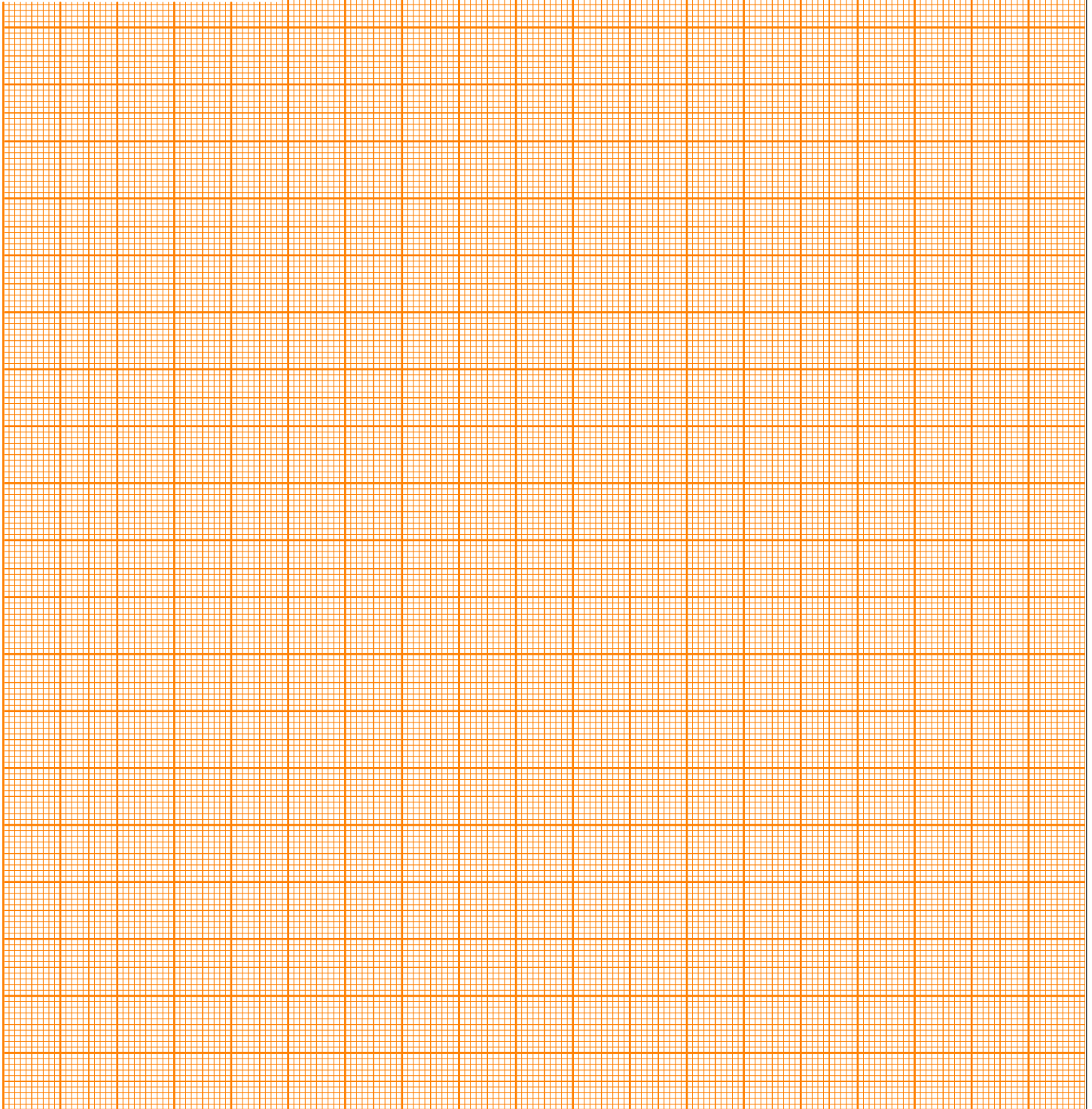| Rolling height h (mm)	Rolling speed v (mm/s)	Force applied (F_m): (mN)				

Graph: F_m versus v

Suggested formula for the dependence $F_m(v)$:
(Indicate the values of all the parameters of
this dependence.)

Part D. Mass of liquid *(0.7 points)*

Formula used to calculate the mass of liquid:

Mass of liquid $m =$

Problem E2. Tungsten Filament *(13 points)*

Part A. Filament diameter *(1.5 points)*

Sketch the measurement setup:

For filament diameter d, directly measured quantities and calculations:

Filament diameter d and its uncertainty:

Part B. Filament's resistance *(2 points)*

Draw measurement circuit(s):

For filament room temperature resistance R, directly measured quantities and calculations:

Filament resistance R and its uncertainty

Filament length l and its uncertainty:

Part C. Current–voltage curve *(2.5 points)*

Draw measurement circuit(s):

Measurements (you don't have to fill the entire table):

Filament temperature before it broke T:

Graph: I versus U
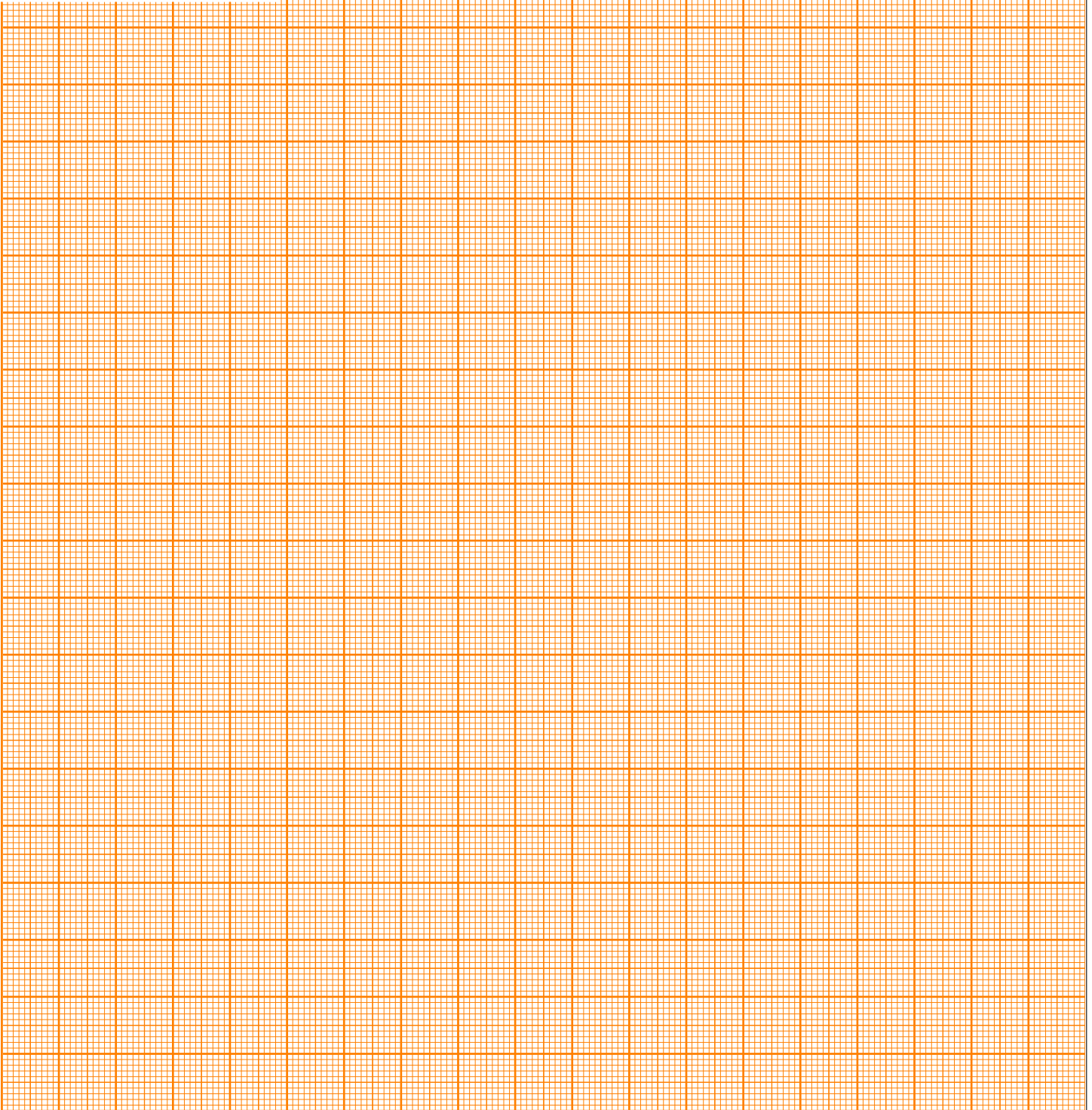
Part D. Emissivity *(3.5 points)*

Formulas used for the graph data:

Calculated data (you don't have to fill the entire table):

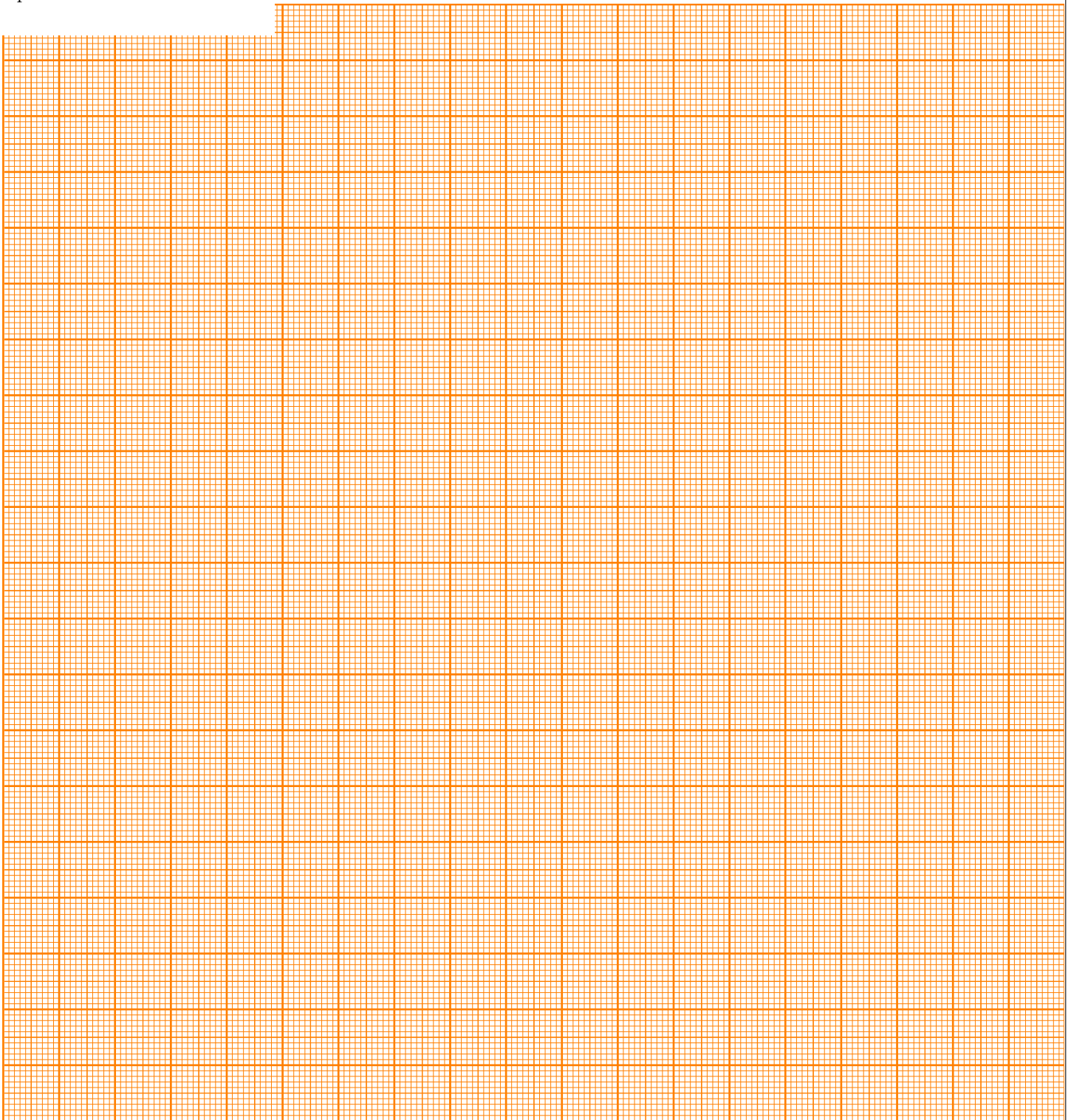|					

Graph

At which temperatures the prediction does hold:

What is the emissivity k in that range:

At which temperatures the prediction does not hold:

Why the prediction fails for these temperatures:

Part E. Specific heat capacity of tungsten *(3.5 points)*

Draw measurement circuit(s):

For quantity of heat Q, directly measured quantities and calculations:

Quantity of heat Q For average specific heat c, measured quantities and calculations:

Average specific heat c

Estimate the magnitudes of the main sources error: