BMEGEÁTBG04	**EVALUATION**	max.50 point
Air Pollution, Waste Water and Solid Wastes Management **1st part: Particle removal from gases** Lecturer: Dr. Jenő M. Suda **1st MIDTERM TEST** **2021-2022-II. (spring) (8th of May 2022)** **45 min (8:15h-9:00h) MGFEA**	group SUM = A	% (min. 30% is a must)

IMPORTANT RULES:

- Only use pen (except for drawings). Take care of your handwriting. Avoid being misread.

NAME (USE CAPITALs!): **NEPTUN code:**

....

Undersigned, I declare with my own signature that I have read and understood the rules.

Signature: **Room Nr. / Seat Nr.:**

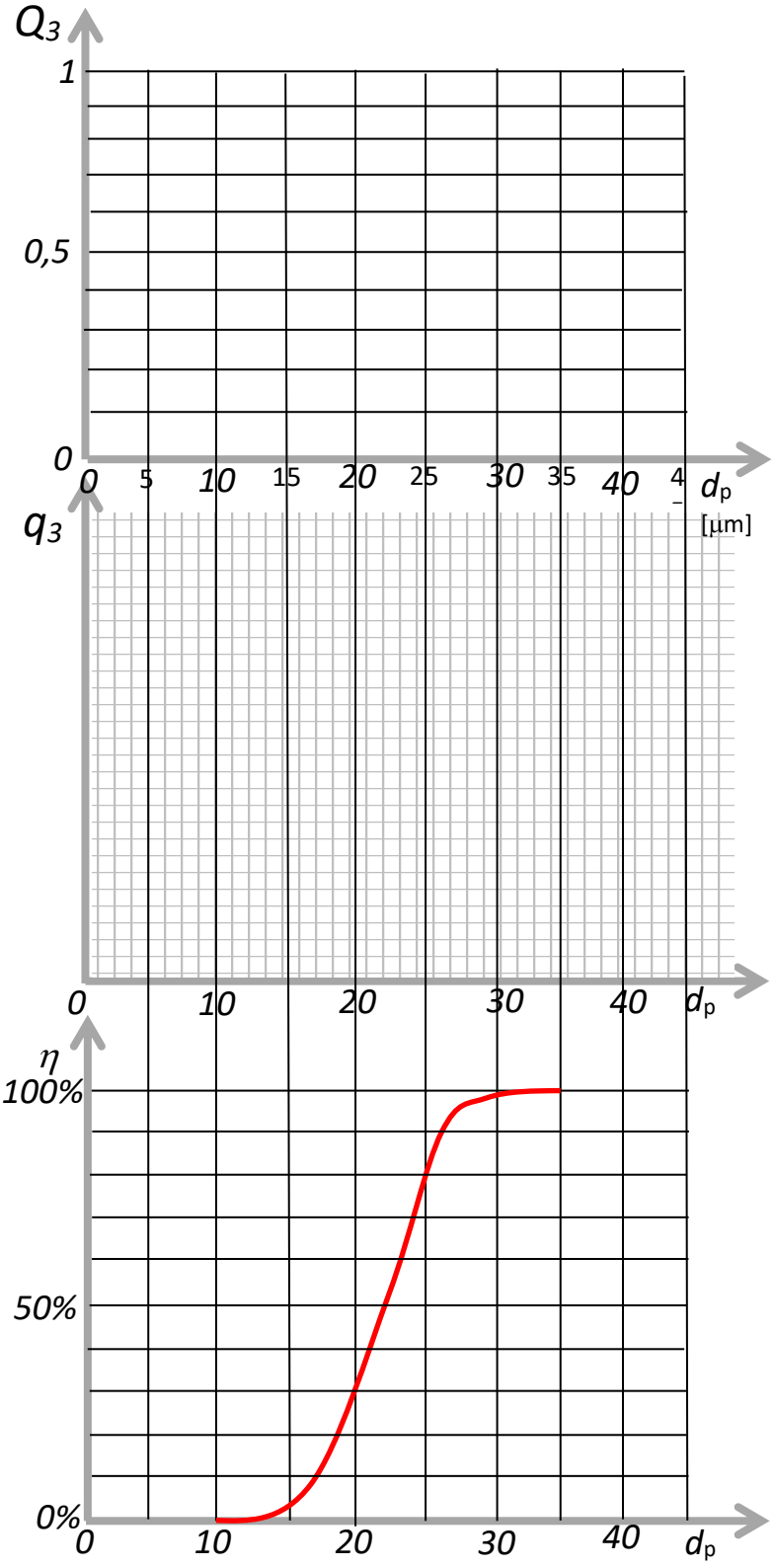
..... MGFEA /.....

1. QUESTION (5points) /

Let's consider a poly-dispersed particle-gas mixture of liquid mist droplets in the air.
The droplet size range is $150\mu m<d_{p,ae}<300\mu m$.
Give a short & clear explanation of whether this particle-gas mixture is or is not an "aerosol" by definition!

2. QUESTION (15points) /

Let's consider an aerosol with a particle size range of $5\mu m<d_p<45\mu m$. It is known that $Q_3=0{,}1$ for particles having $d_p=10\mu m$ and $Q_3=0{,}9$ for particles having $d_p=20\mu m$. Moreover, the average diameter based on the particle mass (or volume) is $d_{50,3}=15\mu m$.



a)Draw the qualitatively proper curve of $Q_3=f(d_p)$ cumulative (undersize) distribution function!

(Graphical answer is needed!)

b)Draw the qualitatively proper curve of $q_3=f(d_p)$ density function!

(Graphical answer is needed!)

Indicate the particle size range in this diagram that contains the upper 30% of the total mass of particles!

(Graphical answer is needed!)

c)The $\eta=f(d_p)$ fractional efficiency curve of a given particle separator equipment is shown here (in red).

Question: Aerosol particles having $d_p>20\mu m$ would be penetrated or separated in this equipment?
(Textual and also graphical answer is needed!)

3. QUESTION (5points) /

STATEMENT: The aerosols are very dilute mixtures.

Give a short & dense proof of this statement (explanation) with the help of the following: *average relative distance, volumetric ratio, mass loading ratio, number density, particle concentration, particle material density etc.*

4. QUESTION (10points) /

Stokes' drag force and Stokes' drag coefficient. Define both with their formulas.
List the validity conditions, and list the name + unit of the quantities used in formulas.

Stokes' drag force:	Stokes' drag coefficient:
Validity conditions:	
List of name + units of the quantities:	

5. QUESTION (5points) /

Settling velocity of a particle. Define it with the formula.
Give also its simplified formula when the buoyancy force is neglected!
List the quantities in the formulas (name + unit)

Settling velocity:	Simplified form(without buoyancy):
List of name + units of the used quantities:	

6. QUESTION (10points) /

What does it mean: “iso-kinetic sampling”?

The iso-kinetic sampling is essential during concentration measurement if large&heavy particles ($\Psi_p \rightarrow \infty$) are in the gas flow. Why?