CALCULATIONS 1

Bulk density, hydrostatical balance

P1.1 In the volumetric cylinder is given 100 cm^3 of water. 500 g of the lightweight absorptive aggregate was added to the water and the aluminum weight with the mass of 216 g was put down on the aggregate. The water increased to the level 1760 cm^3. Than the aggregate was taken out from water, dried on the surface and its mass was 545 g. What is the bulk density of the aggregate?

P1.2 Dry lightweight aggregate was submerged under water and the metal plate was put down on it. Next day the aggregate was taken out from the water, dried on the surface and weighed. The mass of the aggregate was 1820 g. Immediately the aggregate was weighed under water by the hydrostatic balance and its mass under water was 120 g. What is the bulk density of the aggregate?

P1.3 The bulk density of the cement mortar was measured by the hydrostatic balance. Sample of dry mortar with the mass 1,2 kg was attached to the wire from the stainless steel and with the wire was submerged under water. The mass of the sample with the wire under water was 650 g. After that only the wire was submerged and its mass was 70 g. What is the bulk density of the mortar?

Sorptivity and moisture

P1.4 Determine the gravimetric and volumetric sorptivity of the aggregate from the P 1.2

Porosity, loose bulk density

P1.5 The mass of the block from lightweight concrete with the dimensions 600 x 600 x 300 mm is 52 kg. Fully soaked concrete has mass 91 kg. The density of the concrete is 2400 kg/m3. Determine the gravimetric sorptivity and closed porosity of the concrete.

P1.6 Board from the expanded polystyrene has size 1000 x 500 x 40 mm, bulk density 20 kg/m^3, density 1050 kg/m^3. Fully saturated board weights 1,2 kg. Determine the gravimetric and volumetric sorptivity of the board and its total, closed and open porosity.

P1.7 The mass of 1 m^3 of stone was 2960 kg. The stone was grinded into the aggregate with the size 4/8 and the aggregate with the size 16/32. Both aggregates were loosely poured into the calibrated 5l vessel. The vessel with the aggregate 4/8 had mass 8,96 kg and the vessel with the aggregate 16/32 had mass 8,66 kg. After that the both aggregates were compacted to the maximum. The vessel with the consolidated aggregate 4/8 than weighed 10,085 kg and with the 16/32 aggregate weighed 9,32 kg. Mass of empty vessel was 2,3 kg.
Determine the loose bulk density of both aggregates in uncompacted and consolidated state.

Aggregate gradation – particle size curve

P1.8
We have aggregate with the size 0,5/4. Total mass of the aggregate was 1 kg. After sieve analysis these retained were obtained:

Sieve	Individual retained [g]
8	50
4	100
2	250
1	400
0,5	100
0,25	50
0,125	0
< 0,125 (pan)	50
Total	1000

Make the particle size distribution curve of the aggregate.
What is oversize und undersize of this aggregate?

P 1.9 Aggregates C, M, and F are given.

Aggregate C 8/32 :
passing on sieve 63 100%,
passing on sieve 32 70%,
passing on sieve 16 50%,
undersize 5 %.

Aggregate M 2/16:
oversize 10%,
passing on sieve 8 70%,
passing on sieve 4 40 %,
passing on sieve 2 0 %,

Fine aggregate F:
passing on sieve 8 100%,
passing on sieve 4 80%,
passing on sieve 2 60%,
passing on sieve 1 10 %,
passing on sieve 0.5 10 %.

Calculate the total percentage passing for the mixture **C : M : F =** 4 : 2 : 3 and draw the particle size distribution curve.

P1.10 We have these aggregates:

F fraktion 0,5/4		**M** fraction 2/16		**C** fraction 16/32	
oversize	15%	oversize	5%	oversize	10%
sieve 2 passing	70%	sieve 8 passing	80%	undersize	10%
sieve1 passing	30%	sieve 4 passing	50%		
undersize	10%	undersize	0%		

Make the particle size distribution curves of all the aggregates and the curve of the mixture B = F : M : C = 2 : 1 : 4.

P1.11 After sieve analysis of the all-in-one aggregate these retained were obtained:

sieve 32	100 g
sieve 16	360g
sieve 8	400 g
sieve 4	340 g
sieve 2	260 g
sieve 1	400 g
sieve 0,5	100 g
pan	40 g

a) Make the gradation curve of the aggregate.
b) Make the gradation curves of the aggregates 0/2, 2/4 and 4/32, obtained by separating from the mixed aggregate.