



2023 LEVEL 1 PLANT TECHNICIAN CERTIFICATION – PRACTICE PROBLEMS

1. For the following gradation, what is the nominal maximum size?

Sieve, mm	50	37.5	25	19	12.5	9.5	4.75	2.36	1.18	0.6	0.30	0.15	0.075
%Passing	100	100	100	100	97	88	75	64	43	28	19	11	5

2. Consider the following data from a sieve analysis for which all material passes 12.5 mm sieve.

Sieve Size		Accumulated Mass Passing (g)	Total Percent Passing
(std)	(metric)		
1/2"	12.5 mm	1118	100
3/8"	9.5 mm	800	
No. 4	4.75 mm	653	
No. 8	2.36 mm	345	
No. 16	1.18 mm	302	
No. 30	0.600 mm	255	
No. 50	0.300 mm	201	
No. 100	0.150 mm	134	
No. 200	0.075 mm	54	

What is the approximate percent passing the No. 4 (4.75 mm) sieve?

3. You are to develop an aggregate blend for an asphalt mixture. The following fine aggregate (FA) and coarse aggregate (CA) are available. The table gives percent passing as a function of sieve size for each aggregate.

Sieve Size		Fine Aggregate (percent passing)	Coarse Aggregate (percent passing)
(std)	(metric)		
1/2-inch	(12.5 mm)	100	100
3/8-inch	(9.5 mm)	91	98
No. 4	(4.75 mm)	76	32
No. 8	(2.36 mm)	58	21
No. 16	(1.18 mm)	47	3
No. 30	(0.600 mm)	33	---
No. 50	(0.300 mm)	19	---
No. 100	(0.150 mm)	11	---
No. 200	(0.075 mm)	7.9	---

These aggregates are to be combined to produce a final blend having 62% passing the No. 4 (4.76 mm) sieve. What is the percent of fine aggregate in the resulting blend?

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4. Find the combined bulk specific gravity for the following two stockpiles when blended at the percentages shown:
 - Stockpile # 1 (71 percent, $G_{sb} = 2.508$)
 - Stockpile # 2 (29 percent, $G_{sb} = 2.719$)

5. The bulk density of a compacted specimen of a mixture is 140 lbs./ft³. If the maximum density (zero-air void density) of the mixture is 155 lbs./ft³, approximately what percent compaction has been attained?

6. Based on the following laboratory measurements, determine the percent binder absorbed into the aggregate as a percent of the weight of aggregate.
 - Bulk specific gravity of aggregate = 2.695
 - Effective specific gravity of aggregate = 2.725
 - Asphalt binder specific gravity = 1.038

7. What is approximately the Voids in the Mineral Aggregate (VMA) for a compacted asphalt concrete specimen if the following is given for that specimen?
 - Bulk Specific Gravity of Compacted Asphalt Mix = 2.348
 - Bulk Specific Gravity of Combined Aggregate = 2.677
 - Asphalt Content in the mix = 4.3 percent

8. The bulk specific gravity of a compacted specimen of a paving mixture is 2.302. If the maximum specific gravity of this mixture is 2.453, which of the following would closely represent the air void content of the compacted specimen?

9. 259 grams hot liquid asphalt is added to 4680 grams of hot graded aggregate and blended in a bucket mixer. What is the closest to the percent asphalt content?

10. A technician has an aggregate batch of 4210 grams. She wants to make a mix with 6.4 percent asphalt content. How many grams of asphalt binder does she have to add to the hot aggregate batch?

11. A mix design requires a target asphalt binder content of 6.1% by the mass of the mix. The mix will have 20% RAP by the mass of the mix. RAP has a binder content of 5.2%. How much virgin binder, in percent based on the mass of the mix, is needed to deliver the target asphalt content?

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12. For an RPS 9.5mm wearing mix, five specimens from five sublots of a lot deliver average asphalt content of 6.0 percent and standard deviation of 0.14. If the target asphalt content is 5.7 with an acceptable tolerance of $\pm 0.4\%$, what would be approximately percent within limits (PWL) for this lot?
13. What should be the sampling tonnage for the first 500-ton subplot if the generated random number for this subplot is 0.77?
14. For a mix, AASHTO T 283 is followed and average indirect tensile strength of 116 psi is obtained for conditioned (wet) specimens. The standard deviation of these measurements is 22 psi. According to PennDOT Bulletin 27, what is approximately the coefficient of variation for the strength of these conditioned specimens in percent?

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ANSWERS

1. 12.5 mm
2. 58.4%
3. 68.2%
4. 2.566
5. 90.3%
6. 0.42%
7. 16.1
8. 6.2%
9. 5.2%
10. 287.9
11. 5.1%
12. 75
13. 385
14. 19%