

HMA Study Guide

Terminology

- 1) Pb is the _____ of the asphalt mixture.
- 2) In Arkansas, the % binder is based on the total _____ weight.
- 3) Gmb is the _____ specific gravity of the _____.
- 4) Gmm is the _____ theoretical specific gravity of the mixture.
- 5) Report % air voids to the nearest _____ %.
- 6) Gse is the _____ specific gravity of the _____.
- 7) VMA stands for the _____ in the _____ aggregate.
- 8) Report VMA and VMA_e to the nearest _____ %.

Mix Designs

- 9) The allowable field tolerance for % air voids under ARDOT specifications is _____ to _____ %.
- 10) The values calculated for VMA_e are used when determining compliance with field specifications on an ARDOT project. True False
- 11) On ARDOT construction jobs, an asphalt mixture must be produced within the allowable field tolerances for gradation or adjustments must be made. True False
- 12) Two temperatures needed for field quality control which can be found on the ARDOT mix design are the mixing temperature and the _____ temperature.
- 13) The VMA correction factor may be found on the ARDOT mix design. True False

Batching & Mixing

- 14) When batching aggregates for calibration samples, only oven dried aggregates should be used. True False
- 15) The mixing container should be _____ prior to mixing calibration samples to prevent low binder contents in the samples.
- 16) The weight of the aggregate in the mixing bucket is used to compute the weight of the binder to be added to the sample. True False
- 17) After mixing an asphalt specimen, the bucket must be scraped clean until the empty bucket weight is within \pm _____ g of the initial weight of the bucket.

AC Gauge Calibration

- 18) ARDOT 449A requires a dry point, a _____ % point, an optimum % binder point, and a _____ % point for all calibrations.
- 19) A minimum of _____ wet points must be used when performing a calibration.
- 20) Sample pans of an AC Gauge are loaded in _____ layers (lifts).
- 21) The dry point is used for determining the _____ weight for all samples.
- 22) All calibration times including the background count, should be set for _____ minutes.
- 23) When completed, a calibration must achieve a fit coefficient of at least _____ to be considered a valid calibration.

Ignition Oven Calibrations

- 24) Sample weights may not exceed the required minimum masses by more than _____ grams.
- 25) For an accurate determination of a binder correction factor, the calibration factor must be set to _____ in the ignition oven.
- 26) If two calibration samples differ by more than _____ %, then two more samples must be burned at the same temperature for the calibration.
- 27) If the calibration factor determined is greater than _____ % at 538 °C, then the calibration temperature is lowered to _____ ° C and the procedure is repeated.
- 28) An aggregate correction factor for any sieve, is determined by taking the % passing of the _____ sample and subtracting the average % passing of the _____ samples.
- 29) Aggregate correction factors are always applied to all sieves. True False

Sampling Asphalt Mixtures

- 30) When sampling from a truck, you must gather your field sample from a minimum of _____ different locations within the truck.
- 31) When transporting asphalt samples, contamination, _____ of material and _____ loss should be avoided.

Reduction of HMA Samples to Testing Size

- 32) The equipment used in reducing samples may be heated up to _____ °F to help reduce temperature loss.
- 33) WD 40 or diesel oil may be used as a release agent to coat reduction equipment.
True False
- 34) Reduction of samples to testing size may be accomplished using a mechanical _____, the quartering method, or the _____ method.

Gyratory Compaction

- 35) The gyratory compactor must be able to exert _____ ± _____ kPa of force to a specimen after the first five gyrations.
- 36) The internal angle required by AASHTO T 312 for a gyratory compactor is _____ ± 0.02 degrees.
- 37) The speed of gyration during compaction is required to be _____ ± 0.5 gyrations per minute.
- 38) Molds and the gyratory compactor must be verified _____ or as recommended by the manufacturer (whichever comes first).
- 39) Moving the gyratory to a new location does not require re-verification of its calibration.
True False
- 40) To properly compact a specimen for ARDOT quality control/acceptance testing, the gyratory must be set to compact to the _____ number of gyrations shown on the mix design for the mixture.
- 41) Molds and plates must be preheated to the compaction temperature for a minimum of _____ minutes before use and at least _____ minutes between uses.
- 42) The required height of a gyratory specimen is _____ ± 5 mm.
- 43) Specimens compacted for quality control must be compacted at the mixing temperature.
True False
- 44) Asphalt mixtures are placed into a gyratory mold in _____ lift(s).

Bulk Specific Gravity (Gmb)

- 45) When drying back a specimen prior to testing under AASHTO T166, the maximum allowable temperature is _____ $\pm 5^{\circ}$ F to prevent destroying the specimen.
- 46) The water bath used in AASHTO T 166 is required to have an overflow device to control the water level in the tank and to maintain a temperature of _____ \pm _____ $^{\circ}$ F during testing.
- 47) When weighing under water, specimens should be immersed for _____ \pm _____ minute(s) prior to recording the submerged weight.
- 48) When drying the specimen to obtain SSD condition, the specimen may be rolled along a table covered with a dry towel. True False
- 49) Report Gmb to the nearest _____ and absorption to the nearest _____ %.
- 50) AASHTO T 166 may only be used for specimens which have _____ % or less absorption.
- 51) For specimens which have more than 2% absorption, AASHTO _____ or AASHTO _____ must be used to report the bulk specific gravity of the specimen.

Max. Theoretical SpG (Gmm)

- 52) Moisture in the asphalt mixture will influence the test results for Gmm.
True False
- 53) The specimen must be separated during cooling so that there are no fine clumps greater than _____ inch in size to prevent trapped air from influencing the test results.
- 54) After weighing the dry sample in air, the sample is covered with water and a vacuum of _____ ± 0.3 kPa or _____ ± 2.5 mm Hg is applied for _____ ± 2 minutes.
- 55) During vacuuming, the specimen must be agitated at a minimum of _____ minute intervals.
- 56) After vacuuming is complete, the vacuum must be released at rate that does not exceed _____ kPa/s or _____ mm Hg/s.
- 57) After vacuum is released, the specimen is submerged in water for _____ ± 1 minute and the submerged weight of the pycnometer and sample is recorded.
- 58) To determine the submerged weight of the specimen, the submerged weights of the (pycnometer + sample) and (pycnometer) must be _____.

Moisture Content of HMA

- 59) For moisture content determinations of HMA mixtures, scales must be readable to the nearest _____ g.
- 60) To determine the moisture content of an asphalt sample, the sample must be _____ and then dried for an initial period of _____ minutes.
- 61) The temperature required for drying an asphalt mixture is the _____ range shown on an ARDOT mix design.
- 62) After the initial drying period, weights are checked on _____ minute intervals until constant mass is achieved.
- 63) After constant mass is achieved the sample is cooled to room temperature before obtaining the final weight. True False
- 64) Report moisture content of HMA mixes to the nearest _____ %.

AC Gauge Field Testing

- 65) Prior to testing an asphalt sample in the field, a daily _____ count must be taken and the proper _____ activated in the gauge.
- 66) To conduct a field test for binder content using an asphalt content gauge, the sample pans should be filled to within \pm _____ grams of the net calibration weight.
- 67) Field samples should be tested within \pm _____ °F of the calibration temperature.
- 68) The reported % binder is computed by subtracting the moisture content from the gauge reading and rounding to the nearest _____ %.

Ignition Oven Field Testing

- 69) The standard field operating temperature of the ignition oven is either _____ °C or _____ °C based on the _____ temperature.
- 70) The calibration factor should be input into the ignition oven prior to field testing.
True False
- 71) The _____ sample weight is obtained and entered into the ignition oven for computation of the binder content.
- 72) The weight of the sample and basket is used to check proper weighing of the scales within the oven and must check within ± _____ grams of an outside set of scales.
- 73) The reported binder content using an ignition oven is obtained by subtracting any moisture in the tested sample from the binder content shown on the ticket, and then rounding the result to the nearest 1 %. True False

Ignition Oven – Mechanical Analysis

- 74) When washing a sieve analysis sample after an ignition oven burn, you must use a _____ to help in the removal of any asphalt coatings still on the aggregate.
- 75) Required aggregate correction factors are applied prior to rounding for the reported values. True False

Solvent Wash

- 76) When performing an ARDOT solvent wash, you must know the _____ content, and _____ of mixture prior to washing with solvent.
- 77) After solvent washing, the solvent residue must be rinsed from the remaining aggregate with _____ using liquid detergent if needed prior to drying the sample.
- 78) Report the % passing the # 200 sieve to the nearest _____ %.

Rolling Patterns

- 79) Rolling patterns are required for ARDOT asphalt paving projects. True False
- 80) When establishing a rolling pattern, _____ second tests are conducted and each _____ reading is recorded.

Sampling Cores

- 81) When obtaining a sample by coring an asphalt pavement, _____, dry ice, or liquid nitrogen should normally be used to prevent damage to the edge of the cores caused by friction during the cutting process.
- 82) According to ARDOT specifications, if the density of an asphalt pavement is to be determined by cutting cores, then _____ core is required for every lot or subplot of material.
- 83) The minimum diameter of an acceptable core sample is _____ inches in diameter.
- 84) According to ARDOT specifications, tests for density or % compaction of an asphalt pavement should not be taken within _____ feet of the pavements' edge.
- 85) When transporting cores, the cores should be _____ and protected from _____ temperatures.

Density (Nuclear Gauge)

- 86) Before using a nuclear density gauge on a job, a _____ must be taken daily to determine if the gauge is operating correctly.
- 87) A suitable location for conducting a standard count is an _____ surface, _____ feet away from large objects and _____ feet away from other nuclear gauges.
- 88) A nuclear density gauge must pass all standard counts to be used for field testing.
True False
- 89) The use of a nuclear density gauge for determining density of an asphalt pavement requires the determination of a _____ correction factor for each gauge, mix, and every job.
- 90) _____ core correction factors are needed to compute each job correction factor.
- 91) In determining each core correction factor, four _____ density readings are taken within _____ foot of the core location.
- 92) The density (lb/ft^3) of a core is found by multiplying the Gmb of the core by _____ pcf.
- 93) The core correction factor is found by subtracting the average gauge WD from the _____ density.

- 94) The job correction factor is found by _____ the five core correction factors.
- 95) When using the backscatter method on a cold asphalt mat to determine density, set the time to _____ minute(s) and the depth to _____.
- 96) To determine the density of an asphalt pavement using a nuclear density gauge, _____ random test locations are required for each subplot or lot of material.
- 97) The job correction factor is _____ to each test result when calculating the % compaction for the location.
- 98) Report % compaction to the nearest _____ %.
- 99) The reported % compaction for each lot or subplot is determined by using the rules for reporting in ARDOT 461. True False

ARDOT Specifications

- 100) An ARDOT “Lot” of asphalt mix consists of _____ tons, while an ARDOT “Sublot” of asphalt mix consists of _____ tons.
- 101) ARDOT specifications are considered _____ limits.
- 102) Pay items for an ARDOT asphalt paving project are % binder, % air _____, % _____, and % _____.
- 103) ARDOT specifications allow a field compliance range of _____ to _____ % air voids.
- 104) The standard ARDOT specification for % compaction is _____ % to _____ % for normal travel surfaces and widths.