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Question: 1

For granular material, what is the typical optimum moisture content for dry densities ranging from 2100 kg/m³ to 2200 kg/m³?

- A. 4–7%
- B. 8–15%
- C. 16–20%
- D. 21–25%

Answer: A

Explanation:

The optimum moisture content (OMC) is the moisture content at which a soil achieves maximum dry density for a given compactive effort on the Proctor curve. Granular materials (sands/gravels with low plastic fines) typically require relatively low moisture to reach peak density because their structure densifies primarily by particle rearrangement; only a small amount of water is needed to lubricate contacts and aid compaction. Training/compaction manuals define OMC as the peak of the moisture–density relationship and highlight that coarse-grained materials generally peak at lower moisture than fine-grained soils. A maximum dry density range of about 2100–2200 kg/m³ ($\approx 2.10\text{--}2.20 \text{ Mg/m}^3$) is consistent with well-compacted granular base/subbase, which commonly has an OMC in the single-digit percent range. Therefore, the typical OMC range that best matches granular materials at these densities is 4–7%.

Question: 2

What is the main reason for taking handwritten notes while surveying?

- A. To prepare invoices
- B. To create a topographic map
- C. To protect from litigation with the employer
- D. To make a permanent record of survey results

Answer: D

Explanation:

Survey work depends on traceable, reproducible observations. Handwritten field notes (field book entries, sketches, stationing, and benchmark ties) function as the primary record of what was measured, under what conditions, and how control was established. Lindeburg describes that elevations of temporary benchmarks are generally found in field notes and local official filings, reflecting that field notes are treated as an enduring record used later for computations, verification, and re-establishment of control. This is why good surveying practice emphasizes complete notes, clear sketches, and

unambiguous identification of points—so results can be checked, recalculated, and defended long after the crew leaves site. While survey data supports mapping and may indirectly support disputes, the fundamental purpose of handwritten notes is to create a permanent, auditable record of survey results and control ties.

Question: 3

A civil engineering technologist is taking a sample of concrete cylinders from a truck. When should the sample be taken?

- A. At the start of the load
- B. At the end of the load
- C. In the middle of the load
- D. After the load

Answer: C

Explanation:

Concrete cylinder samples must represent the delivered batch , so sampling must avoid the non-representative portions at the beginning and end of discharge where segregation and water/aggregate distribution can differ. ASTM C172/C172M sampling practice requires collecting a composite sample from the middle portion of the load: specifically, not before about 10% and not after about 90% of the batch has been discharged, using two or more portions taken at regularly spaced intervals. A paper hosted by ASTM discussing sampling from truck mixers references ASTM C172/C172M and its requirement for collecting multiple portions from the discharged batch. Training/field guidance consistent with ASTM C172 also states sampling should occur after ~10% and before ~90% of discharge (i.e., the middle of the load). Therefore, the correct answer is in the middle of the load (Option C) .

Question: 4

Which of the following tests are required as part of soil grain size analysis?

- A. Sieve analysis for coarse grains and Atterberg limit tests for fine grains
- B. Sieve analysis for coarse grains and hydrometer test for fine grains
- C. Sieve analysis for fine grains and hydrometer test for coarse grains
- D. Sieve analysis for fine grains and Atterberg limit tests for coarse grains

Answer: B

Explanation:

Soil grain size analysis determines the particle-size distribution across coarse and fine fractions. Coarse particles (sand and gravel) are sized by sieve analysis , where the sample is passed through a stack of sieves and the mass retained on each sieve is measured to build the gradation curve. Fine particles (silt and clay) are too small for practical sieving and are therefore sized using sedimentation methods , most commonly the hydrometer test , which infers particle sizes from settling velocity in a suspension. This combined approach (sieve for coarse, hydrometer for fines) is standard in civil geotechnical testing

programs because it produces a continuous particle-size distribution needed for soil classification and engineering assessment. Atterberg limits (LL/PL) are consistency/plasticity tests for fine-grained soils—not grain size tests—so they are not the required fine-fraction method for grain-size analysis. Therefore, the correct combination for grain size analysis is sieve analysis for coarse grains and hydrometer test for fine grains .

Question: 5

If a controlled product is used, stored, handled, or manufactured at a work site, what documents should be discussed at safety meetings with workers?

- A. Material Safety Data Sheets (MSDS)
- B. Product Application Procedures
- C. Product Colour Board Samples
- D. Workplace Hazardous Materials Information System (WHMIS)

Answer: A

Explanation:

Controlled products (hazardous products) require workers to understand the hazards, safe handling, storage, PPE, first aid, spill response, and emergency measures. The document that communicates this hazard and control information for each product is the Material Safety Data Sheet (MSDS) (now commonly SDS under GHS, but MSDS remains widely referenced in training/exams). Safety systems require that these sheets be readily accessible and that workers be informed/trained on the hazards and controls associated with the products they use. EM 385-1-1 requires hazard communication, including that hazardous chemical information be available and communicated to personnel, and that safety meetings/training address hazard controls and safe work practices. In the WHMIS framework, WHMIS is the overall system, while the MSDS/SDS is the specific product document discussed and referenced for each controlled product. Therefore, the correct choice is Material Safety Data Sheets (MSDS) .

Question: 6

What two municipal plans are required to define a new civil infrastructure project?

- A. Residential/commercial development plan and transportation plan
- B. Municipal Development Plan and Transportation Master Plan
- C. Residential/commercial development plan and city transit plan
- D. Municipal Development Plan and city transit plan

Answer: B

Explanation:

Municipal infrastructure is planned and delivered within a policy framework that links land use (where growth will occur) with transportation (how people and goods will move). A Municipal Development Plan (MDP) typically sets the long-term direction for growth, density, servicing, and community form, while a Transportation Master Plan (TMP) establishes the network strategy, modal priorities, and staging

for roads, transit, active transportation, and related infrastructure. Together, these two plans provide the integrated basis to define and justify new civil infrastructure projects—what is needed, where it should be located, and how it aligns with growth and mobility objectives. Many municipalities explicitly identify the pairing of an MDP with a TMP as the foundational planning structure guiding infrastructure decisions and capital priorities. Therefore, the two municipal plans required to define a new civil infrastructure project are the Municipal Development Plan and the Transportation Master Plan .

Question: 7

Considering Occupational Health and Safety standards for trench side slopes in lieu of shoring, and a 1.2 m wide trench, what is the minimum offset from centre line to the top edge of the trench for an excavation that is 3 m deep?

- A. 1.20 m
- B. 2.40 m
- C. 3.00 m
- D. 5.20 m

Answer: D

Explanation:

For trenches without shoring, OHS/OSHA sloping requirements depend on soil type; when soil is not specified, standard practice is to use the most conservative allowable slope (Type C), which is 1.5H:1V for excavations less than 20 ft (≈ 6 m) deep. Lindeburg's reference (citing OSHA 1926 Subpart P, App. B) provides maximum allowable slopes, including Type C = 1.5:1 (H:V) . For a 3 m deep trench, horizontal run on each side = $1.5 \times 3 = 4.5$ m . Trench bottom width is 1.2 m, so half-width from centreline = 0.6 m . Minimum offset from centreline to top edge = $0.6 + 4.5 = 5.1$ m , which rounds to the available option 5.20 m . Therefore, D is the correct answer.

Question: 8

The delay in the delivery of a critical item may affect the completion date for a project. Which of the following would be the best course of action?

- A. Inform the client of possible delays.
- B. Continue the work on the project as planned.
- C. Tell the client that the delivery is on schedule.
- D. Insist that the supplier meet the original delivery date.

Answer: A

Explanation:

Critical-item delivery risk is a schedule risk that can affect the project finish date, especially if the item lies on or near the critical path. Good project coordination requires timely, accurate communication to stakeholders and proactive risk management. Informing the client early allows transparent expectation management, supports decision-making on mitigation (re-sequencing, alternate materials, expediting,

temporary works), and reduces the likelihood of disputes later. Status reporting guidance emphasizes that project reports should communicate current issues/risks and their impacts so corrective actions can be taken and forecasts updated. Withholding information (option C) is unethical and harmful; simply continuing as planned (B) ignores a known risk; insisting a supplier meet original dates (D) may be attempted but is not always feasible and does not replace proper stakeholder notification and replanning. Therefore, the best course is to inform the client of possible delays and then coordinate mitigation actions through the project controls process.

Question: 9

When calculating the total cost for a multi-year project, which of the following parameters should be considered?

- A. Escalation cost
- B. Cost of material
- C. Alternate material availability
- D. Current material delivery times

Answer: A

Explanation:

Multi-year projects must account for the fact that costs do not remain constant over time; labor, materials, equipment, and subcontract pricing can increase due to inflation and market conditions. Therefore, budgets for longer-duration projects include an escalation estimate to reflect anticipated cost growth over the project timeline. Project management budgeting references explicitly list escalation estimate as a standard budget line item (separate from contingency), recognizing that future-year expenditures need escalation adjustments to be realistic. Civil engineering systems cost analysis also discusses cost escalation patterns in large projects and identifies “cost escalation” as a key phenomenon affecting final cost compared with earlier estimates. While material cost, availability, and delivery times matter for procurement and risk, the parameter that specifically addresses multi-year total-cost realism is escalation cost .

Question: 10

A soil sample has a porosity of 40%, and the specific gravity of solids is 2.60. What would be the approximate value of dry density of the soil if the soil is completely saturated?

- A. 15.30 kN/m³
- B. 20.45 kN/m³
- C. 25.85 kN/m³
- D. 40.25 kN/m³

Answer: A

Explanation:

For soils, porosity and void ratio are related by . With ,

Dry unit weight (often called dry density in kN/m^3 terms) is:

where G_s is specific gravity of solids and V_v is void volume. Substituting :

Note that “completely saturated” affects the bulk/saturated unit weight γ_{sat} , but the dry unit weight γ_d depends only on the solids content (via G_s) and void structure (via V_v), not on how much water occupies the voids. These phase-relationship calculations are standard in soil mechanics.

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