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Questions Bank
Subject: Concrete Technology
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Correct the following expressions by changing one or two word.

1. Portland cement was made in 1800 by calcining nodules of clayey limestone. A cement is stable in liquid environment known as hydrated cement.
2. In the manufacture of cement, raw meal in dry process contains about 40% water and burning in a rotary kiln that is horizontal and brick-lined steel cylinder at a temperature about 1400-1500^{o}C
3. In the microstructure of hardening cement paste C-S-H gel is slightly soluble substance and crystallizes as hexagonal plates.
4. After the hydration of cement the gel contains approximately 23 % porosity and these gel pores about 2 micrometer in nominal diameter.
5. During the mixing process and making the concrete, oven dry aggregate will absorb water greater than the potential water absorption of the aggregate.
6. Aggregate should be free from organic materials that passing through sieve # 200 (size 75 mm)
7. Lightweight expanded clay aggregate known as LECA is one type of natural heavy weight aggregate.
8. For measuring reactivity of aggregate, the frequency of an energy wave passed through the concrete specimens that made by the doubted aggregate is related to the static modulus of elasticity of the specimens. According to ASTM C666.
9. Aluminum sulphates is one of the gas forming chemical admixtures reacts with the hydroxide produced in the hydration of cement to produce minute bubbles of oxygen gas throughout the matrix.
10. The difference in 3 days compressive strength of concrete cubes prepared with pure and doubted water should not differ by more than 5%
11. Non-evaporable water that chemically reacted with cement is about 19 % volume of cement
12. Monosulfate formation on the surface of C_3S crystals prevent quick reaction and delay the setting of cement.
13. The presence of C_2S is harmful to the durability of concrete, particularly where the concrete to be attacked by sulfates.
14. the ability of ordinary steel to withstand the action of water without serious deterioration makes it an ideal construction material to store water.
15. Capillary porosity of cement paste determined by taking the ratio of volume of gel pores without air voids to the total volume of the paste
16. The usual values of silica ratio in the chemical composition of cement is between 0.66 and 1.02
17. Reduction in volume of cement because of the hydration is about 18.5% weight of cement.
18. The main glue in the structure of cement which binds the sand and aggregate particles together in concrete is calcium Aluminate hydrate.
19. Very high level of dehydrated calcium hydroxide in cement paste cause false set of cement.
20. Microsilica is a by-product of the Iron industry.

Choose the correct answer:

21. False set of cement is due to the presence of high :
    a) C_3A content b) C_3S content c) Gypsum content d) Alkalis content
22. If cement partially replaced by pozzolan in making concrete , which one is true

a) Make the concrete permeable at later ages b) less resistance to sulphate attack
c) Increase bleeding and segregation d) nominally delay setting time.

23. The difference in 7 days compressive strength of concrete cubes prepared with pure and impure water should not differ by more than
a) 5% b) 10 % c) 15 % d) 20 %.

24. Organic matter in water for making concrete should not be more than
a) 1000 ppm b) 2000 ppm c) 3000 ppm d) 15000 ppm.

25. Which of the following shape of aggregate give highest workable concrete?
a) Angular b) Irregular c) Rounded d) Flaky.

26. The difference between mortar and concrete, is that mortar not containing
a) Water , b) Fine aggregate c) Coarse aggregate d) cement.

27. Which test apparatus of the following for testing the fineness of cement.
a) Le-Chatlier test b) Vicat test c) Blaine test d). Autoclave test

28. For high resistance to acidic water the best suited cement is
a) Type I , b) Type IP c) Type IA d) type III

29. Which one of the following chemical admixture adds to concrete to increase the rate of early strength development?
a) Thiocyanates. b) Lignosulphonic acids. c) sodium benzoates. d) silicones

30. The water that is chemically combined with cement after the hydration is known also as
a) Gel waster b) absorbed water c) non-evaporable water d) hydrolic water

31. For the manufacture of cement in plants , Burning of raw material mix in a rotary kiln would be at temperature about
a. 1000-1200 ºC b. 1200 – 1400 ºC c. 1400 – 1500 º C d. 1000 – 2000 º

32. For testing standard concrete cylinder of diameter 150 mm, the appropriate rate of increase in load during the test is about------
a. 0.5 kN/s b. 1.5 kN/s c. 3.0 kN/s d. 10 kN/s

33. The electrical resistivity of oven dried concrete is around
a. 10^9 $\Omega.m$ b. 10^4 $\Omega.m$ c. 10^6 $\Omega.m$ d. 10^2 $\Omega.m$

34. Which parameter from the following is related to the strength of concrete in concrete mix design.

a. cement content b. Aggregate to cement ratio c. water to cement ratio d. maximum size of aggregate

35. For aggregate to be within the specification of ASTM C33 , clay lumps and friable particles should not exceed ---
a. 3 % by mass of aggregate sample b. 1 % by volume of aggregate sample c. 3% by volume of aggregate sample d. 3% by mass of concrete mix.

36. Permissible limit of Chloride (CL) in mixing water is
a. 1000 ppm b. 0.1 % c. 1 % d. 0.05% ppm

37. Half of the ultimate strength of the concrete produced with cement type I and usual moist curing will be obtained approximately at the age of
a. 2 days b. 5 days c. 28 days d. 7days

38. When the amount of water absorbed is equal to the potential water absorption, moisture state of aggregate is called,

a. Oven dry, b. Air dry c. SSD d. Damp

39. Air entraining Portland cement is used for making the concrete to:

a. Increase sulfate resistance of concrete b. Accelerate the setting of concrete c. Increase frost resistance of concrete d. Increase the strength of concrete

40. Type of shrinkage that occurs due to no moisture loss from concrete paste but due to the hydration of cement in mix of low w/c ratios under constant temperature is called --

a. Plastic shrinkage b. Drying shrinkage c. Autogeneous shrinkage d. Thermal shrinkage

What is the effect of the following substances on concrete properties briefly?

41. Soft Shale particles in aggregate
42. Bicarbonate in mixing water
43. Algae in mixing water
44. Free lime in the composition of cement.
45. Adding SBR into the concrete mix

Answer the following questions briefly.

46. In cement plants gypsum added to the clinker in the final stages of the manufacture, why?
47. What is the name of the following types of waters in concrete (1) that water used for the hydration of cement, (2) Water on aggregate particles considered as part of mixing water (3) that water used for immersing hardened cement or concrete specimens?
48. What is the reason of D-cracking that happens to concrete?
49. Write three adverse effects of sea water if used as a mixing water for making the concrete
50. What is the meaning of dispersion of flocculated cement particles and increasing the workability by adding HRWR to the mix?
51. Why there is advantage and limit of increasing maximum size of aggregate in concrete.
52. A. Why rapid hardening Portland cement should not be used in large structural sections?
53. B. what you expect to happen if concrete made by siliceous reactive aggregate type tripolitic chert and ordinary Portland cement with high alkali content.
54. C. Classify the aggregate according to their surface texture with one example of rock to each type?
55. D. List three differences between air entrained and air entrapped in concrete,
56. E. What are the advantage and disadvantage of High Alumina Cement
57. Write the name and type of main types and blended types of cement according to ASTM classification.?
58. What are the advantage of using Pozzolanic material to produce Portland Pozzolan cement?
59. write the chemical reactions of both the hydration of tri-calcium aluminate in the presence of gypsum at early age and what will happen after the depletion of gypsum
60. Write the chemical reaction with formula and name related to the hydration of silicates of cement (C_3S. and C_2S).
61. At age of 28 days, assume degree of hydration of ordinary Portland cement is 70% and w/c ratio of 0.5 , determine gel to space ratio and estimate strength of concrete according to Power rule.

62. Define maximum size and nominal maximum size of aggregate according to ASTM and what is the advantage of increasing maximum size of coarse aggregate in concrete mix.
63. Why rapid hardening Portland cement should not be used for mass concrete construction.
64. Why Tests on cylinders are more realistic compared to cubes, and believed to give a greater uniformity of results.

Draw the following relationships, with reasonable values on x & y axis

65. Heat of hydration evolved from cement at early age
66. Well and gap graded aggregate.
67. Effect of maximum size of aggregate on compressive strength of concrete at different cement contents.
68. Development of strength of cement compounds with time.
69. Effect of water content on the workability of fresh concrete measured by flow table diameter with and without HRWR . indicate how to increase both the strength and workability of concrete
70. Effect of length to diameter ratio of concrete cylinder in relation to the strength of cylinder with L/D=2
71. Relation between impact strength and compressive strength of concrete showing the effect of different types of aggregate, (Dolomite, granite and gravel).
72. Effect of rate of loading on the compressive strength of concrete expressed as a percentage to static strength.
73. Development of creep strain of concrete with time since the application of load and creep recovery after 120 days of unloading.

Answer these questions

74. Write the chemical reactions related to the hydration of silicates in cement, showing the amounts of chemicals produced after the hydration for 100 gm of each compound.
75. Where (Which situations) requires using cement of type III.
76. Classify the aggregate according to their shape, give one example of rock to each shape and draw simple sketch.
77. Write about direct and five incidental effects of air entraining admixtures in concrete.

78. Concrete mix with the mixture proportion 1:2 :4 and w/c ratio of 0.55, the actual density of concrete was measured on site was 2375 kg/m^3. Determine the percentage of air in the mix by gravimetric method. Use the following values of specific gravity of ingredients.
    Cement: 3.15 , Fine aggregate: 2.6, Coarse aggregate : 2.7.
79. Cement paste made by adding 75 gm of water to 120 gm of cement, the percentage of air measured was 2.5% and for full hydration of cement determine capillary porosity of the paste.
80. The 28-day specified design compressive strength should be 25 MPa. The concrete required to be low workable for pavement construction. No specimens were tested by concrete manufacturers. Determine the quantities of materials and mix proportion for 1 m^3, and adjust the mix proportion for moisture content of aggregate. The maximum aggregate size provided is 37.5 mm. The properties of the materials are as follows
    Cement: Type I, specific gravity = 3.15
    Coarse Aggregate: Bulk specific gravity (SSD) = 2.70; absorption capacity = 1%;
    dry rodded Unit weight =1650 kg/m^3 ; total moisture is 2.5%.

    Fine Aggregate: Bulk specific gravity (SSD) = 2.65; fineness modulus = 3.0; water absorption = 1.5%. , Total moisture content = 5%