PRACTICE QUESTIONS

for SSC-JE : CBT-2

Building Materials

Civil Engineering

01 Building Materials

Q.1 Consider the following operations of preparation of brick earth:

1. Digging
2. Weathering
3. Tempering
4. Blending
5. Unsoiling

The correct sequence of these operations are:

(a) 5, 1, 2, 4 and 3
(b) 5, 1, 3, 2 and 4
(c) 1, 5, 2, 4 and 3
(d) 5, 1, 4, 2 and 3

Q.2 The ingredients of the brick earth which enables the brick to retain shape is

(a) Alumina
(b) Silica
(c) Iron oxide
(d) Magnesia

Q.3 A queen closer is

(a) full brick
(b) longitudinally $\frac{1}{2}$ brick
(c) $\frac{3}{4}$ brick
(d) $\frac{1}{2}$ brick

Q.4 The defect in clay products because of imprisoned air during their moulding is known as

(a) Blister
(b) Lamination
(c) Cracks
(d) Spots

Q.5 Attrition test on stone is done to find out

(a) Compressive strength
(b) Texture
(c) Rate of wear
(d) Toughness

Q.6 The preparation of surface of stones to obtain plain edges or to obtain stones of required shape and size is known as

(a) Blasting of stone
(b) Quarrying of stone
(c) Seasoning of stone
(d) Dressing of stone

Q.7 Out of the constituents of cement, namely tricalcium silicate (C_3S), dicalcium silicate (C_2S), tricalcium aluminate (C_3A), the first to set and harden is

(a) C_3S
(b) C_3A
(c) C_2S
(d) Any of the above

Q.8 Consider the following oxides in OPC:
1. Al_2O_3
2. CaO
3. SiO_2

The correct descending order of their percentage is
(a) 2, 1 and 3 (b) 2, 3 and 1
(c) 3, 1 and 2 (d) 1, 2 and 3

Q.9 The cement generally used for the construction of road pavement is
(a) rapid-hardening cement (b) ordinary portland cement
(c) low-heat cement (d) blast-furnace slag cement

Q.10 Match **List-I** (Laboratory test apparatus) with **List-II** (Property) and select the correct answer using the codes given below the lists:

List-I	**List-II**
A. Vicat apparatus	**1.** Soundness of cement
B. Le-Chatelier's apparatus	**2.** Initial setting time of cement
C. Briquette	**3.** Tensile strength
D. Permeability apparatus	**4.** Fineness

Codes:

	A	**B**	**C**	**D**
(a)	1	2	3	4
(b)	1	4	3	2
(c)	3	4	2	1
(d)	2	1	3	4

Q.11 The innermost part or core having soft tissues found near the centre of log of a timber tree is called
(a) Pith (b) Heartwood
(c) Sapwood (d) Medullary rays

Q.12 The defect which develops due to uncontrolled and non-uniform loss of moisture from wood is known as
(a) Knot (b) Shake
(c) Warping (d) Cross-grain

Q.13 In plywood manufacturing, the veneers are placed so that the grains of adjacent veneers
(a) Run at right angles (b) Run at 30°
(c) Run at 60° (d) Run at 45°

Q.14 The lime used for finishing coat in plastering is
(a) Semihydraulic lime (b) Kankar lime
(c) Magnesium lime (d) Eminently hydraulic lime

Q.15 For high quality and durable furniture which of the following wood is preferred most?
(a) Sandal wood (b) Deodar
(c) Teak wood (d) Shisham

Q.16 The flaky aggregate is said to be elongated if its length is
(a) Equal to the mean size (b) Twice the mean size
(c) Thrice the mean size (d) Four time the mean size

Q.17 The fineness modulus of fine aggregate is 2.78 and of coarse aggregate is 7.82 and the desired fineness modulus of mixed aggregate is 6.14. What is the amount of fine aggregate to be mixed with one part of coarse aggregate?
(a) 55% (b) 50%
(c) 45% (d) 40%

Q.18 Maturity of concrete is the
(a) 28-days strength of concrete
(b) 365-days strength of concrete
(c) Product of period of curing and temperature of curing
(d) Percentage of strength of concrete cured at 18°C for 28 days.

Q.19 Which of the following is the crudest form of iron?
(a) Steel (b) Pig iron
(c) Cast iron (d) Wrought iron

Q.20 A concrete cylinder of size 150 mm diameter and 300 mm long is tested for split tensile strength of concrete. It failed at a load of 100 kN. The split tensile strength (in N/mm^2) is
(a) 0.35 (b) 0.71
(c) 1.42 (d) 2.83

Q.21 The carpet area of an office building is generally _____ of its plinth area
(a) 80%-95% (b) 60%-75%
(c) 50%-65% (d) 40%-55%

Q.22 The quantity of earthwork for 200 metre lengths for a portion of a road in an uniform ground, the heights of banks at the two ends being 1 m and 1.6 m. The formation width is 10 m and side slopes 2 : 1 (Horizontal : Vertical) is _____ . (Use Prismoidal formula)
(a) 3276 m^3 (b) 3312 m^3
(c) 3288 m^3 (d) 3388 m^3

Q.23 The most accurate cost for a building project is arrived at through
(a) Cube rate estimate
(b) Preliminary estimate
(c) Detailed estimate
(d) Plinth area estimate

Q.24 The scrap value of a building may be about _____ percentage of the total cost of construction.
(a) 7% (b) 5%
(c) 10% (d) 12%

Q.25 The unit of measurement for a half brick wall is
(a) square metre (b) cubic metre
(c) metre (d) cubic foot

Q.26 Which of the following quantities is not measured in square meter?
(a) Damp proof course
(b) Leaf of doors and windows in wood
(c) RCC work for staircase
(d) Painting on walls and underside of slab

Q.27 In a concrete mix of proportion 1 : 2 : 4, the actual quantity of sand, which is judged to have undergone 15% bulking, per unit volume of cement, will be
(a) 2.3 (b) 3.5
(c) 4.6 (d) 4.8

Q.28 The settlement of coarse aggregate towards bottom with scum rising towards the surface is known as
(a) Bleeding (b) Capillarity
(c) Laitance (d) Permeability

Q.29 Addition of air-entraining agents to concrete increases all of the following except
(a) Workability (b) Strength of concrete
(c) Durability (d) Impermeability

Q.30 Which type of vibrator is generally used for compaction of concrete?
(a) Form vibrator (b) Needle vibrator
(c) Surface vibrator (d) Screed vibrator

■■■■

Answer Keys

1. (a)	2. (b)	3. (b)	4. (b)	5. (c)	6. (d)	7. (b)
8. (b)	9. (a)	10. (d)	11. (a)	12. (c)	13. (a)	14. (c)
15. (c)	16. (c)	17. (b)	18. (c)	19. (b)	20. (c)	21. (b)
22. (c)	23. (c)	24. (c)	25. (a)	26. (c)	27. (a)	28. (c)
29. (b)	30. (b)					

Detailed Solutions

1. (a)

The operations involved in the manufacture of clay bricks are:

Unsoiling → Digging → Weathering → Blendning → Tempering

Note: For manufacturing quality bricks, tempering is done in Pug mills.

2. (b)

Functions of various ingredients of brick:

Silica (50-60%): It enables the brick to retain its shape, imparts durability, and prevents shrinkage and warping. Excess of silica makes the brick brittle and weak on burning.

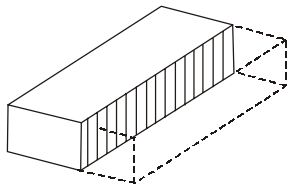
Alumina (20-30%): It absorbs water and renders the clay plastic. If alumina is present in excess of the specified quantity, it produces cracks in brick on drying.

Magnesia (<1%): A small quantity of magnesia in brick earth imparts yellow tint to the bricks and decreases shrinkage. Excess of magnesia leads to the decay of bricks.

Iron oxide (< 7%): It imparts red colour on burning when excess of oxygen is available and dark brown or even black colour when oxygen available is insufficient.

3. (b)

Queen closer: It is the portion of a brick obtained by cutting a brick lengthwise into two portions. Thus a queen closer is a brick which is half as wide as the full brick.



4. (b)

Lamination: These are caused by the entrapped air in the voids of the clay.

Blisters: Broken blisters are generally caused on the surface of sewer pipes and drain tiles due to air imprisoned during their moulding.

Spots: Iron sulphide, if present in the brick clay, results in dark surface spots on the brick surfaces.

Cracks: This defect may be because of lumps of lime or excess of water.

5. (c)

Attrition test: The test predicts the rate of wear of stone against the grinding action against under traffic. Therefore, this test is primarily used for stones to be used in road construction.

6. (d)

Quarrying of stone: The purpose of quarrying is to obtain stones for various engineering purposes.

Dressing of stone: A quarried stone has rough surfaces, which are dressed to obtain a definite and regular shape.

Seasoning of stone: A freshly cut stone carries some natural moisture known as quarry sap making it soft and workable. Good stones should be free from quarry sap. They are allowed to get rid of quarry sap by the action of nature. This process of removing quarry sap is called seasoning.

7. (b)

The compound tricalcium aluminate (C_3A) is characteristically fast reacting with water and may lead to an immediate stiffening of paste, and this process is termed as flash set.

Tricalcium silicate (C_3S) having a faster rate of reaction accompanied by greater heat evolution develops early strength, on the other hand, dicalcium silicate (C_2S) hydrates and hardens slowly and provides much of the ultimate strength.

8. (b)

Oxide composition of ordinary portland cement:

Oxide	Percentage	Average
Lime (CaO)	60-65	63
Silica (SiO_2)	17-25	20
Alumina (Al_2O_3)	3.5-9	6.3
Iron oxide (Fe_2O_3)	0.5-6	3.3
Magnesia (MgO)	0.5-4	2.4
Sulphur Trioxide (SO_3)	1-2	1.5
Alkalis, i.e.,Soda and/or Potash	0.5-1.3	1.0

9. (a)

Rapid hardening cement: It is suitable for repair of road and bridges and when load is applied in a short period of time.

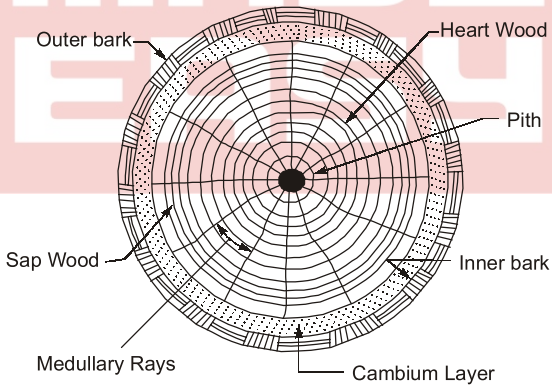
Low heat cement: It is most suitable for large mass concrete works such as dams, large raft foundations etc.

10. (d)

Test Name	Purpose	Apparatus
1. Fineness test	Measure mean size of grains	(a) Sieve method (b) Air permeability method – Nurse and Blaine's method (c) Sedimentation method– Wanger turbidity method
2. Consistency test	To find quantity of water to form a paste of normal consistency	Vicats Apparatus
3. Setting time	To find initial & final setting time of cement	Vicats apparatus
4. Soundness test	To check soundness of cement (i.e. volume change after setting of cement)	(a) Le-Chatelier's apparatus (due to free lime only) (b) Auto Clave test (due to both, free lime and magnesia)
5. Strength test	To check compressive & tensile strength of cement	(a) Compressive strength test (b) Tensile strength test Briquette test or spilt tensile strength test
6. Heat of Hydration	To find out heat of hydration of cement	Calorimeter method
7. Specific gravity test	To find out specific gravity of cement	Le-Chatelier's flask

11. (a)

1. **Pith:** The innermost central portion or core of the tree is called the pith or medulla.
2. **Heart Wood:** The inner annual rings surrounding the pith is known as heart wood. It is usually dark in colour.



It does not take active part in the growth of tree. But it imparts rigidity to tree and hence, it provides strong and durable timber for various engineering purposes.

3. **Sap Wood:** The outer annual rings between heart wood and cambium layer is known as sap wood. It is usually light in colour and weight. It indicates recent growth and it contains sap.

   It takes active part in the growth of tree and sap moves in an upward direction through it. Sap wood is also known as alburnum.

4. **Cambium Layer:** The thin layer of sap between sap wood and inner bark is known as cambium layer. It indicates sap which has yet not been converted into sap wood.

5. **Inner Bark:** It gives protection of cambium layer from any injury.
6. **Outer Bark:** It consists of cells of wood fibre and is also known as cortex.
7. **Medullary Rays:** The thin radial fibres extending from pith to cambium layer are known as *medullary rays*. The function of these rays is to hold together the annual rings of heart wood and sap wood.

12. (c)

Shakes: It is longitudinal separations in the wood between the annual rings.

Knots: These are the bases of branches or limbs which are broken or cut, encased by the wood of the free trunk.

13. (a)

The plywoods are boards which are prepared from thin layers of wood or veneers. The three or more veneers in odd numbers placed one above the other with the direction of grains of successive layers at right angles to each other.

14. (c)

- Magnesium lime is used for finishing coat in plastering and white washing.
- Kankar lime is used for making masonry mortars, plastering and white washing.
- Semi-hydraulic lime is used for masonry mortars flooring and for concrete in ordinary constructions and plaster undercoat.
- Eminently hydraulic lime is used for making mortar and concrete for construction and foundation works i.e., for structural purposes.

15. (c)

Teak wood is the most preferred wood for high quality furniture.

16. (c)

- The least lateral dimension of flaky aggregate should be less than 0.6 times the mean dimension.
- Elongated aggregate are those aggregate whose length is 1.8 times its mean dimension.

Hence, flaky aggregate is said to be elongated if its length is thrice the mean size.

17. (b)

Proportion of fine aggregate

$$= \frac{(FM)_{CA} - (FM)_{mix}}{(FM)_{mix} - (FM)_{FA}} \times 100$$

$$= \frac{7.82 - 6.14}{6.14 - 2.78} \times 100 = 50\%$$

18. (c)

The maturity of concrete is defined as the summation of product of time and temperature

Maturity = Σ (Time × Temperature)

Note: The temperature is reckoned from –11°C as origin in the computation of maturity, since, hydration continues to takes place upto about this temperature.

19. (b)

The crude impure iron which is extracted from iron ores is known as the pig-iron and it forms the basic material for the manufacture of cast-iron, wrought-iron and steel.

20. (c)

$$\text{Split tensile strength} = \frac{2P}{\pi DL} = \frac{2\times 100\times 10^3}{\pi\times 150\times 300} = 1.42\ \text{N/mm}^2$$

21. (b)

The carpet area of an office building may be 60% to 75% of plinth area of the building with a target of 75%. The carpet area of residential building may be 50% to 65% of the plinth area of building with a target of 65%.

22. (c)

By Prismoidal formula

$$\text{Quantity} = \frac{L}{6}(A_1 + A_2 + 4A_m)$$

$$A_1 = Bd_1 + Sd_1^2 = 10\times 1 + 2\times 1^2 = 12\ \text{m}^2$$

$$A_2 = Bd_2 + Sd_2^2 = 10\times 1.6 + 2\times (1.6)^2 = 21.12\ \text{m}^2$$

$$A_m = Bd_m + Sd_m^2$$

$$d_m = \frac{1+1.6}{2} = 1.3\ \text{m}$$

$\therefore$ $A_m = 10 \times 1.3 + 2 \times (1.3)^2 = 16.38\ \text{m}^2$

$$\text{Quantity} = \frac{200}{6}(12 + 21.12 + 4\times 16.38)$$

$$= 3288\ \text{m}^3$$

23. (c)

- Detailed estimate is an accurate estimate and consists of working out quantities of each item of works, and working the cost.
- Preliminary or approximate or abstract estimate is required for preliminary studies of various aspects of a work or project, to decide the financial position and policy for administrative sanction by the competent administrative authority.
- Plinth area estimate is only approximate, and is a preliminary estimate, to know the approximate cost before hand.
- Cube rate estimate is a preliminary estimate or an approximate estimate, and is prepared on the basis of the cubical contents of the building.

24. (c)

Scrap value is the value of dismantled materials.

The scrap value of a building is 10% of its cost of construction.

25. (a)

Half brick wall or thin portion wall measured in sq. m.

26. (c)

RCC work for staircase measured in cu.m.

27. (a)

Mix proportion = 1 : 2 : 4

Let the volume of cement = 1 m^3 (unit volume of cement)

Volume of sand = 2 m^3

Volume coarse aggregate = 4 m^3

$\therefore$ Actual volume of sand = $2\left(1+\frac{15}{100}\right)$ = 2 × 1.15 = 2.3 m^3

28. (c)

If too much water is added to concrete, the excess water along with cement comes to the surface by capillary action and this cement water mixture forms a scum or thin layer of chalky material known as laitance.

29. (b)

The effect of air entrainment on the properties of concrete:

(a) Reduces the tendencies of segregation.
(b) Reduces the bleeding.
(c) Decreases the permeability.
(d) Increases the resistance to chemical attack.
(e) Permits reduction in sand content.
(f) Improves placeability and early finishing
(g) Reduces the cement content cost, and heat of hydration.
(h) Reduces the unit weight.
(i) Permits reduction in water content
(j) Reduces the alkali-aggregate reaction.
(k) Reduces the modulus of elasticity.

30. (b)

Needle vibrator are more efficient than other types of vibrators and hence they are most commonly used.

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