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BUILDING MATERIALS

CIVIL ENGINEERING

Date of Test : 25/08/2025

ANSWER KEY ➤

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

DETAILED EXPLANATIONS

1. (c)

As size of aggregate increases, workability increases.

2. (a)

Preservation serves all the purposes. If it had been **preservative** in the question then option *(c)* would be correct because preservative neither increases the strength nor reduces the moisture content of timber.

5. (b)

Refer Cl. 7.2 of IS : 1077-1992.

7. (d)

Bleeding or water gain is a particular form of segregation in which some of the water from the concrete comes out to the surface of the concrete, because of having lowest specific gravity among all the ingredients of concrete.

Bleeding causes:

- Higher shrinkage cracks at top surfaces.
- Water voids and reduction of bond between the aggregates and cement paste.

8. (b)

As per IS : 456 – 2000, the characteristics compressive strength compliance requirement are:

Grade of concrete	Individual test result (N/mm^2)
M15	$\geq f_{ck} - 3$
M20 or above	$\geq f_{ck} - 4$

So, minimum compressive strength from individual test is f_{ck} – 4 i.e. 26 N/mm^2.

9. (a)

The percentage of fine aggregate will be given as,

$$R = \frac{(FM)_{\text{coarse}} - (FM)_{\text{combined}}}{(FM)_{\text{coarse}} - (FM)_{\text{Fine}}} \times 100$$

$$= \frac{6.8 - 5.4}{6.8 - 2.6} \times 100 = 33.33\%$$

10. (a)

$$\text{Mean dimension} = \frac{60 + 50}{2} = 55 \text{ mm}$$

$$\text{Slot for flakiness index} = \frac{3}{5} \times 55 = 33 \text{ mm}$$

11. (c)

For 1 m^3 of concrete

$$1 = \frac{w_c}{\rho_c} + \frac{w_{ca}}{\rho_{ca}} + \frac{w_w}{\rho_w} + \frac{w_{fa}}{\rho_{fa}}$$

$$\Rightarrow \quad 1 = \frac{400}{3.2\times1000} + \frac{1040}{2.6\times1000} + \frac{200}{1\times1000} + \frac{w_{fa}}{2.5\times1000}$$

$$\Rightarrow \quad w_{fa} = (1 - 0.125 - 0.4 - 0.2) \times 2.5 \times 1000$$
$$= 687.5 \text{ kg/m}^3$$

12. (a)

Specific gravity of aggregates, $G_1 = \frac{C}{B-A}$

Apparent specific gravity of aggregates, $G_2 = \frac{C}{C-A}$

$$\therefore \quad \frac{G_2}{G_1} = \frac{\frac{C}{C-A}}{\frac{C}{B-A}} = \frac{B-A}{C-A}$$
$$= \frac{1250-725}{1200-725} = 1.1$$

13. (b)

As per **Cl. 3.1** of **IS 2180-1988**, the compressive strength of heavy duty clay bricks should not be less than:

Class 40 : Compressive strength not less than 40 N/mm^2 (400 kgf/cm^2)

Class 45 : Compressive strength not less than 45 N/mm^2 (450 kgf/cm^2)

16. (b)

1 m^3 of wet cement mortar = 1.25 m^3 of dry mortar

Sum of proportions = 1 + 6 = 7

$$\therefore \quad \text{Volume of cement} = \frac{1.25}{7} = 0.17857 \text{ m}^3$$

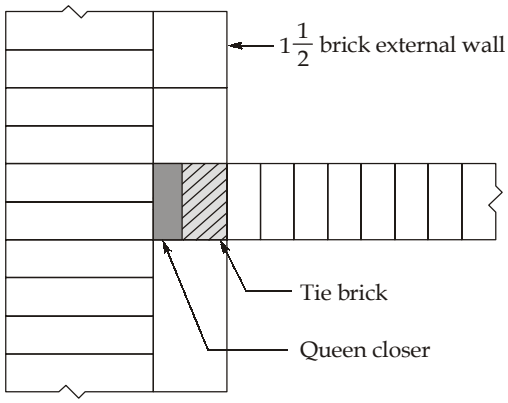
$$\therefore \quad 0.17857 \text{ m}^3 \text{ of cement} = \frac{50}{0.0347} \times 0.17857 = 257.3 \text{ kg cement}$$

$$\text{Volume of sand} = \frac{6\times1.25}{7} = 1.07 \text{ m}^3$$

17. (d)

Chrysotile is incombustible upto 110°C.

18. (b)



19. (c)

Slenderness ratio, $S_R = \frac{L}{t}$ or $\frac{h}{t \times k_n}$ whichever is less

$h = 3$ m, $k_n = 1.2$, $t = 0.20$ m, $L = 3.5$ m

$$S_R = \frac{3.5}{0.2} = 17.5$$

$$S_R = \frac{3}{0.20 \times 1.2} = 12.5$$

So, $S_R = 12.5$

20. (d)

IS 456 : 2000 stipulates a minimum of 7 day moist curing while **IS : 7861 (Part I) 1975** stipulates a minimum of 10 days curing under hot weather condition. On an average, the one-year strength of continuously moist cured concrete is 40% higher than that of 28 days moist cured concrete, while non moist curing can lower the strength to about 40%. Moist curing for the first 7 to 14 days may result in a compressive strength of 70% - 85% of that of 28 days moist curing.

21. (a)

The raw materials used for manufacturing of high alumina cement are limestone and bauxite.

22. (c)

1 m^3 freshly mixed concrete corresponds to 1.54 m^3 dry volume of concrete.

Summation of proportions = 1 + 2 + 4 = 7

$\therefore$ Volume of cement $= \frac{1.54}{7} = 0.22\ m^3$

Volume of sand $= \frac{2}{7} \times 1.54 = 0.44\ m^3$

23. (c)

Fine cement has lower setting time than coarse cement.

25. (a)

Variation in moisture content of wood with atmospheric condition causes dimensional change in wood. If dry piece of timber is kept in saturated atmosphere, it absorbs water from air to about 15% of weight and swells up. Drying of wood below saturation point results in shrinkage.

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