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(1)

Q(1) Which Step is taken to Prevent flash Setting of Cement? ALSO write steps to prevent false setting of concrete.

Ans:- Flash Set:- It is the immediate stiffening of Cement Paste in few minutes after mixing with water. It is accompanied by large amount of heat generation upon reaction of C3A with water. Gypsum is added in cement to prevent flash set Gypsum slow down the setting of cement so that cement is adequately hardened.

⇒ False Set:- It is rapid development of rigidity of cement paste without generation of much heat this rigidity can be overcome and plasticity can be regained by further mixing without addition of water. In this way cement paste restores its plasticity and sets in a normal manner without any loss of strength. This is usually due to the nature of calcium sulfates added, specifically too much calcium sulfate hemihydrate.

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When too high an amount of hemihydrate is present, it simply follows its own hydration route towards gypsum precipitation leading to an early setting of cement.

Hemihydrate may form in hot spots of the mill during clinker-gypsum co-grinding.

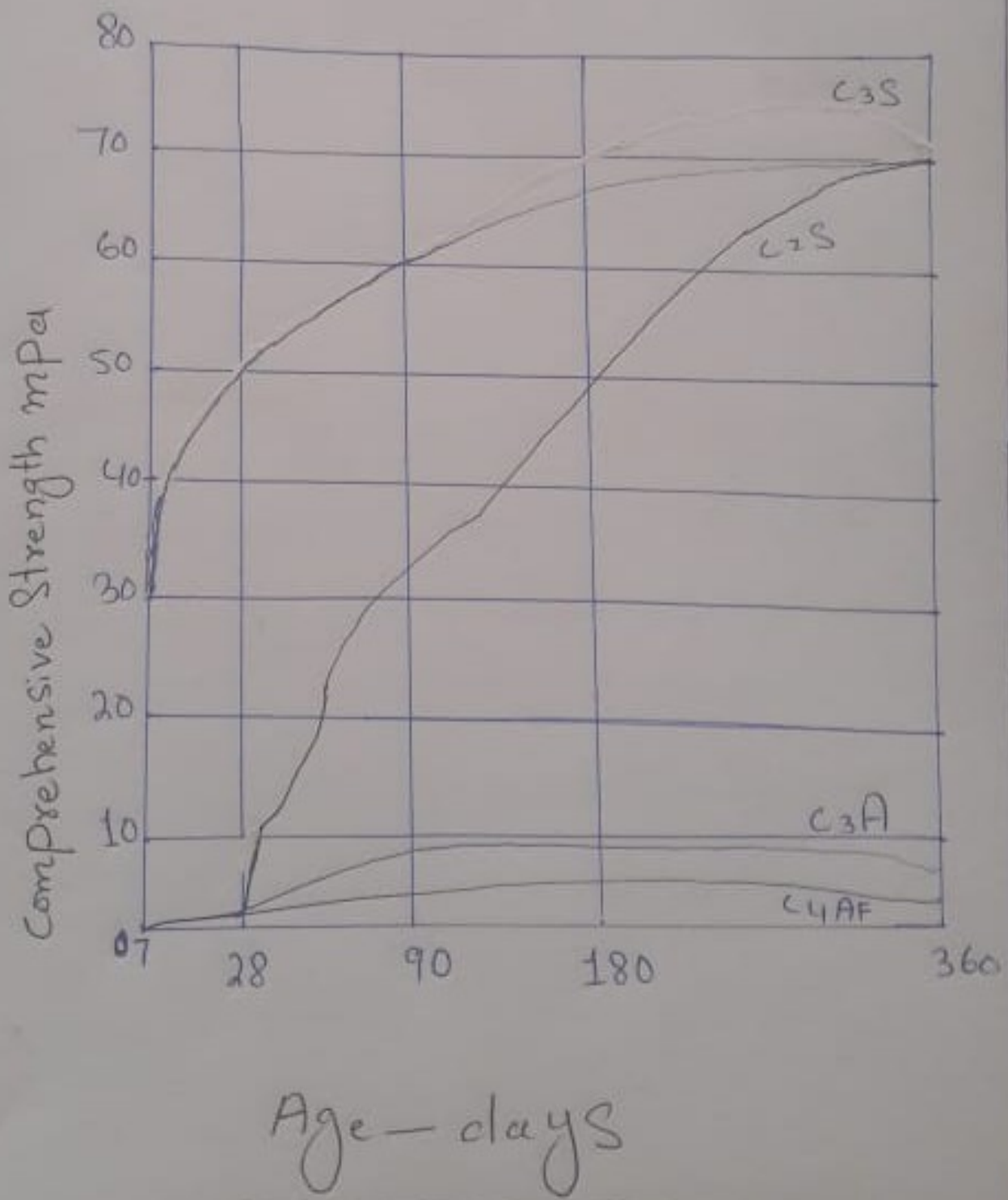
120-140°C is enough.

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Q(2) Draw a graph showing the strength development of Pure compounds of cement.

Ans: Development of Strength of Pure Compound.



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Q3 Why TYPE III cement is Rapid Hardening and TYPE IV Low Heat Producing?

Ans - TYPE III Cement:-

TYPE III Cement is rapid hardening because the component of type III is more finely grounded with roller and grinder and addition of more C_3A as compared to type IV.

⇒ TYPE IV Cement:-

The low heat producing of type IV is due to the low content of C_3A and C_3S . The product of type IV are less finely grounded

Therefore the content react slowly and produce low heat of hydration.

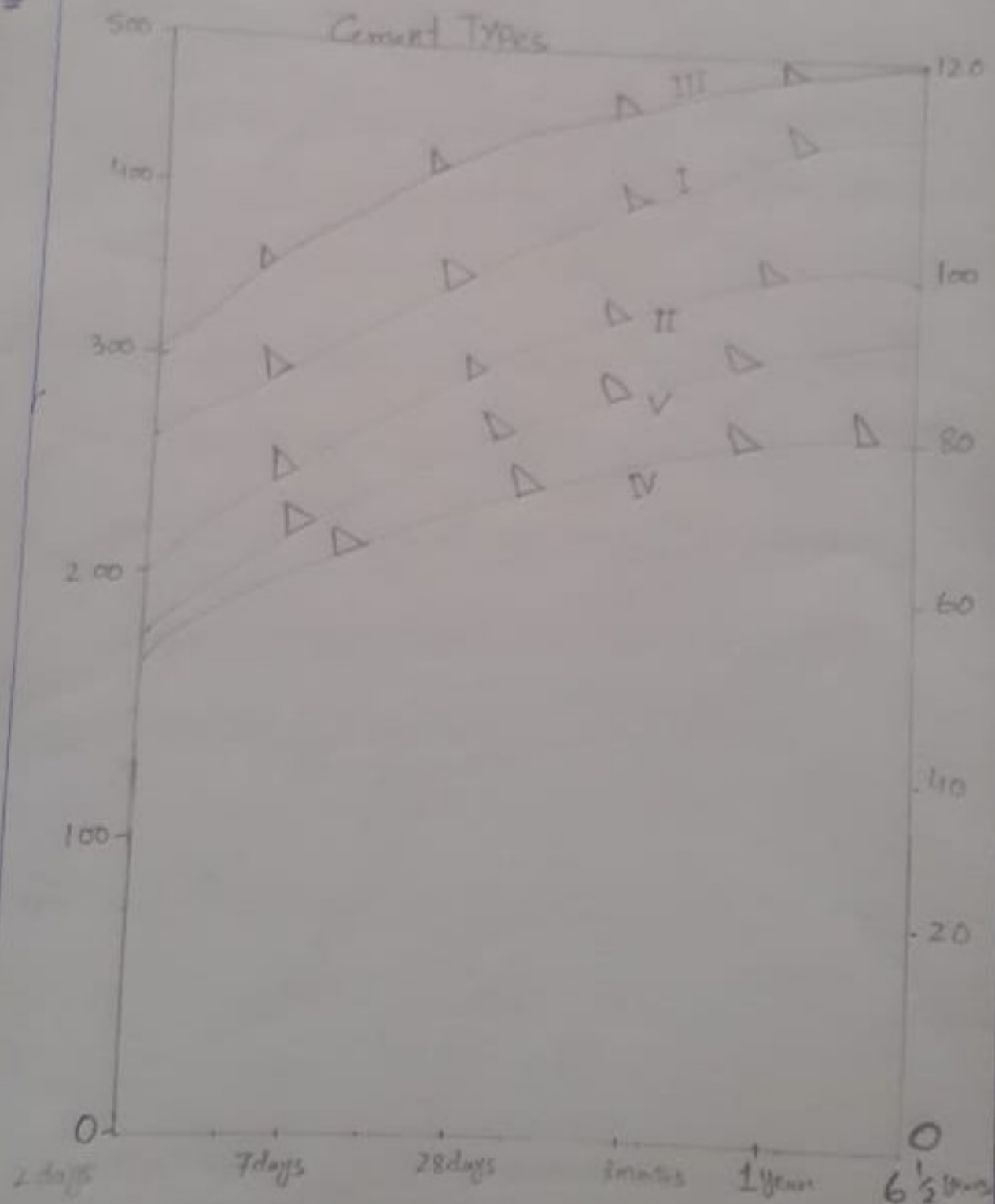
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Q32

Part II:- Draw a graph showing the development of heat of hydration of different Cement types.

Ans:-



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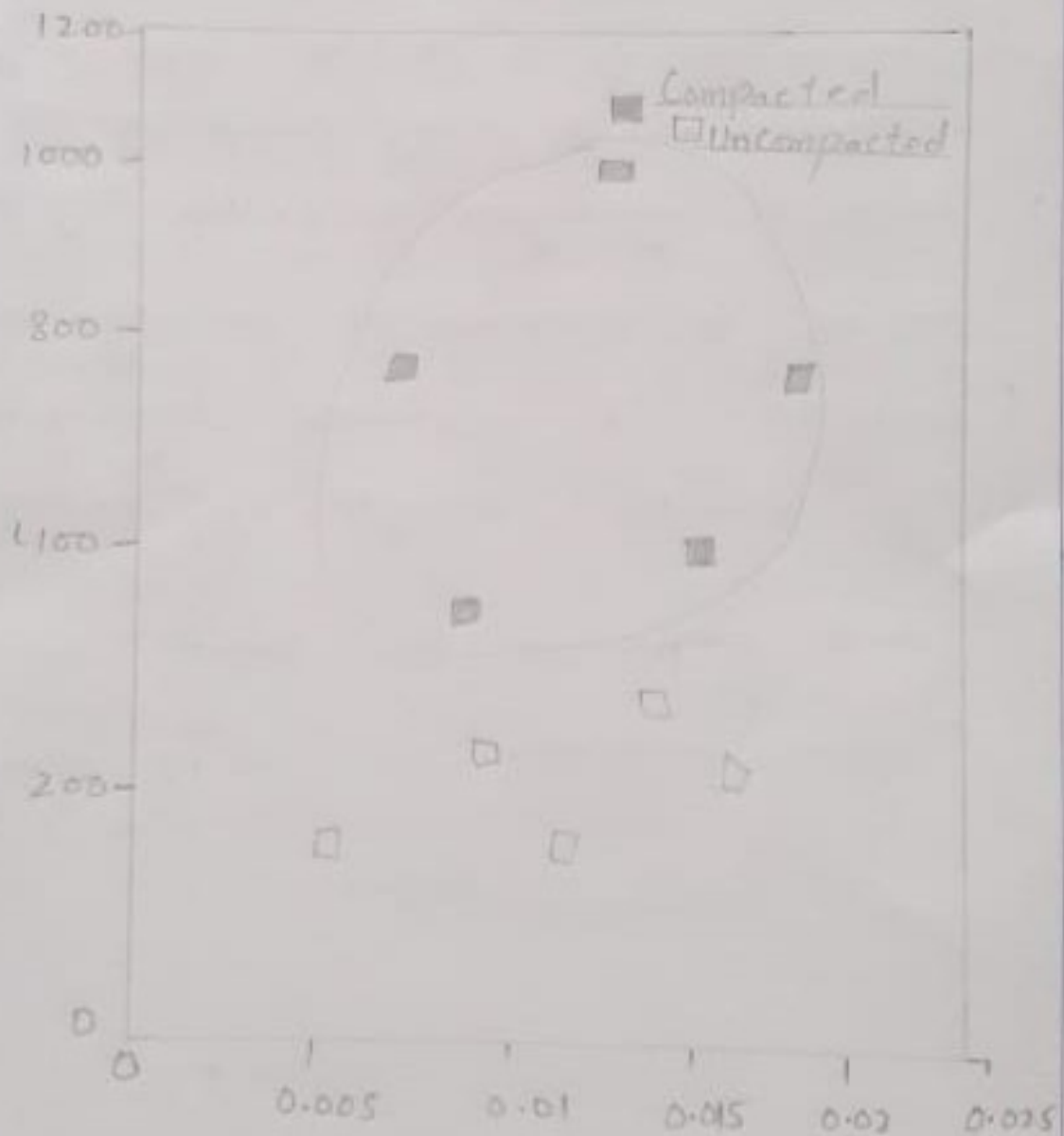
Q4:- What is the effect of Compaction on entrapped air of concrete? What will be the effect on strength if concrete is not compacted sufficiently?
Explain with graph.

Ans:- Compaction is the process which expels entrapped air from freshly placed concrete and packs the aggregate particles together so as to increase the density of concrete. It increases significantly the ultimate strength of concrete and enhances the bond with reinforcement. also graph?

Graph next page:-

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Q4:- Graph & Explanation:-



CaCO₃ Content (g/g)



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Q5 - Why is the percentage of gypsum added to cement limited only to 5%?

Ans - Gypsum is added to cement 2 to 4% during cement manufacturing to control flash set. The limit is 5% but if we exceed the limit it will effect harmful. If you have high amount of C_3A then it may react with extra sulfates of gypsum which forms ettringite. Ettringite can expand in volume which may cause cracks in plaster.

Q6:-

What is the effect of following on the bond strength of concrete?

- ① Shape of aggregate?
- ② Size of aggregate?
- ③ Texture of aggregate?
- ④ Bleeding?

Ans:-

① Shape of aggregate:-

Particle shape of aggregate principally affects the w/cm by its effect on water demand and amount of Paste required for workability of a given mixture. Also, the bond with the cement paste may be weakened due to the accumulation of bleed water under the relatively long surface areas of flat particles of aggregate.

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② Size of aggregate:- The smaller

the size of aggregate the higher is the strength of the concrete and less will be workability. It is so because smaller aggregates consequence less affection of stress that causes due to dia similar elastic module of paste & aggregates, around particles.

Q. 6
6 (iii)

Texture of Aggregate:

The surface texture of aggregate can be either smooth or rough. A smooth surface can impair workability, yet a rougher surface generates a stronger bond between the paste and the aggregate creating a higher strength.

Q. 6 (iv)

Bleeding:-

Concrete bleeding can have multiple negative repercussions, on a project. It can prolong construction, cause poor bonding b/w. layer of poured concrete, and make the mixture harder to pump. As for as safety is concerned, the poor bonding b/w layer is the greatest standard protection from bleeding.

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Q 7:- What is the effect of following on workability of aggregate?

Ans:- (i) Porosity and absorption-

When flat or elongated

particles are contained in the coarse aggregate, the quantities of sand, cementitious material, and water must be increased.

The porosity of an aggregate may also affect the workability of concrete. If the aggregate can absorb a great deal of water, less will be available to provide workability. The absorbed ratio is the water added to the unit weight of cement. If the aggregates absorb water and equivalent water for this absorption is not added above the required w/c ratio, the workability reduces, maybe becoming unworkable, depending on the dryness of the aggregates.

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(ii) Air Entraining agent :- Answer # 7

Air entraining agents or Pare forming are compounds that entrain microscopic air bubbles in Cement composition, which then harden in to concrete having microscopic air voids.

(iii) Coarse aggregate to fine aggregate ratio :-

When flat or elongated particles are contained in the sands, cementations materials, but generally range b/w 3/8 and 3-1.5 inches in diameter, and water must be increased. The porosity of an aggregate may also affect the workability of concrete. If the aggregate can absorb a great deal of water, less will be available to provide workability. Sand or crushed stone particles passing 3/8".

(iv) Grading of Aggregates :- Grading of aggregates have the maximum effect on the workability of concrete. A well graded aggregates have all size in required percentages; the helps in reducing the voids in a given volume of aggregates. The less volume of voids make the cement paste available for aggregate surface to provide better lubrication to the aggregate.

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Q 8.1-

What is the effect of fineness of Cement on the following?

- (i) Strength of concrete
- (ii) Rate of heat evolution during hydration
- (iii) Total heat of hydration
- (iv) Workability.

Ans:-

(i) Strength of concrete-

cause at increased rate of hydration. high strength & high heat generation. Bleeding can be reduce by increasing fineness.

(ii) Rate of heat of evolution during hydration-
The fineness of cement has an important bearing on the rate of hydration & hence on the rate of gain of strength & also on the rate of evolution of heat. finer cement offers a greater surface area for hydration and hence faster the development of strength.

(iii) Total heat of hydration:- The size of cement particles directly affects the hydration setting and hardening strength and heat of hydration. The finer the cement particles are the longer the total surface area is & the bigger the area contacting with water is :-

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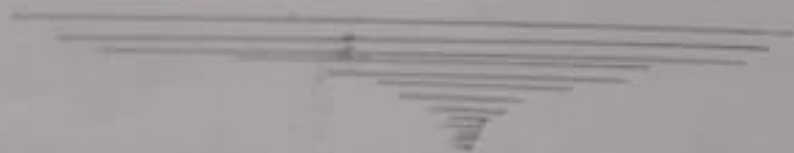
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Q8 (iv)

Workability of Concrete:-

The workability of non air-entrained concrete is increased by increasing the cement fineness in air-entrained concrete the effect of fineness of cement on workability is very much less pronounced the 28 day compressive strength of concrete, with or without entrained air, increases with an increase in cement fineness.



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Q 9:- What Steps Can be taken during transportation and Placement of concrete to prevent Segregation of concrete?

Ans:-

Segregation of concrete can be prevented by correctly proportioning the mix and using the recommended water - cement ratio so as to prevent using excess water. Care should be taken while handling, placing, transporting, compacting and also at finishing stage.

→ Control measures:-

- 1- it should be mixed properly.
 - 2- if unmonitored, excess water is added by unskilled labour/labour contractors for increasing workability leading to higher water - cement ratio in concrete - This should be avoided. - Admixtures or air entraining agents should be used to avoid segregation that too not beyond prescribed by design/engineer in charge.
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