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Paper = Concrete Technology

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Q.1 Which step is taken to prevent flash setting of cement? Also write steps to prevent false setting of concrete.

Step to prevent flash setting of cement:

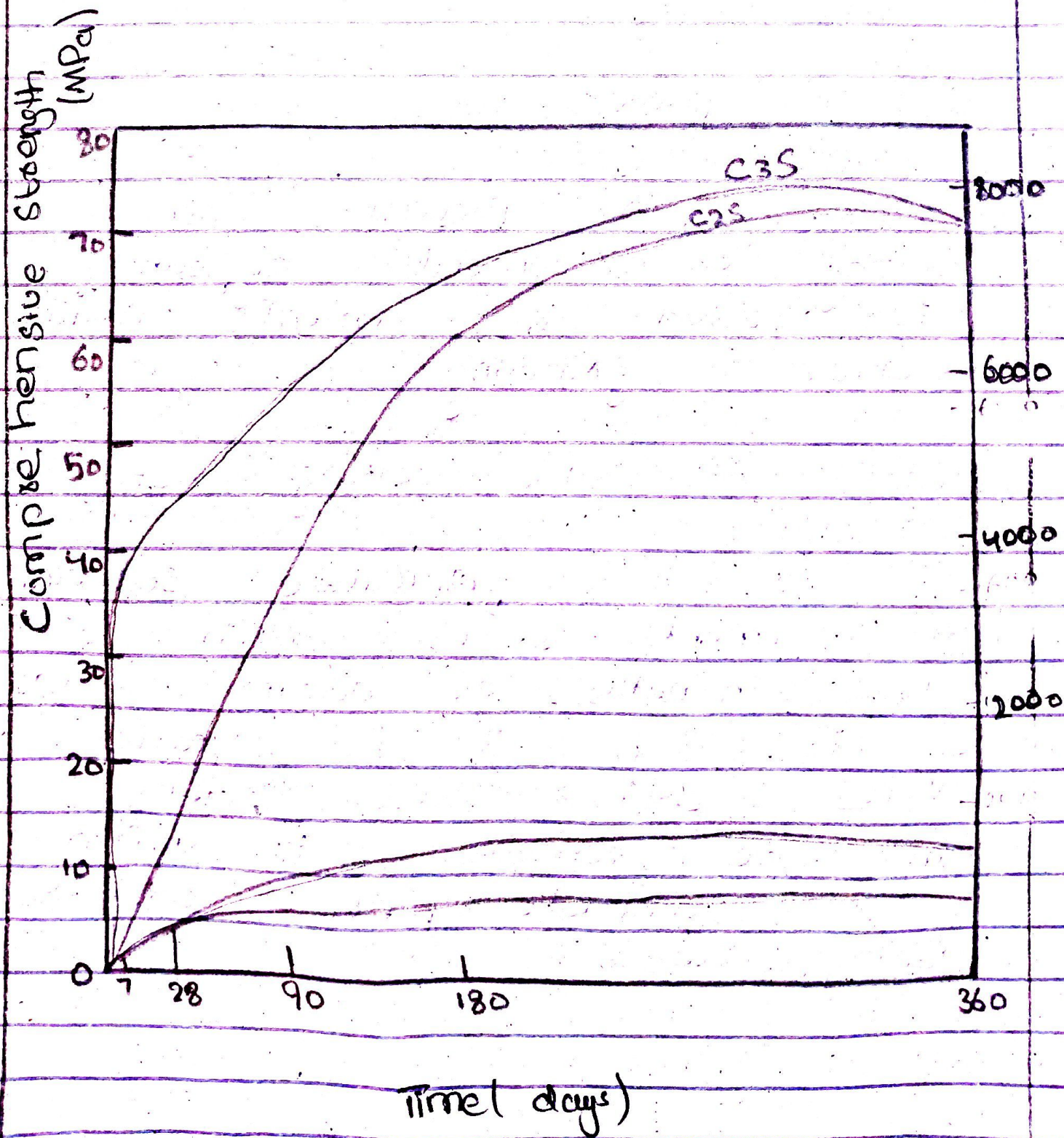
To prevent flash setting of cement, gypsum is added to cement clinker while grinding.

Prevent of false setting of concrete:

If premature stiffening of cement occurs within a few minutes of adding water to it, then it is called false setting. False setting can be removed by remixing the concrete paste without adding water.



Q.2 Draw a graph showing the strength development of pure compounds of cement.





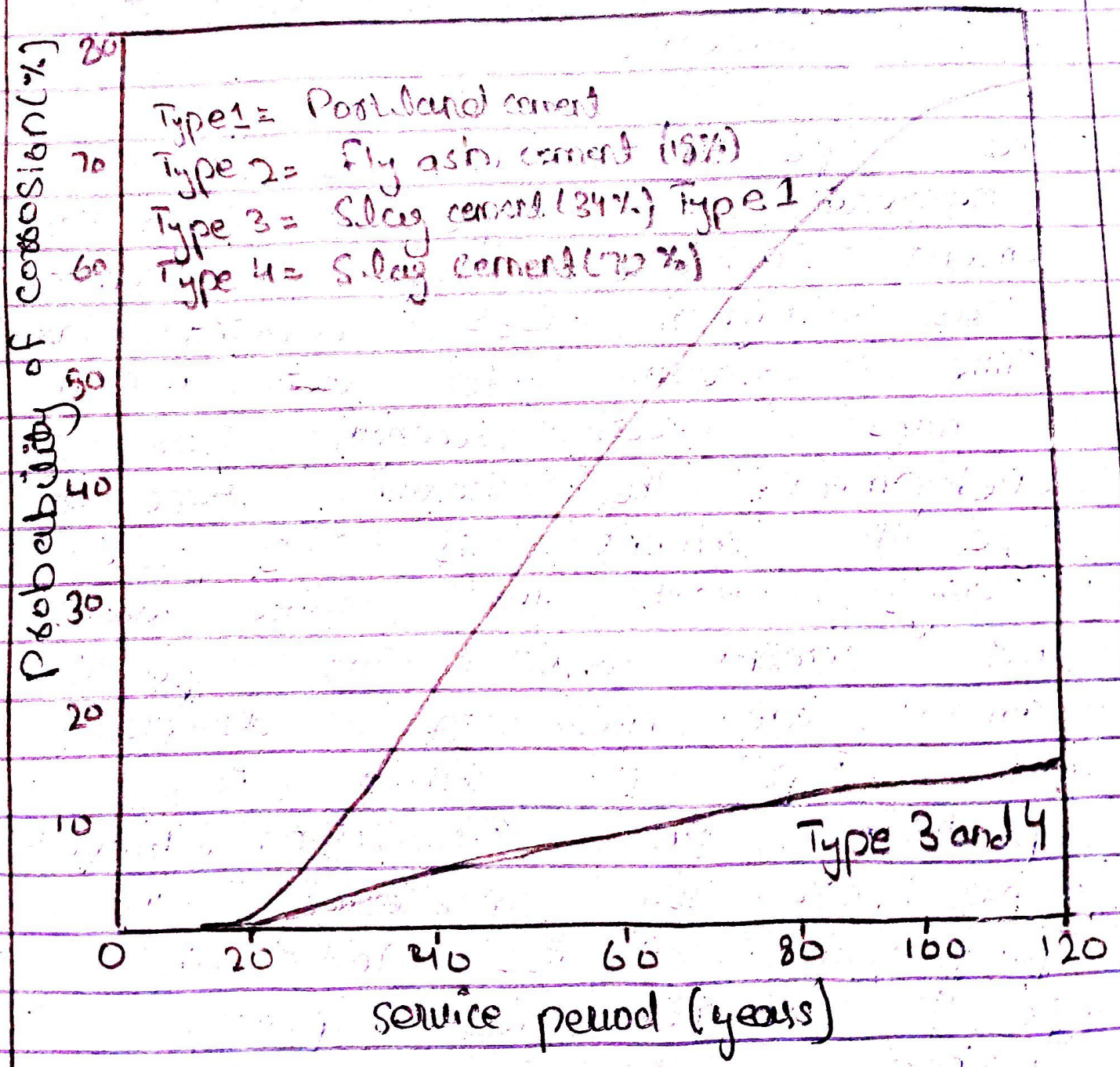
Q.3 Why Type III cement is rapid hardening and Type IV low heat producing? Draw a graph showing heat of hydration of different types of cement.

Ans The Type III cement is rapid hardening and Type IV low heat cement. Because Type III cement has higher  $C_3S$  content and finer grinding for ~~low~~ which gives great strength for development. The hardening time of Type III cement is 3 to 7 days with the same water and cement ratio. The Type III cement are used in roads etc. And Type IV cement is producing from Tricalcium Aluminate below 6% by increasing the proportion of  $C_2S$ . And also Type IV cement give power against sulphate. They are mainly used in dams etc. That's why Type III is more rapid hardening than Type IV.



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Graph of Showing trend of Hydration:





Q.4 What is the effect of compaction on entrapped air of concrete? What will be the effect on strength of concrete if compacted sufficiently? Explain with graph.

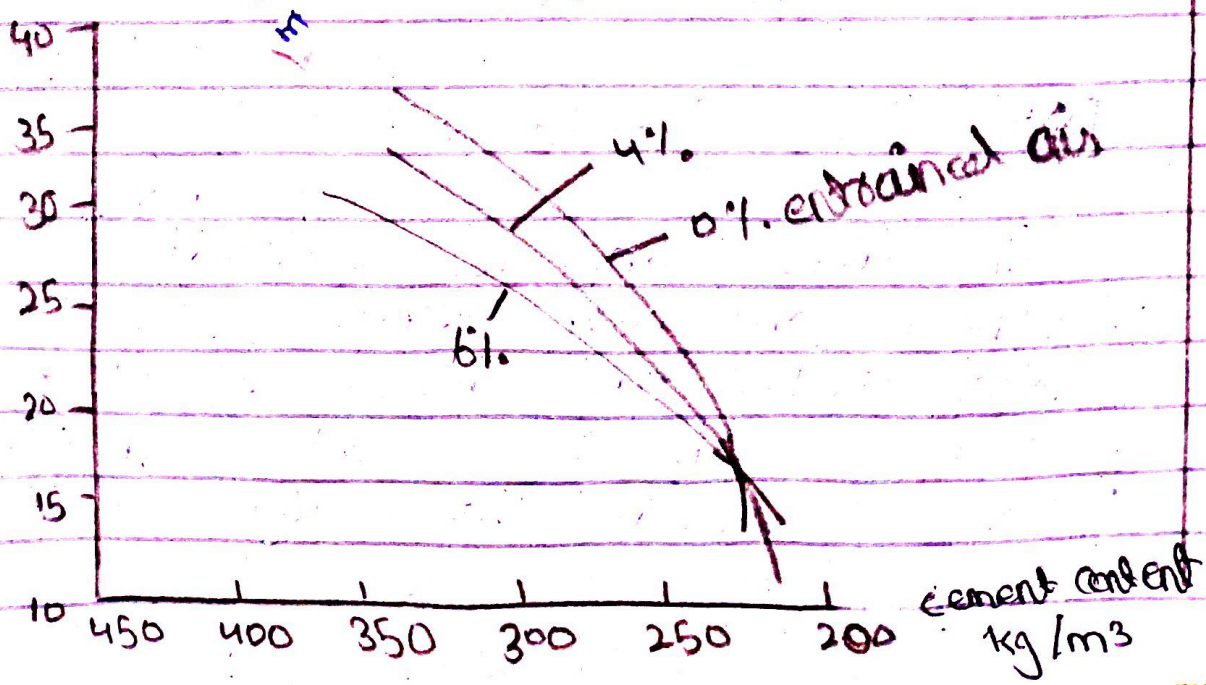
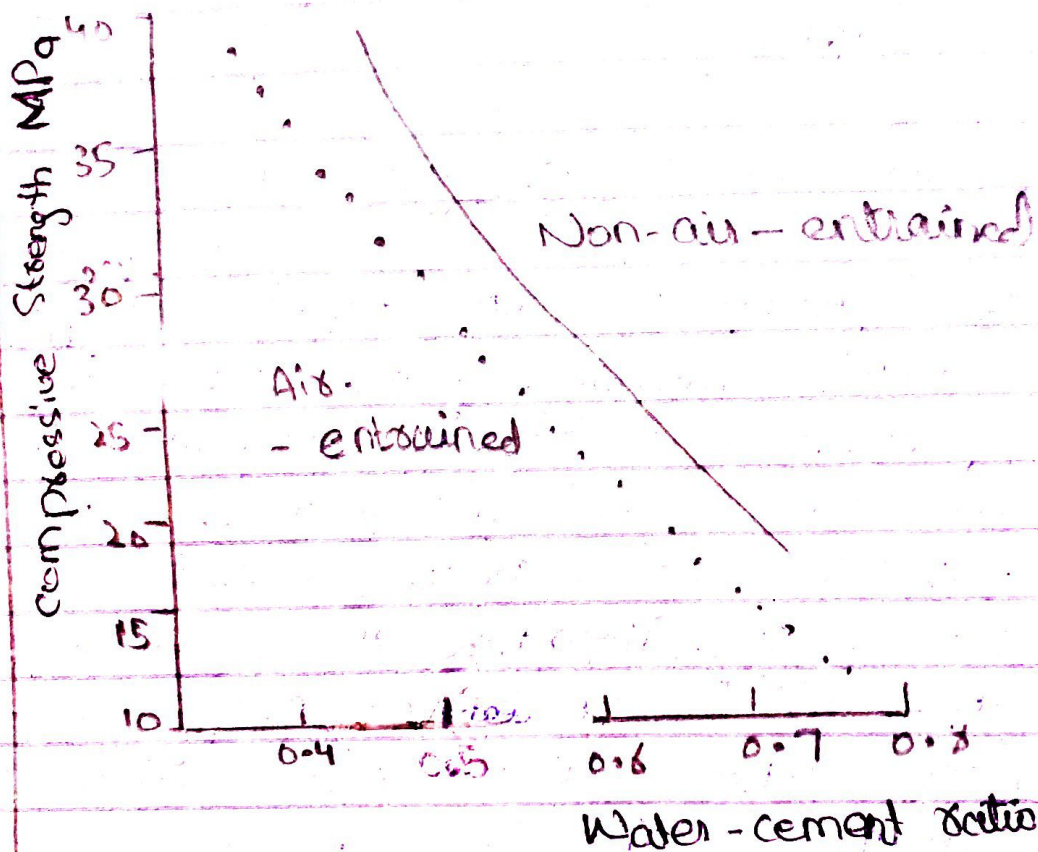
Ans Compaction on entrapped air:  
 is the process which expels entrapped air from freshly placed concrete and packs the aggregate particles together so as to increase the density of concrete. It increases significantly the ultimate strength of concrete and enhances the ultimate strength bond with reinforcement.

Fresh Cement Concrete effect:

concretes lacking fines can be difficult to compact and, even when fully compacted, can have a high porosity. On the other hand, those with too high a fines



content. Particularly if they also have a high slump may be prone to segregation and excessive bleeding.





(7)

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

Ans Gypsum plays a very important role in controlling the rate of hardening of the cement. During the cement manufacturing process upon the cooling of clinker a small amount of gypsum is introduced during the final grinding process.

Q6 What is the effect of following on the bond strength of concrete?

1) Shape of Aggregate:

Angular Aggregate:

Increased flatness or elongation reduces workability which results into stronger bond,

Round smooth Aggregates:

Require less water



For lubrication and gives greater workability which results into weaker bond.

## 2) Size of Aggregate:

The smaller the size of aggregates the less will be the workability and higher will be the bond strength and vice versa.

## 3) Texture of Aggregate:

Porous aggregate need more water as compared to absorbed aggregate for achieving same workability and bond strength. Hence,

## 4) Bleeding of Aggregate:

Bleeding has a bad effect on the bond strength of concrete because it decrease the bond strength.



Q7) what is the effect of following on workability of concrete.

1) Porosity & Absorption:

Porosity of aggregate mean that low porosity aggregate are denser - have higher strength and are more durable. Water absorption of Aggregates. They are used in road construction ranges from 2.5 to 3.0 with the average of about 2.68. The absorption shall not be more than 0.6 per unit.

2) Air entraining agents

Air entraining agent affects compressive strength of concrete and its workability. It increase the workability of concrete without much increase in water cement ratio.



3) Coarse aggregate to fine aggregate ratio:

Fine aggregate require more water for a large surface, hence aggregate with finer particles need more water to make it workable. On the other hand coarse aggregates have less surface area demand less water for wetting surface and making workable. Gravel and crushed stone are generally preferred.

4) Grading of aggregate:

Grading of aggregate help us to reduce the voids in a given volume of aggregate. The less volume of voids make the cement paste available for aggregate surface to provide better lubrication to the aggregates.



Q.2 What is the effect of fineness of cement on the following?

1) Strength of concrete:

The fineness of cement influences the drying shrinkage of concrete. When water is increased and also fineness drying shrinkage increased.

2) Rate of heat evolution during hydration:

The hydration heat generated high fineness and larger, faster than coarse cement. The set time increase due to workability of concrete.

3) Workability of concrete:

Increasing the fineness of cement reduces the amount of bleeding in concrete. The workability of non-air-entrained concrete is increased by increase the fineness.

1) Total heat of hydration:

The size of cement particles directly affects the hydration setting and hardening the hydration strength and heat of hydration.



Q.9 What steps can be taken during transportation and placement of concrete to prevent segregation of concrete?

Ans Where ever depth of concrete is more than 1.5 meters it should be placed through temporary inclined chutes. The angle of incline should be 1:3 - 1:2, so that the concrete from top of chutes travels smoothly towards the bottom. Use of little bit of water from to help in lubricating the path of flow for concrete.