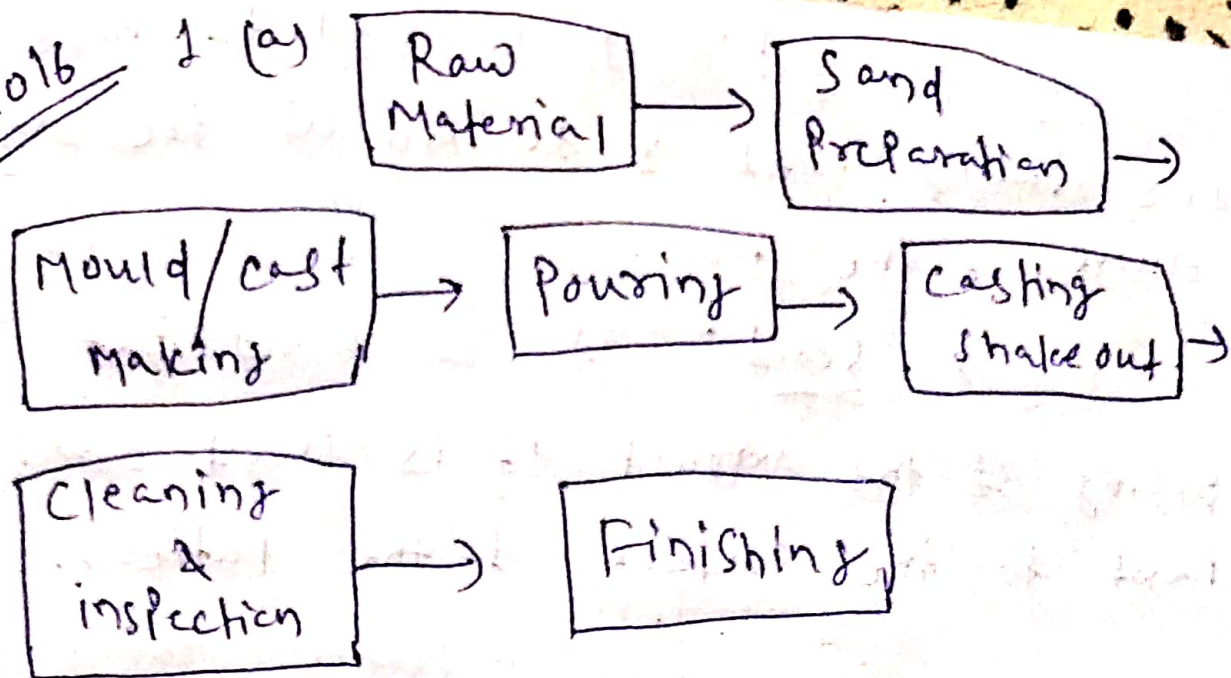


2016

2 (a)



(b) Different Allowance are,

- Pattern Allowance.
- Shrinkage Allowance.
- Machine Allowance.
- Draft Allowance.
- Distortion Allowance.

(c) Master Pattern :- It the cope & drag

where the final product is obtain by cooling of the metal or plastic.

Black — Left unmachined

Red — Machined

Yellow — Core Print & Seat for loose core Print

No colour — Parting surface.

(1)

2(a) Balcing Sand :- It is used to back up the Facing Sand & to fill up the whole volume of the box.

Facing Sand :- It is used for Facing of the mould, It is used directly next to the surface of the Pattern.

b) Green Sand :- It is the mixture of Sand clay & water & some organic additives.

Dry Sand :- It doesnot required moisture to develop strength. All parts are baked to inc. the strength & improve surface condition.

(c) Ingredients of Moulding Sand are Silica Sand, Zircon Sand & Binder

Moister Content test :-

It may determined by the loss of weight after evaporation.

② $\% \text{ of Moisture content} = \frac{\text{Loss of weight in sample}}{\text{Wght of sample before heating}} \times 100$

3/ (a) Core :- A core is used to obtain the desired recess uncavity in the casting. It should possess very high refractoriness.

(b) Additives are used to bind the molecules with another molecules of other materials.

Role of additives :-

- 1) Coal dust :- Used to improve finish of cast-iron casting.
- 2) Iron oxide :- Used to achieve high temperature plasticity.
- 3) Molasses :- It is used for increase dry strength and collapsibility.

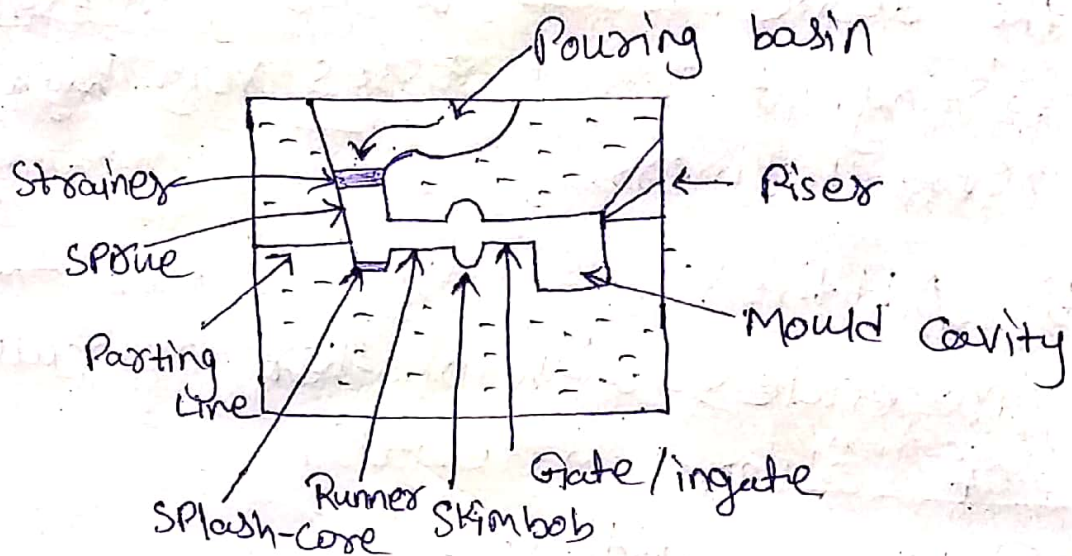
(c) cores type :-

- Cylindrical core
- Balanced core
- Dovetail core

4/ (a) chill :- It is used for directional solidification which ensure control freezing towards the riser.

Chaplet :- It is a metallic support inside the mold cavity.

(b) Elements of gating system :-



4) Riser efficiency :- It is the wght of the casting divided by the wght of the total amount of metal poured.

- Riser efficiency can be increased by the decreased of shrinkage cavities.

5) Investment casting is the lost wax process in which aluminium is used to make the die.

(b)

Shell moulding

Hot Metal Pattern



Box inverted & kept in that position for some time



(4)

Box made in horizontal position, with shell of upper bonded sand block in pathway



Shells stopped from pathway with the erect pin mechanism



Two shells arranged clamped pathway with sand in a box

(c) Centrifugal casting:- Mould is rotate rapidly about its central axis as metal poured into it. Centrifugal pressure will acts & solidifies.

- True centrifugal casting.
- Semi " "
- Centrifuse casting.

pg. No - 44248

6(a) Cleaning of casting:-

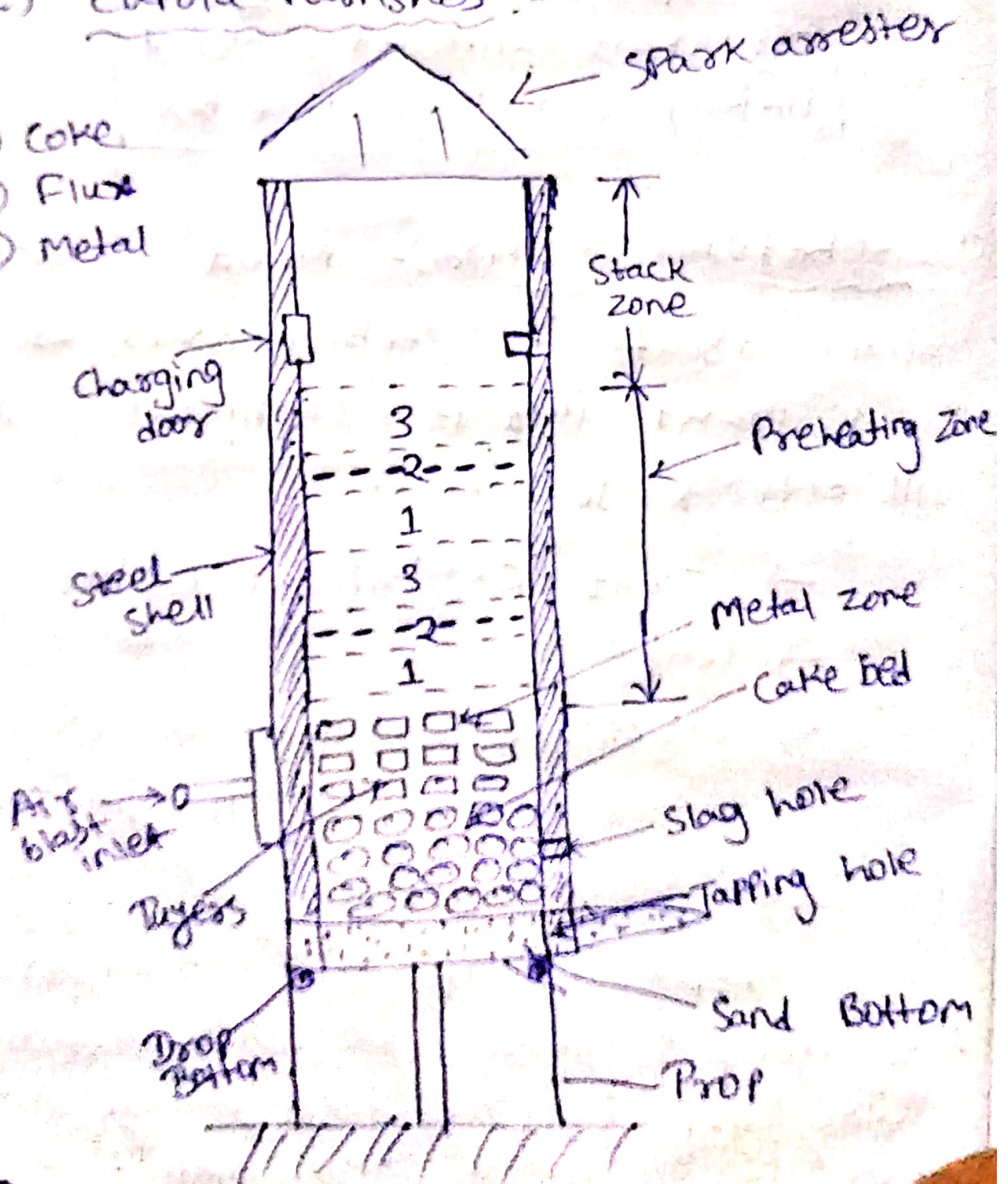
After the metal is removed then the mould go to a shake out station where the sand & casting are dumped from the flask. This is called...

(b) Cleaning steps for removal of gates and risers :-

- with chipping hammer
- By using cutting saw
- Flame cutting
- with abrasive cut off machine.

(c) Cupola furnishes :-

- 1) Coke
- 2) Flux
- 3) Metal



operation :- It is made up of vertical steel shell of refractory material. A constant volume of air is passed through wired pipe. Proper mechanism for removal of waste and a tapping hole is there for extraction of metal.

Procedure :-

- Preparation of cupola
- Fixing the cupola
- charging the cupola
- Soaking of iron
- opening of air blast
- Pouring the molten metal
- closing the cupola

7/ (a) Directional Solidification :-

It occurs from farthest end of the casting and work its way towards the sprue.

(c) Casting defects :-

- Blow holes
- Porosity
- Shrinkage
- Misruns and cold shuts
- Inclusions
- Hot tears
- cuts and washes
- Metal Penetration

(7)

Pg. no. :- (53-61)

2017

1/c) Disadvantages of Casting :-

- It gives low fatigue strength compare to forging.
- It is not economical for mass production.

(b) Pattern :- A Pattern is defined as a model of casting and is used to prepare the mould activity. It is also termed as duplicate shape of component with some allowance consideration.

Casting :- It is a process in which the material is first liquefied by heating it to a proper temperature in a certain heating unit termed as 'furnace'.

(c) Reasons for selecting Pattern material :-

- * It is the most common material used for pattern making because of the following advantages :-
 - It is cheap and available in abundance.
 - It can be easily shaped into different forms and intricate designs.
- * Materials are faster wood, metal & alloy, plastic & rubber, Plaster of Paris and waxes.
- * Waxes is the pattern material for investment casting.

(d)

2/c) Synthetic moulding sand :- Moulding sand for high and low temperature sand casting of metals and alloys is usually obtained from natural deposit or from synthetic composition of silica sand particles, binder and moisture. Synthetic sands are basically high silica sands containing little or no clay binder in the natural form.

(c) Repeat in [2016, 2(c), pg no. - ②]

3/c) Core Print :- The part of a foundry pattern which makes an opening in a mold to receive a core and to support it while the metal is being poured.

(b) Clay is one of the important ingredients of moulding sand because it imparts necessary binding strength to the moulding sand.

During ramming the mold doesn't lose its shape. If the clay quantity is increased the permeability will reduce. So equal quantity of clay should be chosen.

4/c) casting defects are shift and shot metal.

(b) Shift :- It is a misalignment between two mating surfaces.

Causes :-

- Miss alignment

— Faulty core box

Remedies:

- Repair & replace the pins.
- Locate the core properly.

(c) Lost wax Process :-

Wax is injected into the die made up of soft material such as aluminium



Wax Pattern is taken out from the die.



Pattern is dipped in a slurry composed of silica flux, water and some bonding agent.



The pattern with precoat is placed in a steel container and the container is filled with a slurry of self hardening refractory concrete composing of sand, water and calcium phosphate.



When the container is placed in the ~~concrete~~ oven, thus most of the wax melts away and flow out from mould.



Desired cavity is formed



Molten metal is poured in the cavity

①

5(a) Previous 2016 6(a) Pg-5
Year

(b) Types of Mould are

- Extension Molding
- Injection
- Spin casting
- Transfer Molding
- Compression

6(a) Gating ratio is $A : B : C$

A = cross-sectional area of sprue

B = " " " " runner

C = Total " " " inlets

(b) Open riser:- If the riser is open to the atmosphere then it is called open riser.

Blind riser:- If the riser is completely contained in the mould it is called blind riser.

(c) Previous 2016 4(c) Pg-4 (12)

7 (a) It is the

$$t = B \left(\frac{V}{A} \right)^\eta$$

Where

t = solidification time.

V = volume.

A = surface area of casting.

B = Mould const.

η = const.

(b) previous 2016 6 (C) Pg-6
year.

(c) Direct Arc Furnance:- In this 3-phase supply and graphite electrode is directly in contact with the metal.

Indirect Arc Furnance:- It is used for non-ferrous & plain carbon steel.

Limitation of cupola:-

- It is unable to maintain the main the close temp.

Advantage of cupola :-

- Simple & economic
- Less harmful
- High melting heat
- Floor space required is less.

2018
1 (a) It is a process in which the metal is first liquified by heating and then the liquid is poured into the mould cavity and allowed to solidify. After the solidification the product is formed.

1 (b) Previous year 2016 7(a) Pg - 7

(c) Previous year 2016 5 (b) Pg - 4

2 (b) Previous year 2016 3 (c) Pg - 3

(a) Same as 1(a) of 2018
Pg - (15)

(c) centrifugal casting process :-

→ The axis may be horizontal, vertical (or) inclined.

- Used for making hollow pipes

(15) tubes & bushes

- Long pipe horizontal axis & short pipe vertical axis.

- It is free from shrinkage.

Advantages :-

- No need of core to make a pipe (or tube).

- Proper directional solidification is obtained.

- No riser is used.

- Fine grain metal casting.

- It is quick & economical.

Disadvantage :-

- Skilled worker required.

- Equipment cost is high.

- Limited to symmetrical shape.

3(a) Moulding :- It is a process where the metal is poured & put in the mould cavity when it solidifies it is taken out & after cleaning the final product is obtained.

(16)

3(c) Casting defects :-

- Blow holes
- Porosity
- Shrinkage
- Misrun
- Hot tears
- Metal Penetration
- Fusion
- Drop

Hot tears remedies :-

- Modify design ~~from~~
- Provide soft ramming
- Improve collapsibility

Shrinkage cavities remedies :-

- Ensure proper directional solidification
- chilling

1/cas chaplets :- It is the metallic support inside the mold cavity to produce hollow products.

(b) Characteristic required in molding sand :-

- Permeability
- Cohesiveness
- Adhesiveness
- Plasticity
- Refractoriness

(c) Sweep Pattern :- It refers to the section that rotates about an edge to produce circular section.

Skeleton Pattern :- A skeleton pattern is made by using a wooden frame (skeleton) and filling space between the wooden pieces with moulding sand. The overall shape is obtained by firmly pressing sticking it (It is basically used for large casting component. Heavy eng. parts are the best application of this types of pattern.)

5/cas Binder :- Binders are the bonding agent that binds one molecules to the another molecules ~~to~~ of same materials.

(b) Working Principle of induction furnace :-

The furnace works on the principle of resistance heating effect of current, that means when even a current (I) carrying conductor having an electrical resistance ' R ' for some times (t) then the heat produced will be ' $I^2 R t$.'

(c) Previous year 2017, 4(c), [pg no. 11]

6/cas Gate :- It is a passage in which the molten metal from the runner enters into the mould cavity.

(b) Previous year 2016, 6(a), [pg no. 5]

(8)

(c) Pressure die casting :-

- In this molten metal is forced into permanent mould cavity under high pressure.
- The die is water cool and self lubricating.
- A saw is provided below rolls to cut the products to a desired length.

Advantages :-

- cheaper process
- casting surface are better
- 100% casting yield

Application :-

- Production of blooms, slabs, sheets and copper bars.

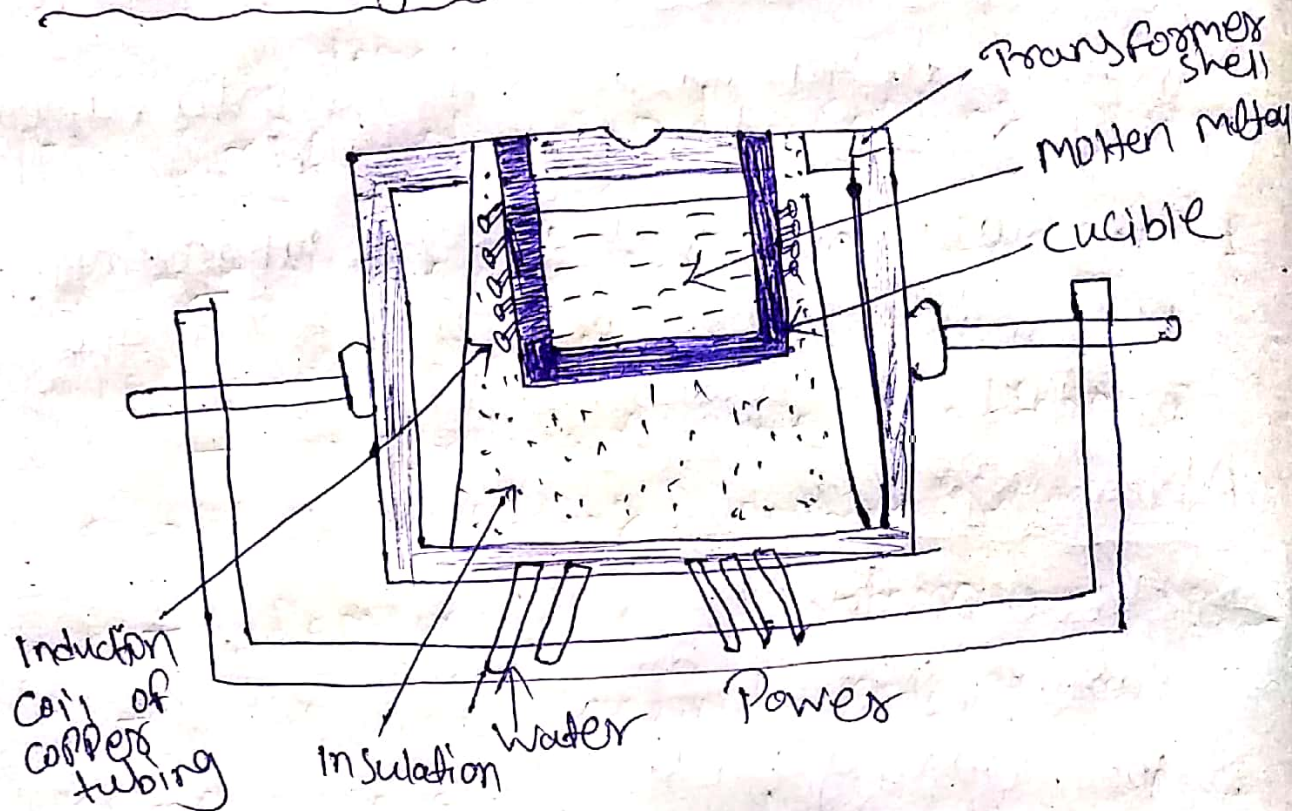
7/(a) Function of risers :- It's main function is as a feeder to feed the molten metal into the casting. and it is also act as a removal of hot gases.

(b) Previous year 2017, 2(a), [Pg. no. 13]

(c) Types electric arc furnace :-

- coreless type
- core type

Core less type :-



- Steel scrap is placed in furnace.
- High frequency current is passed through the water cooled in coils which acts as primary winding.
- High AC current is produced in secondary winding by Electro Magnetic induction.
- When current generates heat develops & metal melts & final products is obtained.

2019 (a) Adv :- It can create any complex structure economically.

Dis adv. - Poor surface finish & requires finishing.

(b) Previous 2016 2 (a) Yes

(d) Previous 2017 5 (a) Yes

(c) Mould :- It is the cavity where the replica of the product is present where the molten metal is poured.

(e) Previous 2016 7 (a) Yes

(f) " 2016 7 (a) Yes

(g) " 2016 5 (a) Yes

(b) Negative Allowance :- when the metal shrink after solidification the product dimension is less than actual that is (2)

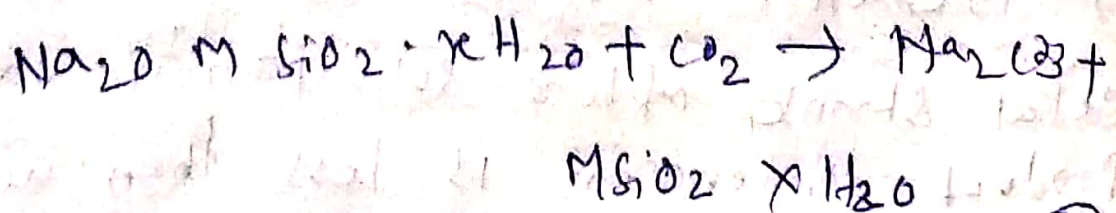
i) Previous 2016 1 (c)
Year:

(5) Steps of Sand Casting Process

- Place a pattern to create a mould
- incorporate the pattern & sand in a jacking system.
- Remove the pattern.
 - Fill the mould cavity with molten metal.
 - Allow to solidify.
 - Remove the product

2(a) Binders! - Its main function is to bind the molecules of particles so that it can hold the material with the material.

CO₂ as Binders! - It has a mixture of sodium silicate.



→ for binder of shell moulding
thermo setting synthetic resin, phenol
formaldehyde, urea formaldehyde
and polystyrene.

→ for binder in core phenol &
urea formaldehyde is used.

b) Previous 2016 3(c)
year

(c) Advantage of Permanent Mould

- Better mechanical property
- Low shrinkage
- Low gas porosity
- Good surface quality
- High cost of mould
- Little scrap process
- Low dimensional tolerance

(d) Sand blasting is an abrasive cleaning process that blast sand at high speed, probably using water as a medium, to remove rust, scale, old paint etc.

Shot blasting is a much more controlled process that shoots small metal balls usually steel at a component. This is done to reduce the risk of fatigue failure.

(e) Grain Fineness Number:-

In this process the sand sample is placed in the top sieve and the whole set is shaken in a sieve shaking machine for 15 min. The amount of sand remaining in each sieve is then collected, weighed & expressed in percentage.

$$GFN = \frac{\text{Total Product}}{\text{Total sum of \% collected in each sieve.}}$$

(f) Previous year 2016 5(b)

(g) Previous 2017 6(b)

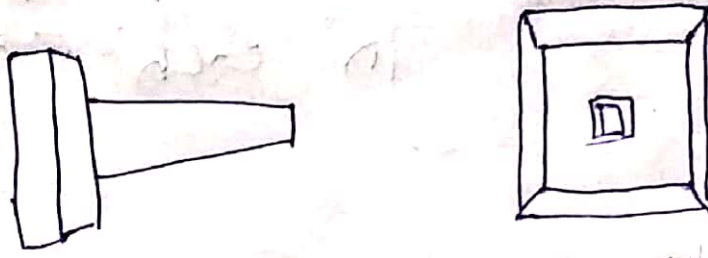
3 Types of Pattern :-

- Single Piece Pattern
- Split Pattern
- Multi Piece Pattern
- Gated Pattern
- Sweep Pattern
- Skeleton "
- Match Plate Pattern
- Follow Board "

i) Single Piece Pattern :-

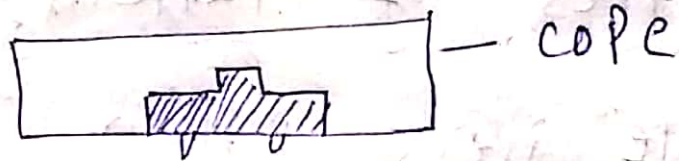
It is made in one piece usually from wood & best suited

For limited production. It is done in
Box shaped component



ii) Multiple Piece Pattern:-

It is required when one piece or split pattern are unsuitable for withdrawal from the mould



— cope



— Cheek



— Drag

iii) Split Pattern:-

It is used when the casting component is having intricate design.



pins.

4. Previous year 2016 4(b)

6. Previous year 2016 6(c)

7. Previous year 2016 7(c)

5. Ingredients of moulding sand are:

- Green sand mould

- Dry " "

- Clay.

→ Binders

→ silica sand, Zircon sand etc.

Clay:- It imparts necessary binding strength to the moulding sand so that the mould does not lose its shape. Clay should be chosen for preparation of mould.