higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# MARKING GUIDELINE

## NATIONAL CERTIFICATE

## FOUNDRY THEORY N1

## 5 APRIL 2018

**This marking guideline consists of 5 pages.**

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## QUESTION 1

1.1 These grains have the least contact with one another in a rammed structure, thereby making the sand highly permeable to gases. Sand having rounded grains, however, lack strength and do not pack up to the optimum extent. The binder requirements are minimum. (8)

1.2 These grains have comparatively lower permeability and greater strength than the rounded ones. (2)

1.3 These grains have defined edges, and the surfaces are nearly flat. They produce higher strength and lower permeability in the mould than sub-angular grains. The binder is likely to be high. (6)

1.4 In some cases, the grains are cemented together such that they fail to separate when screened. They may consist of rounded, sub-angular, or angular grains or a combination of the three. Such grains are called compounded grains and are the least desirable due to their tendency to break down at high temperatures. (9)

**[25]**

## QUESTION 2

Organic combustible matter present as an impurity leads to gas evolution and reduces the refractoriness of the sand. The amount of combustible matter is estimated by heating a weighed sand sample at 875 °C for one hour, cooling it, and finding the percentage loss in weight. This value is called loss on ignition. **[10]**

## QUESTION 3

3.1
- Moisture content
- Permeability
- Green compression strength
- Total (A.F.S.) clay
- Sieve analysis
- Combustibles (6)

3.2
- Sand grain, size and distribution
- Clay content
- Permeability
- Shear/Tensile/Compressive strength
- Sinter point (5)

**[11]**

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## QUESTION 4

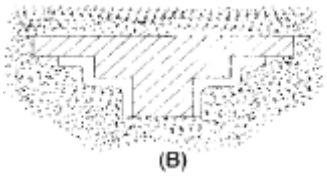
- Moisture content
- pH value
- Liquid limit
- Gelling index
- Swelling capacity
- Cone fusion temperature
- Bonding properties, e.g. green and dry compressive strength and shatter index of a sand mix prepared under standard conditions **[7]**

## QUESTION 5



(A)

Balanced core



(B)

Cover core



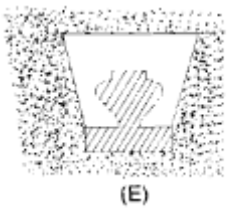
(C)

Hanging core



(D)

Wing core



(E)

Ram-up core



(F)

Kiss core

(Any 5 × 2) **[10]**

**QUESTION 6**

6.1 Combination of metals

6.2 Hole in the casting caused by trapped air or gases

6.3 The portion of the flask placed between the cap and the drag when the mould has more than two sections

6.4 The imperfect junction where two streams of metal meet but do not fuse

6.5 Slight taper given to pattern to allow drawing from the sand

6.6 A metal or wooden frame, without top or bottom, in which the mould is formed

6.7 Moulding sand tempered with water to the proper consistency for foundry use

6.8 A device arranged to expedite a hand or machine operation

6.9 Unsoundness in cast metals due to blow holes, shrinkage cavities and voids

6.10 Loosening the pattern from the mould by jarring or knocking

(10 × 2) **[20]**

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## QUESTION 7

7.1 Before commencing to line the large ladle, it is advisable that it should be slightly heated; the furnace-man coats the interior with a wash of clay of about the consistency of cream, and proceeds to apply the prepared sand or loam to the bottom of the ladle in a uniform coating using the utmost precaution to force it into close contact with the plates at all points. In working upwards the thickness of the lining is slightly reduced, and the covering of the lips must be neatly rounded off, so as not to expose an uneven surface to the flow of the metal, while at the same time it must be prevented from coming in contact with the iron of the ladle.
When the lining is completed, the ladle is allowed to stand until the loam has dried sufficiently by air, before firing. A fire is then lit inside the ladle so as to completely dry the lining. If any cracks are observed in the lining during the process of drying they must be filled up with moist loam. When the whole lining is perfectly dry and without cracks or flaws, a coating of thick blackwash is applied. When about to run the metal into a large ladle, an old piece of plate should be placed in a sloping position, resting against one side and the bottom, so as to prevent the first force of the current of metal from coming into contact with the lining; this plate can be removed with tongs when there is enough metal in the ladle to receive the flow of the falling metal. (5)

7.2 The bottom lining must be thicker than the sides because the molten metal poured from the furnace hits the bottom with a force. (2)

7.3 The lining of the ladle should have fibre in it. Venting must be done on the sides and the bottom, to help the gas escape. (5)

7.4 If the ladle is not dried correctly, moisture is contained in the lining. The moment molten metal is poured into the ladle, an explosion will occur. Metal and moisture is a very dangerous combination. (5)
**[17]**

**TOTAL: 100**

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