higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FOUNDRY THEORY N1

28 November 2023

This marking guideline consists of 7 pages.

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SECTION A

QUESTION 1

1.1 A
1.2 D
1.3 D
1.4 A
1.5 A
1.6 B
1.7 C
1.8 B
1.9 B
1.10 C

(10 × 1) **[10]**

QUESTION 2

THE EXPLANATION MAY BE IN STUDENTS' WORDS, NOT NECESSARILY THE EXACT WORDS ON THE MEMO

2.1 B Sand Slinger✓

Explanation: Sand slinger has a rapidly rotating cup-shaped blade that scoops up moulding sand and throws it down into a mould box with a great force to ram it in the mould box.✓✓

2.2 A Inertia✓

Explanation: While a sand slinger rams sand in the moulding boxes, sand is filled and rammed at the same time. The density of sand is the result of its inertia, which is uniform throughout the mould.✓✓

2.3 C Squeeze machine✓

Explanation: A squeezer, squeeze head plate or presser board slides inside the flask to compress the sand above and around the pattern. The presser plate exerts a substantial amount of pressure. The pressure can be easily distributed for the shallow patterns in a squeeze machine.✓✓

2.4 D Sand Inertia✓

Explanation: Power-operated moulding machines are extension versions designed to overcome all the drawbacks of traditional moulding machines. The sand inertia is used for moulding and is not a medium of machine whereas compressed air, hydraulic power or high impellor are used to obtain performance from power-operated machines.✓✓

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2.5 A True✓

Explanation: The squeeze moulding machine rams the sand harder at the back of the mould and softer on the pattern face. Sand has the greatest density at the surface where a pressure is applied to sand. In modern machines, the harder ramming on the mould edge is also ensured.✓✓

(5 × 3) **[15]**

QUESTION 3

3.1 G
3.2 J
3.3 A
3.4 C
3.5 E
3.6 H
3.7 K
3.8 B
3.9 D
3.10 F

(10 × 1) **[10]**

QUESTION 4

4.1 Gasses
4.2 Pattern
4.3 Patterns
4.4 Gating
4.5 Gates

(5 × 1) **[5]**

TOTAL SECTION A: 40

SECTION B

QUESTION 5

5.1 B Moisture
5.2 A Mulling
5.3 C Oil
5.4 D Complex
5.5 A True

(5 × 1) **[5]**

QUESTION 6

6.1 A Harden✓

Explanation: Sand moulds are hardened by gassing them with carbon dioxide. CO_2 treatment has been adopted on a large scale in modern core making.✓✓

6.2 B Sodium Silicate✓

Explanation: CO_2 moulding is an extremely simple procedure. A highly flowable mixture of pure, dry silica and sodium silicate is rammed or blown into a mould or a core box. Because sodium silicate binds well with silica sand, it is used as a binder.✓✓

6.3 B False✓

Explanation: Carbon dioxide gas at a low pressure of usually about 1.5 kg/cm^2 is diffused through a mixture (of sand and sodium silicate) to initiate the hardening reaction, which takes from a few seconds to a few minutes depending upon the size of the core or mould.✓✓

6.4 A Impaired✓

Explanation: When gas is passed at the required pressure, the compression strength of a given sand mixture reaches its maximum at some critical amount of gas passed. If gassing is continued beyond the critical point, the strength of the bond is impaired.✓✓

6.5 A True✓

Explanation: The clay is used alongside sodium silicate as a binder. The clay movement is usually movement in small quantities. The clay and starch (often used) are added to improve the green strength of a mix.✓✓

6.6 C Carbonic acid✓

Explanation: The passage of carbon dioxide through sand containing sodium silicate produces carbonic acid in the aqueous solution. This causes a rise in the SiO_2-Na_2O ratio and the formation of a colloidal silica gel, which hardens and forms the bond between sand grains.✓✓

6.7 B Dextrin✓

Explanation: The sodium silicate may contain additives such as sugars, to help the breakdown of the core in casting and improve the collapsibility of the core. Because molasses is a by-product of the sugar industry, it is not used.✓✓

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6.8 B False✓
Explanation: Overgrazing usually decreases the strength of the core, which is responsible for functioning in the CO_2 moulding. Overgrazing causes defective castings.✓✓

6.9 A True✓
Explanation: Since gassing hardens the sand mass, a pattern with a rough surface may be difficult to withdraw from the mould. It can be overcome if a pattern is rubbed with graphite before ramming the sand around it.✓✓

6.10 A True✓
Explanation: Short gassing times (15 to 30 seconds) produce strong cores. Short gassing times increase the efficiency of cores used in this process.✓✓

(10 × 3) **[30]**

QUESTION 7

THE EXPLANATION MAY BE IN STUDENTS' WORDS, NOT NECESSARILY THE EXACT WORDS ON THE MEMO

7.1 A Founding✓

Explanation: Founding is a process of producing component parts of the desired shapes by pouring the molten metal/alloy into a prepared mould and then allowing it to solidify. The solidified piece is called as casting.✓✓

7.2 D d) Mould, sand and core✓

Explanation: The foundry process always results in the formation of casting. The type of mould and core that is to be prepared depends on the pattern of the casting. The type of sand also depends on the type of pattern that will be used to produce a casting.✓✓

7.3 A True✓

Explanation: Fettling involves cleaning a casting and making it of the dimension required by the customer. Fettling can also involve machining. Once fettling has been done, a casting is ready for dispatch. In other words, it is the last step of the foundry process.✓✓

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7.4 D Brass, aluminium, and iron.✓

Explanation: Aluminium and cast iron are commonly used to make castings. Special arrangements have to be made to make castings of brass, steel, and magnesium since their melting temperatures differ. A variety of castings can be made in a foundry.✓✓

7.5 B False✓

Explanation: Virgin metal is pure metal. Because scrap is available in large amounts, it is not economical to use virgin metal to form castings. The principle of foundry also involves the reuse of scrap and as little wastage as possible.✓✓

7.6 C Auxiliary✓

Explanation: The tuyeres supply air for combustion in the cupola. They are always fitted in one or more rows. Because auxiliary tuyeres are more efficient, they are fitted in the cupola to supply more air and increase the melting efficiency.✓✓

7.7 B Heat treatment✓

Explanation: The extensive process to prepare a casting imparts high stress to its walls. Heat treatment is the most economical method to relieve the stress and make the casting ready.✓✓

7.8 C Casting✓

Explanation: The foundry process involves several operations such as pattern making, sand preparation, and so on. After all the process, the product is and the sand sticking to it, are separated. The product is called the casting while the rest is used to make its mould.✓✓

7.9 A True✓

Explanation: The casting or the foundry process provides the greatest freedom of design in terms of shape, size and product quantity. Hence, it is the most versatile process in manufacturing till date.✓✓

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7.10 B False✓

Explanation: The foundry process involves various machines such as sand slingers, jolt-squeeze machines to automate the moulding process and conveyor belts to transport the mould boxes. Because this process is mechanized, several other processes can also be mechanized.✓✓

(10 × 3) **[30]**

TOTAL SECTION B: 65
GRAND TOTAL: 105

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