

- (B) Decreases
  - (C) Remain same
  - (D) Remains same, only if the number of tube passes does not change
- Answer: Option A

**383. Lessing ring is formed by the addition of a partition across the centre of a raschig ring, which results in an area increase of about \_\_\_\_\_ percent.**

- (A) 5
- (B) 20
- (C) 35
- (D) 55

Answer: Option B

**384. What is the value of 'q' for saturated liquid feed to a distillation column?**

- (A) 0
- (B) <1
- (C) 1
- (D) >1

Answer: Option C

**385. In chemical process equipments, the conical bottom heads used, usually has an apex angle of**

- (A) 20°
- (B) 40°
- (C) 60°
- (D) 80°

Answer: Option C

## Refractory Technology

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**01. Silica refractories are not used in**

- (A) Coke oven walls
- (B) Beehive coke ovens
- (C) Dome and upper portion of B.F. stoves
- (D) Open hearth furnace roof

Answer: Option B

**02. Si percentage in silica refractories used in the walls of coke oven is about**

- (A) 45
- (B) 60
- (C) 80
- (D) 95

Answer: Option D

**03. Porosity of silica bricks varies from \_\_\_\_\_ percent.**

- (A) 5 to 10
- (B) 20 to 30
- (C) 45 to 60
- (D) 60 to 75

Answer: Option B

**04. Chrome magnesite bricks are**

- (A) Acidic in nature
- (B) Neutral in nature
- (C) Having higher RUL than silica bricks
- (D) Made by mixing 30% Chromite and 70% Periclase

Answer: Option C

**05. Alumina-graphite bricks are used for lining the**

- (A) Slide gate in teeming laddies
- (B) Continuous casting systems
- (C) Both (A) and (B)
- (D) Neither (A) nor (B)

Answer: Option C

**06. Maximum shrinkage in volume occurring during burning/firing of dried refractories may be as high as \_\_\_\_\_ percent.**

- (A) 10
- (B) 15
- (C) 20
- (D) 30

Answer: Option D

**07. The main raw material for manufacture of silicon carbide refractories is**

- (A) Corundum
- (B) Carborundum
- (C) Bauxite
- (D) Periclase

Answer: Option B

**08. Which of the following consumes the maximum tonnage of refractories annually in an integrated steel plant?**

- (A) Soaking pits
- (B) Reheating furnace
- (C) L.D. converter
- (D) Rotary lime kiln

Answer: Option C

**09. Upper portion of hot metal mixer are lined with mullite bricks, which helps in resisting the**

- (A) Washing action of metal
- (B) Corrosion by layer of slag
- (C) Both (A) & (B)
- (D) Neither (A) nor (B)

Answer: Option A

**10. Lower part of hot metal mixer are lined with \_\_\_\_\_ bricks.**

- (A) Superduty fireclay
- (B) High alumina
- (C) Silica
- (D) Carborundum

Answer: Option D

**11. High density refractory bricks have lower**

- (A) Spalling resistance
- (B) Thermal conductivity
- (C) Fusion point
- (D) Slag penetration resistance

Answer: Option A

**12. Bauxite calcining rotary kilns are lined with \_\_\_\_\_ bricks.**

- (A) Fireclay
- (B) Carbon
- (C) 85% alumina
- (D) Corundum

Answer: Option C

**13. Fireclay bricks are used in the**

- (A) Furnaces allowed to cool frequently
- (B) Flues
- (C) Chimney linings
- (D) All (A), (B) and (C)

Answer: Option D

**14. Carbon refractory blocks**

- (A) Are wetted by molten iron
- (B) Are used in the hearth of blast furnace
- (C) Are acidic in nature
- (D) All (A), (B) and (C)

Answer: Option B

**15. Spalling of a refractory means its**

- (A) Softening
- (B) Fracture due to uneven expansion at high temperature
- (C) Resistance to compressive loads
- (D) Resistance to chemical action of gases and molten fluxes

Answer: Option B

**16. Chromite refractories are used in**

- (A) Bottom of soaking pits
- (B) Between acid & basic linings in basic open hearth furnaces to prevent their chemical action with each other
- (C) Both (A) & (B)
- (D) Neither (A) and (B)

Answer: Option C

**17. The linear thermal expansion of \_\_\_\_\_ bricks upto 1000 °C is very low of the order of ≤ 0.5 percent.**

- (A) Fireclay
- (B) Silica
- (C) Magnesite
- (D) Corundum

Answer: Option A

**18. Maximum apparent porosity of magnesite bricks is about \_\_\_\_\_ percent.**

- (A) 8
- (B) 24
- (C) 44
- (D) 58

Answer: Option B

**19. Chrome magnesite is not used in the**

- (A) Inner lining of L.D. converter
- (B) Aluminium melting furnaces
- (C) Wear out lining of steel melting furnaces
- (D) All (A), and (B) and (C)

Answer: Option C

**20. Cold crushing strength of refractories depends upon its**

- (A) Composition
- (B) Texture
- (C) Firing temperature
- (D) All (A), (B) and (C)

Answer: Option D

**21. \_\_\_\_\_ bricks are used in the burning zone of a cement rotary kiln.**

- (A) High alumina
- (B) Fireclay
- (C) Thoria
- (D) Silicon carbide

Answer: Option A

**22. Pick out the wrong statement.**

- (A) Fluxing material like lime is added in clay to reduce the vitrification temperature
- (B) Main constituents of clay are alumina and silica
- (C) Addition of sand in ceramic materials makes it non-plastic, increases its fusion point and reduces its shrinkage on burning
- (D) Vitrification of fireclay material is done to increase its porosity

Answer: Option D

**23. Maximum water percentage in refractory mix meant for hand moulding may be as high as \_\_\_\_\_ percent.**

- (A) 2-3
- (B) 5-7

(C) 7-12  
(D) 14-20  
Answer: Option D

**24. Which property is important for bricks used in the combustion chamber & dome of blast furnace stoves?**

- (A) High refractoriness
- (B) High resistance to spalling
- (C) High strength and density
- (D) All (A), (B) and (C)

Answer: Option A

**25. Which of the following has the lowest electrical resistivity?**

- (A) Graphite
- (B) Fireclay
- (C) Alumina
- (D) Zircon

Answer: Option A

**26. Spalling resistance of a refractory cannot be increased by**

- (A) Increasing its porosity
- (B) Using a coarser grog during its manufacture
- (C) Decreasing its thermal co-efficient of expansion
- (D) Making it denser

Answer: Option D

**27. Refractory castables are used for**

- (A) Producing monolithic linings
- (B) Patch work
- (C) Minimising the number of joints in the structure
- (D) All (A), (B) and (C)

Answer: Option D

**28. High refractoriness of refractory bricks means, that it has a**

- (A) High spalling resistance
- (B) Low spalling resistance
- (C) High resistance to fusion
- (D) Low porosity

Answer: Option C

**29. Silicon carbide refractories have very low**

- (A) Refractoriness ( $< 1700^{\circ}\text{C}$ )
- (B) Thermal conductivity
- (C) Resistance to thermal shock
- (D) None of these

Answer: Option D

**30. To resist spalling tendency, a refractory should have**

- (A) Greater diffusivity
- (B) Low specific heat
- (C) Low thermal co-efficient of expansion
- (D) All (A), (B) and (C)

Answer: Option D

**31. Because of its very high refractoriness of the order of \_\_\_\_\_  $^{\circ}\text{C}$ , silicon carbide refractories are used in zinc smelting furnace, muffle furnace and for supporting the wares in tunnel kilns.**

- (A) 1800
- (B) 2200
- (C) 2400
- (D) 2700

Answer: Option D

**32. Cermets are**

- (A) Composite material containing both ceramic & metallic constituents

- (B) Having high strength & resistance to high temperature
  - (C) Used in space vehicles, missiles & nuclear energy plants
  - (D) All (A), (B) and (C)
- Answer: Option D

**33. Carbon refractories are exclusively used in the**

- (A) Hearth of blast furnace
- (B) Walls of coke oven
- (C) Regenerators of coke oven
- (D) Side wall of soaking pits

Answer: Option A

**34. Dry mix hydraulic compositions of refractory aggregates with suitable bonding materials are called refractory**

- (A) Mortars
- (B) Cements
- (C) Castables
- (D) None of these

Answer: Option C

**35. Which is the most stable crystalline form of silica at room temperature?**

- (A) Quartz
- (B) Cristobalite
- (C) Tridymite
- (D) None of these

Answer: Option A

**36. Hot face insulating linings of high purity alumina fused mullite are used, where**

- (A) Very high temperatures are involved
- (B) Highly reducing conditions are involved
- (C) Presence of iron or silica is harmful
- (D) All (A), (B) and (C)

Answer: Option D

**37. Which of the following bricks has the most close values of RUL and PCE?**

- (A) Silica bricks
- (B) Fireclay bricks
- (C) High alumina bricks
- (D) Tar dolomite bricks

Answer: Option A

**38. Periclase refractory contains mainly**

- (A) CaO
- (B) MgO
- (C) Al<sub>2</sub>O<sub>3</sub>
- (D) SiO<sub>2</sub>

Answer: Option B

**39. Roof of a basic open hearth furnace is lined with \_\_\_\_\_ bricks.**

- (A) Silica
- (B) Fireclay
- (C) Dolomite
- (D) Magnesite

Answer: Option A

**40. Silica bricks have low spalling resistance below 600°C, due to its**

- (A) Very high thermal conductivity
- (B) High co-efficient of expansion upto this temperature
- (C) High thermal diffusivity
- (D) Low refractoriness

Answer: Option B

**41. Chrome magnesite bricks are used in the**

- (A) Side walls of soaking pits and arc furnaces
- (B) Copper melting furnaces & converters

- (C) Burner block of glass tanks
  - (D) All (A), (B) and (C)
- Answer: Option D

**42. Magnesite refractories have low resistance to**

- (A) Attack by basic slag
- (B) Abrasion
- (C) Disintegration on sudden change of temperature
- (D) Both (B) and (C)

Answer: Option D

**43. Refractory materials are never used in the construction of**

- (A) Segar cones
- (B) Orton cones
- (C) Pressure vessels
- (D) Ovens & retorts

Answer: Option C

**44. Which is a basic refractory?**

- (A) Fireclay
- (B) Silica
- (C) Chrome magnesite
- (D) None of these

Answer: Option C

**45. Graphite or carbon refractories**

- (A) Exhibit wetting characteristics
- (B) Should be used in neutral or reducing atmosphere
- (C) Exhibit high shrinkage on thermal treatment
- (D) Are not resistant to corrosion by slag

Answer: Option B

**46. Tar dolomite bricks are used in the**

- (A) Basic Bessemer converter
- (B) Basic open hearth furnace
- (C) Electric furnaces
- (D) All (A), (B) and (C)

Answer: Option D

**47. Zirconia refractory**

- (A) Does not react with basic slags
- (B) Is produced from baddeleyite
- (C) Cannot be used as an insulator
- (D) Has poor electrical conductivity at high temperature

Answer: Option B

**48. Cold crushing strength of fireclay bricks is about \_\_\_\_\_ kgf/cm<sup>2</sup>.**

- (A) 50-100
- (B) 100-150
- (C) 200-400
- (D) 500-1000

Answer: Option C

**49. Carbon refractories have very high**

- (A) Wetting characteristics
- (B) Refractoriness
- (C) Thermal conductivity
- (D) Both (B) and (C)

Answer: Option D

**50. Sillimanite (Al<sub>2</sub>O<sub>3</sub>.SiO<sub>2</sub>) refractory, which is a neutral refractory, is not used in**

- (A) Pottery furnace
- (B) Glass melting furnace
- (C) Crucibles
- (D) Gas retorts

Answer: Option D

**51. An ideal refractory should have high**

- (A) Spalling rate
- (B) Fusion point
- (C) Shrinkage ability
- (D) None of these

Answer: Option B

**52. Pick out the wrong statement.**

- (A) Electrical conductivity of refractory is not important, when these are to be used in electrical furnaces
- (B) Graphite and metals are the good electrical conductor among the refractories and others are all electrical insulators
- (C) Refractories used for lining electrical furnaces should ordinarily have very low electrical conductivity
- (D) Electrical conductivity of porous refractory material is low

Answer: Option A

**53. Fusion point of an acidic refractory material is**

- (A) Increased by the addition of basic oxides
- (B) Reduced by the addition of basic oxides
- (C) Not affected by the addition of basic oxides
- (D) Always more than 2500°C

Answer: Option B

**54. Rate of slag attack on refractories increases with rise in temperature due to the**

- (A) Decreased viscosity of slag
- (B) Increased thermal conductivity of brick
- (C) Oxidising condition in the furnace
- (D) None of these

Answer: Option A

**55. Segar cones are used for the determination of \_\_\_\_\_ of refractories.**

- (A) Softening temperature
- (B) Spalling resistance
- (C) Electrical conductivity
- (D) Resistance to slag attack

Answer: Option A

**56. Tar bonded dolomite bricks**

- (A) Are stored under controlled temperature & humidity to avoid hydration
- (B) Are used in outer lining of L.D. converters
- (C) Have poorer hydration resistance than pitch bonded bricks
- (D) All (A), (B) and (C)

Answer: Option D

**57. Porosity is induced in insulating refractories by adding**

- (A) Powdered naphthalene
- (B) Ammonium chloride/sulphate
- (C) Calcium phosphate
- (D) All (A), (B) and (C)

Answer: Option D

**58. Which furnace consumes maximum refractory annually in an integrated steel plant ?**

- (A) Soaking pit
- (B) Blast furnace
- (C) L.D. converter
- (D) Coke ovens

Answer: Option C

**59. Machine moulding of dry mixture of refractories requires a pressure of the order of \_\_\_\_\_ kg/cm<sup>2</sup>.**

- (A) 10
- (B) 100

(C) 500  
(D) 1000  
Answer: Option D

**60. Which of the following bricks should not be used, if the furnace is to be used intermittently?**

- (A) Firebricks
- (B) Silica bricks
- (C) Silicon carbide bricks
- (D) Sillimanite

Answer: Option B

**61. Carbon bricks are not used in the lining of the**

- (A) Combustion chamber of blast furnace stoves
- (B) Electric furnaces
- (C) Highly chemical resistant equipments
- (D) Blast furnace hearth

Answer: Option A

**62. Refractoriness under load (RUL) is the most important property for the refractory bricks**

- (A) At the hearth bottom of the furnace on which stock is placed
- (B) Used for furnace insulation
- (C) Used in the roof of the furnace
- (D) None of these

Answer: Option A

**63. Grog addition in fireclay during brick manufacture is done to**

- (A) Reduce its shrinkage on heating
- (B) Impart greater spalling resistance
- (C) Enhance the strength of fired refractories
- (D) All (A), (B) and (C)

Answer: Option D

**64. Pick out the wrong statement.**

- (A) Sand & coke is the main raw material for the manufacture of silicon carbide
- (B) Carbon refractories cannot be used in the furnaces operating under reducing conditions
- (C) Mullite can be obtained by the heating of alusite, kyanite or sillimanite
- (D) Silica occurs in nature in all cellular, amorphous or crystalline form

Answer: Option B

**65. Which of the following does not occur during firing/burning of refractories?**

- (A) Removal of water of hydration
- (B) Vitrification
- (C) Decrease in crushing strength
- (D) Development of stable mineral form

Answer: Option C

**66. Ganister is a source of the**

- (A) Silica
- (B) Periclase
- (C) Lime
- (D) None of these

Answer: Option A

**67. Conversion of silica mineral to Cristobalite is accompanied by reduction in its**

- (A) Volume
- (B) Specific gravity
- (C) Both (A) & (B)
- (D) Neither (A) nor (B)

Answer: Option B

**68. Which is required in an insulating refractory?**

- (A) High thermal conductivity
- (B) Low porosity
- (C) Both (A) and (B)
- (D) Neither (A) nor (B)



Answer: Option D

**69. Magnesite chrome bricks are used in the**

- (A) Roof lining of basic open hearth & other basic furnaces
- (B) Reheating furnaces
- (C) Soaking pits
- (D) All (A), (B) and (C)

Answer: Option D

**70. Sillimanite is a \_\_\_\_\_ refractory.**

- (A) Basic
- (B) Neutral
- (C) High alumina
- (D) Insulating

Answer: Option C

**71. Silica bricks are attacked by basic slags at high temperature. Which of the following is not used solely as a binding material?**

- (A) Aluminium phosphate
- (B) Water
- (C) Lime
- (D) Plaster of Paris

Answer: Option B

**72. Carbon refractories**

- (A) Do not burn/oxidise, when exposed to air on heating
- (B) Are not attacked by slags, as they are not wetted by melts
- (C) Do not resist temperature fluctuations
- (D) Have extremely low thermal & electrical conductivities

Answer: Option B

**73. Periclase is**

- (A) Crystalline form of MgO
- (B)  $MgCO_3$
- (C)  $ZrSO_4$
- (D) Amorphous magnesite

Answer: Option A

**74. Refractoriness under load (RUL) of fireclay bricks (under a load of  $2 \text{ kg/cm}^2$ ) is \_\_\_\_\_ °C.**

- (A) 500
- (B) 1000
- (C) >1350
- (D) >2000

Answer: Option C

**75. RUL of refractories depends on the**

- (A) Chemical composition
- (B) Physical structure
- (C) Presence of impurities like iron & alkali
- (D) All (A), (B) and (C)

Answer: Option D

**76. Natural silica**

- (A) Mainly contains quartz
- (B) Is not stable at high temperature
- (C) Transforms to other allotropic forms i.e. Tridymite and Cristobalite involving very high volume changes
- (D) All (A), (B) and (C)

Answer: Option D

**77. Which one contains maximum percentage of  $Al_2O_3$ ?**

- (A) Firebrick
- (B) Sillimanite
- (C) Magnesite

(D) Aluminous firebrick  
Answer: Option B

**78. Spalling tendency of refractories is reduced by increasing its**

- (A) Porosity
  - (B) Specific gravity
  - (C) Thermal conductivity
  - (D) Strength
- Answer: Option A

**79. Which is not a basic refractory?**

- (A) Chrome magnesite
  - (B) Magnesite
  - (C) Dolomite
  - (D) Silicon carbide
- Answer: Option D

**80. Which is not a high alumina refractory?**

- (A) Mullite
  - (B) Corundum
  - (C) Bauxite
  - (D) Dolomite
- Answer: Option D

**81. Silica refractories**

- (A) crack when subjected to sudden change of temperature
  - (B) Cannot be used in the dome of hot blast stoves
  - (C) Have lower thermal conductivity than fireclay bricks
  - (D) All (A), (B) and (C)
- Answer: Option A

**82. Which brick undergoes maximum shrinkage on drying?**

- (A) Tar bonded dolomite bricks
  - (B) Fireclay bricks
  - (C) Magnesite bricks
  - (D) Chromite bricks
- Answer: Option B

**83. Firing of refractory brick is done to**

- (A) Dehydrate the dried refractory
  - (B) Develop stable mineral forms in them
  - (C) Form ceramic bonds necessary for development of high crushing strength in the finished product
  - (D) All (A), (B) and (C)
- Answer: Option D

**84. 10 to 30% magnesite is added to Chromite to produce chrome-magnesite refractories. Magnesite addition is mainly done to improve the \_\_\_\_\_ of Chromite.**

- (A) Spalling resistance
  - (B) Refractoriness
  - (C) Crushing strength
  - (D) Resistance to slag
- Answer: Option A

**85. Ferromagnetic ceramic material is not used in the**

- (A) Thermal insulation
  - (B) Transformers
  - (C) Magnetic switches
  - (D) Television sets
- Answer: Option A

**86. Furnace atmosphere for softening temperature determination of refractories (in which Seger Cones are placed) should be**

- (A) Oxidising
- (B) Neutral

- (C) Either (A) or (B)
  - (D) Neither (A) nor (B)
- Answer: Option C

**87. Which one expands on heating?**

- (A) Silica bricks
  - (B) Fireclay bricks
  - (C) Both (A) & (B)
  - (D) Neither (A) nor (B)
- Answer: Option A

**88. Ramming masses are used for**

- (A) Obtaining monolithic working faces
  - (B) Repairing construction of various furnace parts
  - (C) Both (A) & (B)
  - (D) Neither (A) nor (B)
- Answer: Option C

**89. \_\_\_\_\_ nozzles are used in continuous casting of steel,**

- (A) Zircon
  - (B) Thoria
  - (C) Carborundum
  - (D) Beryllia
- Answer: Option A

**90. Pyrometric cone equivalent (PCE) of a refractory is the measure of its**

- (A) Spalling resistance
  - (B) Fusion point
  - (C) Resistance to slag penetration
  - (D) Resistance to carbon monoxide attack
- Answer: Option B

**91. Chromite refractories**

- (A) Are bonded with lime and clay
  - (B) (Free from silica) have better thermal fatigue resistance than silica and magnesite refractories.
  - (C) Are resistant to basic slag
  - (D) All (A), (B) and (C)
- Answer: Option D

**92. Addition of grog in fireclay brick during its manufacture is advantageous, because it results in**

- (A) Less shrinkage in heating, decreased apparent porosity & increased specific gravity
  - (B) High strength & thermal spalling resistance
  - (C) Less addition of water to get a workable plasticity & lesser time required for drying the raw refractories and hence increased rate of production
  - (D) All (A), (B) and (C)
- Answer: Option D

**93. Zircon refractories have**

- (A) Low co-efficient of expansion
  - (B) High RUL (1600°C) and refractoriness (> 2000°C)
  - (C) High spalling resistance
  - (D) All (A), (B) and (C)
- Answer: Option D

**94. Use of higher percentage of lime for bonding silica bricks, reduces their**

- (A) Strength
  - (B) Abrasion resistance
  - (C) Both (A) & (B)
  - (D) Neither (A) nor (B)
- Answer: Option C

**95. Cermets are combination of ceramic and metallic materials due to which they have high strength & resistance to high temperature. Cermets are used in the**

- (A) Hearth of the blast furnace

- (B) Nuclear reactors, missiles & space crafts
  - (C) Insulation of high temperature furnaces
  - (D) Roof of electric furnaces
- Answer: Option B

**96. Magnesite chrome refractories**

- (A) Have better spalling resistance than chrome magnesite refractories
  - (B) Have very low thermal co-efficient of expansion
  - (C) Are not at all resistant to the corrosive action of iron oxide
  - (D) Have very low ( $50 \text{ kg/cm}^2$ ) cold crushing strength (C.C.S.), and cannot be used in metalcase form
- Answer: Option A

**97. 'Super refractories' are made from pure**

- (A) Carbides
  - (B) Oxides
  - (C) Borides
  - (D) Nitrides
- Answer: Option B

**98. Which is the stable form of silica upto  $1470^\circ\text{C}$ ?**

- (A) Quartz
  - (B) Cristobalite
  - (C) Tridymite
  - (D) None of these
- Answer: Option C

**99. Skull is not formed on the carbon blocks in the hearth of a blast furnace, when it becomes cold, because of its**

- (A) Non-wetting characteristic
  - (B) High thermal conductivity
  - (C) High crushing strength
  - (D) None of these
- Answer: Option A

**100. Thermal spalling mainly occurs during \_\_\_\_\_ of furnaces.**

- (A) Cooling down
  - (B) Warming up
  - (C) Both (A) & (B)
  - (D) Neither (A) nor (B)
- Answer: Option C

**101. Maximum safe working temperature for fireclay bricks is about \_\_\_\_\_  $^\circ\text{C}$ .**

- (A) 1150
  - (B) 1300
  - (C) 1450
  - (D) 1550
- Answer: Option D

**102. High alumina refractories are used in the**

- (A) Dome of blast furnace stoves
  - (B) Electric arc furnace roof
  - (C) Glass melting furnaces
  - (D) All (A), (B) and (C)
- Answer: Option D

**103. Which is the stable form of silica between  $1470^\circ\text{C}$  and the melting point  $1713^\circ\text{C}$ ?**

- (A) Cristobalite
  - (B) Tridymite
  - (C) Quartz
  - (D) None of these
- Answer: Option A

**104. \_\_\_\_\_ is not a single oxide-refractory.**

- (A) Zirconia

- (B) Silicon carbide
  - (C) Magnesia
  - (D) None of these
- Answer: Option B

**105. Cold crushing strength of a refractory does not depend upon its**

- (A) Shape
- (B) Composition
- (C) Firing temperature
- (D) Texture

Answer: Option A

**106. Chrome magnesite brick is not used for lining the**

- (A) Hearth of soaking pits
- (B) Bottom hearth of reheating furnace
- (C) Coke oven regenerator
- (D) Burning zone of limestone rotary kilns

Answer: Option C

**107. Thoria**

- (A) Has high fusion temperature ( $> 3000^{\circ}\text{C}$ ) but poor resistance to thermal shock
- (B) Has high resistance to basic slags
- (C) Which is expensive & radioactive, is used in crucibles for melting high purity metals
- (D) All (A), (B) and (C)

Answer: Option D

**108. Most Cermets, which normally have high thermal conductivity and high thermal shock resistance, comprises of ceramic & metallic components of \_\_\_\_\_ percent respectively.**

- (A) 80 and 20
- (B) 20 and 80
- (C) 50 and 50
- (D) 60 and 40

Answer: Option A

**109. Chromite refractories are**

- (A) Acidic refractory
- (B) Neutral refractory
- (C) Basic refractory
- (D) Fired at a temperature of  $600^{\circ}\text{C}$  only

Answer: Option B

**110. \_\_\_\_\_ of carbon blocks in the hearth of blast furnace helps in avoiding skull formation, when it becomes cold.**

- (A) High thermal conductivity
- (B) Low porosity
- (C) Non-wetting characteristics
- (D) High density

Answer: Option C

**111. Vacuum steel degassing units are lined with**

- (A) Silica bricks
- (B) Low duty firebricks
- (C) High alumina bricks
- (D) Graphite blocks

Answer: Option C

**112. Rotary kilns meant for calcination of limestone are lined with chrome magnesite in \_\_\_\_\_ zone.**

- (A) Preheating
- (B) Cooling
- (C) Burning
- (D) All the above

Answer: Option C

**113. With increasing alumina content, the fusion point of high alumina refractories**

- (A) Increases
  - (B) Decreases
  - (C) Remain constant
  - (D) May increase or decrease; depends on its alumina content
- Answer: Option A

**114. Semi-silica bricks compared to silica bricks have**

- (A) Less fusion point
  - (B) Better spalling resistance
  - (C) Both (A) and (B)
  - (D) Neither (A) nor (B)
- Answer: Option C

**115. Walls, roofs & combustion chambers of annealing furnaces are made of \_\_\_\_\_ bricks.**

- (A) High duty fireclay
  - (B) Silica
  - (C) Mullite
  - (D) Carborundum
- Answer: Option A

**116. Which of the following impurities reduces the refractoriness of magnesite bricks?**

- (A)  $Al_2O_3$
  - (B) CaO
  - (C)  $SiO_2$
  - (D) All (A), (B) & (C)
- Answer: Option D

**117. Cold crushing strength of ordinary fireclay brick is about  $950 \text{ kg/cm}^2$ . On exposure to a temperature of about  $1500^\circ\text{C}$ , its crushing strength may come down to as low as \_\_\_\_\_  $\text{kg/cm}^2$ .**

- (A) 450
- (B) 250
- (C) 150
- (D) 65

Answer: Option D

**118.  $SiO_2$  percentage in firebrick is about**

- (A) 35-40
- (B) 55-60
- (C) 80-85
- (D) > 94

Answer: Option B

**119. Thoria is an expensive refractory material and is radioactive in nature. Thorium oxide is used in the manufacture of**

- (A) Seger cones
- (B) Muffles for muffle furnaces
- (C) Insulating bricks
- (D) Crucibles used for melting of high purity metals

Answer: Option D

**120. Pick out the wrong statement.**

- (A) A ceramic material which becomes fluid upon heating and can be moulded in liquid/viscous state is termed as glass
- (B) Ceramic materials do not undergo vitrification on heating
- (C) Ceramic materials are brittle in nature
- (D) Non-oxide ceramic materials generally act as a semi-conductor

Answer: Option B

**121. PCE value (Seger cone) of Superduty refractories is more than 33, which is equivalent to a temperature of \_\_\_\_\_  $^\circ\text{C}$ .**

- (A) 1520
- (B) 1630
- (C) 1670
- (D) 1730

Answer: Option D

**122. 'Spinel', a refractory mineral is chemically represented as**

- (A)  $MgAl_2O_4$
- (B)  $MgAl_2O_3$
- (C)  $MgSO_4$
- (D)  $MgAl_2O_3 \cdot 2H_2O$

Answer: Option A

**123. Spray test determines the \_\_\_\_\_ of refractories.**

- (A) Resistance to slag penetration
- (B) Resistance to CO attack
- (C) RUL
- (D) Permanent linear change

Answer: Option A

**124. With increase in the density of silica refractories, its**

- (A) Resistance to slag attack increases
- (B) Spalling resistance reduces
- (C) Both (A) and (B)
- (D) Neither (A) nor (B)

Answer: Option C

**125. Fireclay refractories have**

- (A) Low co-efficient of thermal expansion
- (B) Poor thermal spalling resistance
- (C) Tendency to expand unduly high during firing
- (D) Very high cost

Answer: Option A

**126. Mixing of ground refractory material and water is done in a \_\_\_\_\_ mill.**

- (A) Pug
- (B) Ball
- (C) Tube
- (D) Rod

Answer: Option A

**127. Dolomite bricks have good resistance to attack by**

- (A) Molten steel
- (B) Iron oxide
- (C) Lime slag
- (D) None of these

Answer: Option A

**128. Silicon carbide refractories are used in the**

- (A) Muffle furnace
- (B) Zinc smelting furnace
- (C) Ceramic recuperators
- (D) All (A), (B) and (C)

Answer: Option D

**129. Zirconia refractories are not used in**

- (A) Making sheaths for thermocouple
- (B) Lining high temperature ceramic kilns
- (C) Furnaces subjected to fluctuating temperature
- (D) High frequency induction furnaces in the form of inductors

Answer: Option C

**130. Firing temperature of magnesite bricks is about \_\_\_\_\_ °C.**

- (A) 800-1000
- (B) 1000-1200
- (C) 1600-1800
- (D) 2400-2600

Answer: Option C

**131. The highest melting pure oxide (m.p. > 3000°C) is**

- (A) Thoria
- (B) Alumina
- (C) Beryllia
- (D) Zirconia

Answer: Option A

**132. Which of the following is not an acidic refractory?**

- (A) Silica bricks
- (B) Fireclay bricks
- (C) Bauxite bricks
- (D) Magnesite bricks

Answer: Option D

**133. The largest consumer of refractories is the \_\_\_\_\_ industry.**

- (A) Cement
- (B) Metallurgical
- (C) Fertiliser
- (D) Power

Answer: Option B

**134. Grog**

- (A) Contains both alumina and silica
- (B) Is crushed firebrick
- (C) Is a non-plastic material
- (D) All (A), (B) and (C)

Answer: Option D

**135. Crushing strength of a refractory**

- (A) Increases with rise in service temperature
- (B) Decreases with rise in service temperature
- (C) Is unaffected with change in service temperature
- (D) Decreases with increase in porosity

Answer: Option B

**136. Except \_\_\_\_\_, all other refractories are bad conductors of electricity (i.e. have low electrical conductivity).**

- (A) Fireclay
- (B) Carborundum
- (C) Graphite
- (D) Chromite

Answer: Option C

**137. Colour of fireclay bricks is**

- (A) Light buff to reddish buff
- (B) Yellow
- (C) Black
- (D) None of these

Answer: Option A

**138. Refractoriness of a typical silica brick corresponds to Segar cone number, '32', which is equivalent to a temperature of \_\_\_\_\_ °C.**

- (A) 1380
- (B) 1520
- (C) 1710
- (D) 1915

Answer: Option C

**139. Slide gates in teeming laddie used for steel pouring in ingot moulds is lined with \_\_\_\_\_ bricks.**

- (A) Bakelite impregnated or fused periclase
- (B) Silica
- (C) Semi-silica
- (D) Fireclay

Answer: Option A



**140. With increase in the alumina content in firebricks, its fusion point (refractoriness)**

- (A) Decreases linearly
- (B) Remains unchanged
- (C) Increases
- (D) Decreases

Answer: Option C

**141. Highest melting (m.p = 3070°C) oxide refractory is**

- (A) Alumina
- (B) Thoria
- (C) Zirconia
- (D) Magnesite

Answer: Option B

**142. Insulating refractories should have**

- (A) High porosity
- (B) Low thermal conductivity
- (C) Both (A) and (B)
- (D) Neither (A) nor (B)

Answer: Option B

**143. Dilatometer is used for the determination of \_\_\_\_\_ of refractories.**

- (A) Modulus of rupture
- (B) Permanent linear change
- (C) Resistance to CO attack
- (D) RUL

Answer: Option B

**144. Which is the stable form of silica below 870°C?**

- (A) Tridymite
- (B) Cristobalite
- (C) Quartz
- (D) None of these

Answer: Option C

**145. Refractoriness under loads (RUL) is quite close to the fusion temperature (PCE) for \_\_\_\_\_ bricks.**

- (A) Fireclay
- (B) Silica
- (C) Dolomite
- (D) Very low alumina

Answer: Option B

**146. Which of the following is not a neutral refractory?**

- (A) Silicon carbide
- (B) Magnesite
- (C) Chromite
- (D) Graphite

Answer: Option B

**147. The maximum linear expansion of silica bricks during firing is about \_\_\_\_\_ percent.**

- (A) 0.5
- (B) 1
- (C) 2
- (D) 3.5

Answer: Option D

**148. Firing temperature is minimum (1250-1400 °C) for \_\_\_\_\_ bricks.**

- (A) Fireclay
- (B) Direct bonded basic
- (C) Silica
- (D) Magnesite

Answer: Option A

**149. Hot blast main (carrying air at 1000°C) in blast furnace are lined with \_\_\_\_\_ bricks.**

- (A) Silica
- (B) Fireclay
- (C) Magnesite
- (D) Zirconia

Answer: Option B

**150. Electrical resistor bars are made of**

- (A) Silicon carbide
- (B) Alumina
- (C) Zirconia
- (D) Graphite

Answer: Option A

**151. With decrease in porosity, the \_\_\_\_\_ of the refractories decreases.**

- (A) Strength
- (B) Thermal conductivity
- (C) Spalling resistance
- (D) None of these

Answer: Option C

**152. Refractories are dried in the**

- (A) Rotary kilns
- (B) Tunnel kilns
- (C) Sun
- (D) None of these

Answer: Option B

**153. \_\_\_\_\_ bricks should not be used in oxidising atmosphere.**

- (A) Tar dolomite
- (B) Carbon
- (C) Silica
- (D) Fireclay

Answer: Option B

**154. Which refractory must have controlled atmosphere (temperature and humidity) for its safe storage?**

- (A) Tar bonded dolomite bricks
- (B) Fireclay bricks
- (C) Mullite bricks
- (D) Magnesite bricks

Answer: Option A

**155. Magnesite bricks have poor resistance to attack by \_\_\_\_\_ slag.**

- (A) Lime
- (B) Basic
- (C) Acid
- (D) None of these

Answer: Option C

**156. An indication of degree of firing in silica brick is its**

- (A) Specific gravity
- (B) Fusion point
- (C) RUL
- (D) None of these

Answer: Option A

**157. Which is not a natural insulating material?**

- (A) Diatomaceous earth/kieselgur
- (B) Asbestos
- (C) Vermiculite
- (D) None of these

Answer: Option D

**158. Which is not an alumino-silicate refractory?**

- (A) Fireclay bricks
  - (B) Mullite bricks
  - (C) Tar dolomite bricks
  - (D) High alumina bricks
- Answer: Option C

**159. Which of the following is not a high alumina refractory material?**

- (A) Kyanite
- (B) Sillimanite
- (C) Diaspore
- (D) Periclase

Answer: Option D

**160. Resistance to slag attack of a refractory**

- (A) Depends on the nature of slag & refractory
- (B) Decreases at higher temperature
- (C) Decreases, if defective joints & cracks exist in the refractory
- (D) All (A), (B) and (C)

Answer: Option D

**161. \_\_\_\_\_ is the measure of the strength of refractory under the combined effect of temperature & load.**

- (A) Porosity
- (B) RUL
- (C) Specific gravity
- (D) Thermal conductivity

Answer: Option B

**162. Fireclay bricks are never used in the**

- (A) Beehive oven
- (B) Coke oven walls
- (C) Zinc roaster
- (D) Lead blast furnace

Answer: Option B

**163. Which one contains minimum percentage of SiO<sub>2</sub>?**

- (A) Firebrick
- (B) Sillimanite
- (C) Semi-silica
- (D) Aluminous firebrick

Answer: Option B

**164. Magnesite bricks are used in those parts of furnaces, which are**

- (A) Subjected to temperature fluctuation
- (B) Required to resist corrosive basic slag
- (C) Subjected to high load
- (D) None of these

Answer: Option B

**165. Pure bauxite is the best raw material for the manufacture of high alumina refractories, in which maximum alumina content can be as high as \_\_\_\_\_ percent.**

- (A) 55
- (B) 70
- (C) 80
- (D) 90

Answer: Option D

**166. High thermal conductivity of a refractory material is not important, when it is to be used in the**

- (A) Coke oven regenerators
- (B) Muffle furnace
- (C) Blast furnace
- (D) Recuperators

Answer: Option C

**167. Mullite is chemically represented by**

- (A)  $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$
- (B)  $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$
- (C)  $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$
- (D)  $2\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$

Answer: Option B

**168. Pyrometric cone equivalent (PCE) value (Segar cone) of 'Superduty refractories' is more than 33 which corresponds to a temperature of \_\_\_\_\_ °C.**

- (A) 1520
- (B) 1630
- (C) 1670
- (D) 1730

Answer: Option D

**169. High alumina refractory compared to fireclay bricks have**

- (A) Less load bearing capacity
- (B) Less resistance to slag attack
- (C) Low refractoriness
- (D) High resistance to thermal shock and creep

Answer: Option D

**170. Basic bricks are not made of**

- (A) Fireclay
- (B) Magnesite
- (C) Forsterite
- (D) Chromite

Answer: Option A

**171. Porosity of fireclay refractories is \_\_\_\_\_ percent.**

- (A) 5-10
- (B) 10-25
- (C) 25-35
- (D) 35-50

Answer: Option B

**172. A steel member used in the furnace construction to take the thrust of the brickwork is called**

- (A) Buckstay
- (B) Breast wall
- (C) Armouring
- (D) Baffle

Answer: Option A

**173. Fusion temperature of pure silica ( $\text{SiO}_2$ ) is \_\_\_\_\_ °C.**

- (A) 1350
- (B) 1715
- (C) 2570
- (D) 2800

Answer: Option B

**174. Hollow refractory bricks are made by**

- (A) Slip casting
- (B) Hand moulding
- (C) pressing/machine moulding
- (D) Extrusion

Answer: Option A

**175. Bottom of basic open hearth furnace are constructed of**

- (A) Dead burnt magnesite ramming mass
- (B) Porous fireclay bricks
- (C) Semi-silica bricks
- (D) Silicon carbide bricks

Answer: Option A

**176. Capacity of a refractory brick to withstand-sudden changes in temperature is denoted by the property called**

- (A) Spalling resistance
- (B) Refractoriness
- (C) Refractoriness under load (RUL)
- (D) None of these

Answer: Option A

**177. Addition of zircon to silica refractory brick improves its**

- (A) Crushing strength
- (B) Resistance to slag attack
- (C) Both (A) and (B)
- (D) Neither (A) nor (B)

Answer: Option B

**178. Refractoriness/fusion points of 'Superduty' refractories is \_\_\_\_\_ °C.**

- (A) 1520-1630
- (B) 1630-1670
- (C) > 1730
- (D) > 2000

Answer: Option C

**179. Refractories subjected to alternate cycles of heating & cooling are liable to loose their resistance to**

- (A) Thermal spalling
- (B) Slag attack
- (C) Fusion under load
- (D) CO attack

Answer: Option A

**180. With increase in the porosity, thermal spalling resistance of fireclay brick**

- (A) Increases
- (B) Decreases
- (C) Remain same
- (D) May increase or decrease

Answer: Option A

**181. Refractory bricks with lower permeability is produced by using**

- (A) Higher firing temperature
- (B) Higher moulding pressure
- (C) Finer grog size
- (D) All (A), (B) and (C)

Answer: Option D

**182. Quartz is**

- (A) Stable form of silica upto 870°C
- (B) Converted to Tridymite on firing between 870 to 1470°C
- (C) Transformed to Cristobalite on heating above 1470°C
- (D) All (A), (B) and (C)

Answer: Option D

**183. Pure oxide refractories are generally monocrystalline in nature and are self bonded \_\_\_\_\_ bricks are generally used as moderator in nuclear reactors.**

- (A) Beryllia
- (B) Carborundum
- (C) Corundum
- (D) Thoria

Answer: Option A

**184. Beryllia (which is used in making crucibles for melting uranium & thorium) is superior to alumina in all respects for high temperature (> 1900°C ) use, except**

- (A) Cost
- (B) Electrical conductivity
- (C) Thermal conductivity
- (D) Fusion point

Answer: Option A

**185. Ceramic recuperators used for waste heat recovery from high temperature flue gas going out of the furnace is made of**

- (A) Fireclay
- (B) Silicon carbide
- (C) Corundum
- (D) Siliceous fireclay

Answer: Option B

**186. Water content in ground refractory material to be shaped into bricks by hand moulding is about \_\_\_\_\_ percent.**

- (A) 5
- (B) 20
- (C) 40
- (D) 55

Answer: Option B

**187. Refractory bricks having lower porosity have**

- (A) High insulating properties
- (B) Low heat capacity
- (C) Low thermal conductivity
- (D) Greater strength

Answer: Option D

**188. Maximum alumina content in high alumina refractory can be as high as \_\_\_\_\_ percent.**

- (A) 30
- (B) 50
- (C) 70
- (D) 90

Answer: Option D

**189. Silica bricks are never used for lining the**

- (A) Beehive coke ovens
- (B) By-product coke ovens
- (C) Dome of blast furnace stoves
- (D) Roof of open hearth furnace

Answer: Option A

**190. Panel test determines the \_\_\_\_\_ of refractories.**

- (A) Fusion point
- (B) Spalling resistance
- (C) Slag penetration resistance
- (D) Refractoriness under load (RUL)

Answer: Option B

**191. Fireclay refractories**

- (A) Are not resistant to the action of basic slags
- (B) Combine with salts (e.g. chlorides sulphates etc.) & bases (e.g. lime, magnesia etc.) forming fusible aluminates silicates etc
- (C) Shrink during firing
- (D) All (A), (B) and (C)

Answer: Option D

**192. Chemically, mullite refractories is**

- (A)  $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$
- (B)  $\text{Al}_2\text{O}_3$
- (C)  $\text{ZrSO}_4$
- (D)  $\text{ThO}_2$

Answer: Option A

**193. Fireclay bricks is not used for lining the**

- (A) Cupola
- (B) Gas producer

- (C) Bottom of hot metal mixer
  - (D) Roof of open hearth furnace
- Answer: Option C

**194. Presence of MgO in alumino-silicate refractories \_\_\_\_\_ its refractoriness.**

- (A) Increases
- (B) Lowers
- (C) Does not affect
- (D) Either (A) or (B); depends on its quantity

Answer: Option B

**195. In panel test for spalling resistance, the average face temperature of panel assembly is maintained at \_\_\_\_\_ °C for 24 hours.**

- (A) 700
- (B) 1000
- (C) 1600
- (D) 2000

Answer: Option C

**196. Hot metal runner in blast furnace are lined with \_\_\_\_\_ bricks.**

- (A) Silica
- (B) Carborundum
- (C) Fireclay
- (D) Magnesite

Answer: Option C

**197. Which is an acidic refractory?**

- (A) Magnesite
- (B) Dolomite
- (C) Fireclay
- (D) Chrome magnesite

Answer: Option C

**198. Fireclay bricks are not used in the**

- (A) Beehive coke oven
- (B) By-product coke oven walls
- (C) Combustion chamber of B.F. stoves
- (D) Coke oven regenerators

Answer: Option B

**199. Which is a neutral refractory?**

- (A) Graphite
- (B) Magnesite chrome
- (C) Silica
- (D) Magnesia

Answer: Option A

**200. High porosity refractory bricks have**

- (A) Poor resistance to the penetration of molten slag, metal & flue gases
- (B) Poor heat conductivity & low strength
- (C) Better thermal spalling resistance
- (D) All (A), (B) and (C)

Answer: Option D

**201. Which is not an acidic refractory?**

- (A) Silica
- (B) Fireclay
- (C) High alumina refractory
- (D) Carbon black

Answer: Option D

**202. Fireclay bricks are used in the**

- (A) Coke ovens regenerator
- (B) Outer lining of L.D. converter
- (C) Hearth bottom of blast furnace

(D) Coke oven walls  
Answer: Option A

**203. Magnesite refractories are generally not used in the**

- (A) Electric furnace walls
  - (B) Steel melting furnace
  - (C) Open hearth furnace
  - (D) Burning zone of cement kilns
- Answer: Option B

**204. Fusion point of a basic refractory material is**

- (A) Reduced by the addition of acid oxides
  - (B) Increased by the addition of acid oxides
  - (C) Not affected by the addition of acid oxides
  - (D) Always less than 1000°C
- Answer: Option A

**205. Thermal conductivity of refractory bricks**

- (A) Increases with decrease in porosity
  - (B) Decreases with decreases in porosity
  - (C) Is independent of its porosity and is maximum for insulating bricks
  - (D) Increases with the amount of air entrapped in pores
- Answer: Option A

**206. Thermal diffusivity of a refractory brick is high, when its \_\_\_\_\_ is high.**

- (A) Density
  - (B) Specific heat
  - (C) Thermal conductivity
  - (D) None of these
- Answer: Option C

**207. Which form of silica has the highest specific gravity?**

- (A) Quartz
  - (B) Cristobalite
  - (C) Tridymite
  - (D) All have the same specific gravity
- Answer: Option A

**208. With increase in the alumina content, the refractoriness of high alumina refractories**

- (A) Increases
  - (B) Decreases
  - (C) Remain same
  - (D) May increase or decrease
- Answer: Option A

**209. Pick out the wrong statement.**

- (A) Refractories used in muffle furnace should have low thermal conductivity
  - (B) The electrical resistivity of refractories drops rapidly with rise in temperature
  - (C) For reducing spalling tendency, the refractory should be well fired and its porosity should be more
  - (D) Refractoriness under load (RUL) of a refractory is always less than its refractoriness
- Answer: Option A

**210. Test piece for determination of RUL of a refractory is heated in a/an**

- (A) Oxidising atmosphere
  - (B) Reducing atmosphere
  - (C) Electric furnace
  - (D) Neutral atmosphere
- Answer: Option C

**211. Fireclay bricks are not used in the**

- (A) Blast furnace
- (B) Hot blast stove
- (C) Cupola
- (D) Wall of coke oven



Answer: Option D

**212. An insulating refractory brick should have high porosity and low thermal conductivity. Which of the following is not used for inducing porosity in the insulating refractory bricks during its manufacture?**

- (A) Cork
- (B) Saw dust
- (C) Sand
- (D) Chemically prepared foam

Answer: Option C

**213. Permeability of bricks is a measure of the**

- (A) Refractoriness
- (B) Melting point
- (C) Rate at which a fluid will pass through the pores
- (D) Expansion during heating

Answer: Option C

**214. Magnesite refractories are used for the construction of those furnaces, which are**

- (A) Not required to resist the corrosive action of basic slag
- (B) Not subjected to fluctuation in temperature
- (C) Used for raising & maintaining high temperature
- (D) Both (B) and (C)

Answer: Option D

**215. Pick out the wrong statement.**

- (A) Insulating refractories used in place of regular refractory bricks are usually called light weight refractories, and they have similar composition as heavy bricks
- (B) Graphite refractories are also called plumbago refractories
- (C) Superduty fireclay bricks correspond to a pyrometric cone equivalent of 26-28
- (D) Calcined magnesite is also called dead burnt magnesite

Answer: Option C

**216. Outer combustion chamber of blast furnace stove is lined with \_\_\_\_\_ bricks.**

- (A) Fireclay
- (B) Silica
- (C) Chrome magnesite
- (D) Zirconia

Answer: Option A

**217. Carborundum used for making crucibles for melting non-ferrous metals is chemically**

- (A) Silicon carbide
- (B) Silicon nitride
- (C) Crystalline magnesia
- (D) Zirconium sulphate

Answer: Option A

**218. Roof of a basic electric furnace is made of \_\_\_\_\_ bricks.**

- (A) Superduty fireclay
- (B) Silica
- (C) Chromite
- (D) None of these

Answer: Option B

**219. Faster rate of drying of moulded refractories results in high \_\_\_\_\_ of refractories.**

- (A) Green strength
- (B) Voids
- (C) Shrinkage
- (D) Both (B) and (C)

Answer: Option D

**220. Which property of refractories is the most important for top section of the blast furnace?**

- (A) Resistance to abrasion
- (B) Resistance to slag penetration
- (C) Stability of volume at high temperature