

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet No. :

Series

00153

TEST BOOKLET
Paper—II
(**CHEMICAL ENGINEERING**)



Time Allowed : 2 Hours

Full Marks : 100

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.
3. All questions carry equal marks.

The Answer-Sheet should be submitted to the Invigilator.

Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

Example :

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
(B) London
(C) Dhaka
(D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (●) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

1. The main components present in cement are
 - (A) MgO, SiO₂ and K₂O
 - (B) CaO, SiO₂ and Al₂O₃
 - (C) CaO, MgO and K₂O
 - (D) Al₂O₃, MgO and SiO₂

2. Rotary kiln used in cement manufacturing is
 - (A) longer in dry process
 - (B) shorter in wet process
 - (C) longer in wet process
 - (D) None of the above

3. According to BIS10500:1991, the required limit of Cr⁶⁺ in potable water is
 - (A) 0.1 mg/litre
 - (B) 0.5 mg/litre
 - (C) 0.05 mg/litre
 - (D) None of the above

4. With increase in temperature, the solubility of gas
 - (A) decreases
 - (B) increases
 - (C) remains same
 - (D) does not change

5. Effective porosity is
 - (A) $\phi = (\text{pore volume})/(\text{bulk volume})$
 - (B) $\phi = (\text{total pore volume})/(\text{bulk volume})$
 - (C) $\phi = \{(\text{bulk volume}) - (\text{grain volume})\}/(\text{bulk volume})$
 - (D) $\phi = (\text{interconnected pore volume})/(\text{bulk volume})$

6. The presence of a fracture in rock
 - (A) drastically increases its permeability and only slightly affects the porosity
 - (B) drastically increases its permeability
 - (C) drastically decreases its permeability
 - (D) does not affect permeability and porosity

7. Scour velocity means
 - (A) it allows to interact
 - (B) it does not allow resuspension of settled particles
 - (C) it attains maximum velocity at a particular point
 - (D) None of the above

8. Disposal limit of COD, according to pollution norms (the Environment Rules, 1986), is
- (A) 200 mg/litre
 - (B) 350 mg/litre
 - (C) 250 mg/litre
 - (D) 150 mg/litre
9. For storing volatile materials, the roof of the storage tank should be
- (A) fixed
 - (B) conical
 - (C) floating head
 - (D) Both (A) and (B)
10. The most widely used coagulant for treatment of turbid water is
- (A) alum
 - (B) lime
 - (C) ferric chloride
 - (D) sodium aluminate
11. The estimated capacity of Subansiri Hydroelectric Project is
- (A) 1000 MW
 - (B) 2000 MW
 - (C) 740 MW
 - (D) 250 MW
12. The principal objective of sludge management is to
- (A) stabilize the organic matter
 - (B) reduce the sludge volume
 - (C) destroy the pathogens
 - (D) All of the above
13. The secondary treatment of wastewater is
- (A) trickling filter
 - (B) screening
 - (C) aeration
 - (D) sedimentation
14. In relation to BOD, which of the following statements is/are correct?
- (A) Full form of BOD is biochemical oxygen demand.
 - (B) In BOD experiment, light (Sun) is not allowed to pass inside.
 - (C) BOD concentration level tells about the quality of water.
 - (D) All of the above
15. Which of the following cements is useful when concrete is to be laid under running water?
- (A) Ordinary cement
 - (B) High alumina cement
 - (C) Quick setting cement
 - (D) Rapid hardening cement

16. For oil and gas reservoir, trap
- (A) is a reservoir rock
 - (B) is a cap rock
 - (C) may be a structural, stratigraphic or a combination of the two
 - (D) None of the above
17. The addition of gypsum in cement
- (A) increases the setting time
 - (B) reduces the setting time
 - (C) does not affect the setting time
 - (D) can increase or decrease depending on the quantity
18. Well logging means
- (A) lowering electrical and gas sensors into the hole to take measurements of the rock formation there
 - (B) lowering a device into the hole to measure pressures
 - (C) Both (A) and (B)
 - (D) None of the above
19. Priming is needed in a
- (A) reciprocating pump
 - (B) centrifugal pump
 - (C) gear pump
 - (D) diaphragm pump
20. The gamma ray log is used for
- (A) identifying lithology
 - (B) defining bed thickness
 - (C) detecting and evaluating radioactive minerals
 - (D) All of the above
21. The drill bit is made up of
- (A) stainless steel
 - (B) carbon rod
 - (C) tungsten carbide steel and diamond
 - (D) iron
22. Wastewater containing nitrogen and phosphorus, if discharges into lakes, causes
- (A) foaming
 - (B) turbidity
 - (C) undesirable plant growth
 - (D) odor nuisance
23. Water coning in oil or gas well is
- (A) vertical movement of water across bedding planes in producing formation
 - (B) horizontal movement of water
 - (C) Both (A) and (B)
 - (D) Neither (A) nor (B)

24. To increase the weight on the bit
- (A) a kelly is used
 - (B) a packer is used
 - (C) a drill collar is used
 - (D) a stabilizer is used
25. Choose the correct statement.
- (A) The natural gas consists of saturated hydrocarbons.
 - (B) The natural gas is partially or completely saturated with water vapour and may contain nitrogen.
 - (C) The natural gas that occurs along with crude oil may be in either free or dissolved state.
 - (D) All of the above
26. Coagulation process removes solid from wastewater by
- (A) adding positively charged ions for destabilization and neutralization
 - (B) adding negatively charged ions for destabilization and neutralization
 - (C) adding both positively and negatively charged ions
 - (D) None of the above
27. Corrosion resistance of steel can be increased with
- (A) phosphorous and tungsten
 - (B) lead and vanadium
 - (C) molybdenum and tungsten
 - (D) nickel and chromium
28. An ideal fluid is one which
- (A) is incompressible
 - (B) has zero viscosity
 - (C) has potential flow
 - (D) All of the above
29. Which of the following is a Newtonian fluid?
- (A) Rubber latex
 - (B) Sewage sludge
 - (C) Quicksand
 - (D) Non-colloidal solution
30. The terms dam, generator, control gate, penstock, turbine and spillway are related to
- (A) hydel power plant
 - (B) nuclear power plant
 - (C) wind energy
 - (D) solar panel

31. Standard equation for energy production, where P = power, H = head, F = flow, E = efficiency is
- (A) $P = (H + F + E) / 11.8$
 (B) $P = (H \times F \times E) / 11.8$
 (C) $H = (P \times F \times E) / 11.8$
 (D) $E = (P \times F \times H) / 11.8$
32. In hydroelectricity, the medium head is
- (A) less than 30 metres
 (B) below 3 metres
 (C) between 30 metres to 75 metres
 (D) above 75 metres
33. In drilling, the rotary motion is supplied by
- (A) the draw works
 (B) crown and travelling block
 (C) kelly
 (D) series of gearing under the rotary table
34. Flow of fluid (laminar flow) through beds of solid particles is represented by _____ equation.
- (A) Kozeny-Carman
 (B) Blake Plummer
 (C) Hagen-Poiseuille
 (D) Bernoulli's
35. The smallest unit that can generate the crystal is
- (A) atom
 (B) unit cell
 (C) molecule
 (D) space lattice
36. Gunmetal is an alloy consisting of
- (A) copper
 (B) nickel
 (C) silver
 (D) magnesium
37. Persons working in cement plants and limestone quarries are more prone to disease like
- (A) asthma
 (B) silicosis
 (C) cancer
 (D) fluorosis (bone disease)
38. Activated sludge process is
- (A) attached growth
 (B) suspended growth
 (C) hybrid (suspended + attached) growth
 (D) All of the above

39. The most suitable technique for disposal of major hospital's clinical wastes is

- (A) incineration
- (B) landfilling
- (C) composting
- (D) recycling

40. The bronzes are alloys of

- (A) copper and zinc
- (B) copper, tin, aluminum, silicon and nickel
- (C) copper, tin and iron
- (D) silicon, tin and iron

41. In constant-pressure filtration

- (A) resistance decreases with time
- (B) rate of filtration is constant
- (C) rate of filtration increases with time
- (D) rate of filtration decreases with time

42. Leg support is preferable for

- (A) large horizontal cylindrical vessels
- (B) tall but empty vessels
- (C) small vessels
- (D) thicked-wall tall vessels

43. Aluminum has

- (A) FCC crystal structure
- (B) BCC crystal structure
- (C) Both (A) and (B)
- (D) Neither (A) nor (B)

44. The maximum uses of copper are in

- (A) small-scale industries
- (B) utensil manufacture
- (C) electrical industry
- (D) industrial equipment manufacture

45. Hardened steel is softened by

- (A) annealing
- (B) normalizing
- (C) carburizing
- (D) tempering

46. Cathodic protection can be made by

- (A) external power supply
- (B) appropriate galvanic coupling
- (C) addition of iron compound
- (D) Both (A) and (B)

47. For a particle settling in water at its terminal velocity, which of the following is true?
- (A) Buoyancy = Weight + Drag
 (B) Weight = Buoyancy + Drag
 (C) Drag = Buoyancy + Weight
 (D) Drag = Weight
48. The method for sand control in drilling is
- (A) matrix acidization
 (B) hydraulic fracturing
 (C) acid spotting
 (D) gravel packing
49. A storage tank is considered to be a small tank if
- (A) $D(H - 1) \geq 1720$
 (B) $D(H - 1) \leq 1720$
 (C) $H(D - 1) \leq 1720$
 (D) $H(D - 1) \geq 1720$
50. Burning of plastic like PVC releases _____ into atmosphere.
- (A) dioxin
 (B) furan
 (C) hydrogen
 (D) Both (A) and (B)
51. The minimum thickness of carry bags made of recycled plastics shall be
- (A) 20 micron
 (B) 30 micron
 (C) 25 micron
 (D) 15 micron
52. Horizontal cylindrical vessels are supported by
- (A) brackets
 (B) saddles
 (C) skirts
 (D) columns
53. SI unit of G_c , the Newton's law of conversion factor, is
- (A) kg-m/kgf
 (B) kg-m/kgf-sec²
 (C) kg/kgf-sec²
 (D) kg-m/sec²
54. The optimum condition for composting like pH be
- (A) 6-9
 (B) 4-7
 (C) 8-10
 (D) 5-8

55. To achieve deeper penetration in fracture acidizing, it is often desirable to retard acid reaction rate. This is done by adding
- (A) CaCl_2
 - (B) acetic acid
 - (C) formic acid
 - (D) All of the above
56. Workover rigs are specially used
- (A) when well stimulation is involved
 - (B) for remedial action on problem wells
 - (C) Both (A) and (B)
 - (D) Neither (A) nor (B)
57. Gravitational settling chambers are used to remove size range of
- (A) $20 \mu\text{m}$
 - (B) $< 30 \mu\text{m}$
 - (C) $> 50 \mu\text{m}$
 - (D) $25 \mu\text{m}$
58. Bingham plastic is example for flow of
- (A) Newtonian fluid
 - (B) Reynolds analogy
 - (C) non-Newtonian fluid
 - (D) Both (A) and (B)
59. The thickness of the bottom section of a storage tank is
- (A) smaller than the thickness of the top section
 - (B) larger than the thickness of the top section
 - (C) equal to the thickness of the top section
 - (D) None of the above
60. Disadvantage of gravitational settling chambers is
- (A) it requires large space
 - (B) its efficiency is low
 - (C) larger sized particles are separated out
 - (D) All of the above
61. The viscosity of a gas increases with
- (A) pressure
 - (B) temperature
 - (C) volume
 - (D) mole fraction
62. For transition region, the value of Reynolds number is
- (A) < 2100
 - (B) > 4000
 - (C) > 3000
 - (D) between 2100 to 4000

63. The evolution of hydrogen-type corrosion occurs in

- (A) basic environment
- (B) neutral environment
- (C) acidic environment
- (D) Both (A) and (C)

64. Potential flow is characterized by

- (A) irrotational and frictionless flow
- (B) irrotational and frictional flow
- (C) formation of eddies within the flow
- (D) None of the above

65. Which of the following pumps is suitable for pumping smaller fluid at higher discharge pressure?

- (A) Volute pump
- (B) Reciprocating pump
- (C) Centrifugal pump
- (D) Rotary vacuum pump

66. Bernoulli's equation describes

- (A) kinetic energy balance in laminar flow
- (B) mechanical energy balance in potential flow
- (C) mechanical energy balance in boundary layer
- (D) kinetic energy balance in turbulent flow

67. On cooling, a solid phase is converted to two different solid phases. The reaction is termed as

- (A) eutectic
- (B) peritectic
- (C) eutectoid
- (D) peritectoid

68. Hydraulic radius is the ratio of

- (A) flow area to wetted perimeter
- (B) wetted perimeter to flow area
- (C) flow area to square of cross-section
- (D) square root of flow area to wetted perimeter

69. The crystal defect, produced due to a vacancy in positive ion site, is called
- (A) Frenkel defect
 - (B) compositional defect
 - (C) Schottky defect
 - (D) edge defect
70. Because of cavitation occurred in pump, it
- (A) reduces the pump capacity
 - (B) causes severe erosion
 - (C) No liquid can be drawn into the pump
 - (D) All of the above
71. The required value of NPSH for small centrifugal pumps is
- (A) 5 metres to 10 metres
 - (B) 4 metres to 6 metres
 - (C) 1 metre to 3 metres
 - (D) 2 metres to 3 metres
72. The wall thickness of a pipe is indicated by
- (A) outlet of pipe
 - (B) diameter of pipe
 - (C) schedule number
 - (D) Both (A) and (B)
73. The rate of corrosion of metal is influenced by
- (A) electrode potential of metal
 - (B) temperature
 - (C) stress
 - (D) All of the above
74. Which of the following dimensionless numbers is related to mixing process?
- (A) Prandtl number
 - (B) Mach number
 - (C) Reynolds number
 - (D) Power number
75. During the washing of filter cake
- (A) all resistances are constant
 - (B) the filter medium resistance increases
 - (C) the filter medium resistance decreases
 - (D) the cake resistance increases
76. While beginning a centrifugal pump, its outlet valve is needed to be
- (A) close
 - (B) open
 - (C) either open or close
 - (D) neither open nor close

- 77.** For centrifugal blower, the gas capacity varies as
- (A) velocity
 - (B) speed
 - (C) volume
 - (D) density
- 78.** The pump used for handling toxic or corrosive liquid is
- (A) piston pump
 - (B) plunger pump
 - (C) diaphragm pump
 - (D) centrifugal pump
- 79.** The size of tubing is specified by
- (A) inside diameter
 - (B) length of tube
 - (C) outside diameter
 - (D) size
- 80.** The most suitable process for separating two immiscible liquids is
- (A) centrifuging
 - (B) decantation
 - (C) cyclone separator
 - (D) gravity settling
- 81.** 1 g mole of NaCl is equivalent to
- (A) 0.13 lb NaCl
 - (B) 1.03 lb NaCl
 - (C) 0.31 lb NaCl
 - (D) 0.21 lb NaCl
- 82.** Filter aid is used to
- (A) increase the rate of filtration
 - (B) decrease the pressure drop
 - (C) increase the porosity of the cake
 - (D) support the septum
- 83.** The purposes of agitation of liquid are
- (A) suspending solid particles
 - (B) blending miscible liquids
 - (C) dispersing a gas through the liquid in the form of small bubbles
 - (D) All of the above
- 84.** Impellers are type of
- (A) propellers
 - (B) paddles
 - (C) turbines
 - (D) All of the above

85. The density of a liquid is 1500 kg/m^3 . Its value in g/litre will be
- (A) 15
(B) 1.8
(C) 1500
(D) 1.55
86. The method of reducing swirling in large tank with vertical agitator is to install
- (A) baffle
(B) valve
(C) pump
(D) turbine
87. The unit of filter medium resistance is
- (A) cm
(B) m/s
(C) cm^{-1}
(D) g/cm
88. The dimensionless number(s) is/are
- (A) power number, N_P
(B) Froude number, N_{Fr}
(C) Reynolds number, N_{Re}
(D) All of the above
89. Diatomaceous silica, perlite and purified wood cellulose are
- (A) filter aid
(B) explosive
(C) filter medium
(D) All of the above
90. The molar composition of a gas mixture is 10% H_2 , 10% O_2 , 30% CO_2 and 50% H_2O . If water completely condenses, the final mole percent of H_2 in the gas mixture will be
- (A) 5%
(B) 10%
(C) 20%
(D) 18%
91. The largest hydroelectricity power station of India is located in
- (A) Assam
(B) Maharashtra
(C) West Bengal
(D) Uttar Pradesh
92. The most suitable material for thermal shield used in nuclear reactor is
- (A) concrete
(B) steel
(C) graphite
(D) zircaloy

93. On commercial scale, sedimentation occurs in
- (A) rotary drum filters
 - (B) cyclones
 - (C) thickeners
 - (D) classifiers
94. Rivet parts are
- (A) short cylindrical bar with a head integral to it
 - (B) cylindrical portion of rivet as shank
 - (C) lower portion of shank as tail
 - (D) All of the above
95. Commercial sulphuric acid is 98% sulphuric acid and 2% water. The mole ratio of sulphuric acid to water will be
- (A) 9:1
 - (B) 8:2
 - (C) 9:2
 - (D) 8:1
96. Hardness of material is measured by
- (A) Brinell hardness test
 - (B) Rockwell test
 - (C) Vickers' test
 - (D) All of the above
97. The most commonly used joint in underground pipeline is
- (A) coupling
 - (B) flange
 - (C) sleeve joint
 - (D) expansion joint
98. The cake removed by scraping off with a horizontal knife in continuous rotary vacuum filter is known as
- (A) cutter
 - (B) doctor blade
 - (C) blade
 - (D) All of the above
99. Production casing is also known as
- (A) oil string or long string
 - (B) drill bit
 - (C) hoisting
 - (D) None of the above
100. The design of storage vessel for tanks having shell thickness dependent upon D and H is
- (A) $D = 2H \{C_1 / (C_2 + C_3 + C_4 + C_5)\}$
 - (B) $D = 4H \{C_1 / (C_2 + C_3 + C_4 + C_5)\}$
 - (C) $H = 2D \{C_1 / (C_2 + C_3 + C_4 + C_5)\}$
 - (D) $D = 2H \{C_1 / (C_2 + C_5)\}$

SPACE FOR ROUGH WORK

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10/10/10

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