

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

Test Booklet No. :

Series

00481

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.

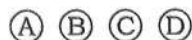
Example :

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 :



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 :



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 unit of viscosity in the CGS system is
 - (A) stokes
 - (B) poise
 - (C) coulomb
 - (D) dyne

2. The important relation that can be derived by applying the momentum balance to the steady flow of a fluid in potential flow without friction is
 - (A) equation of state
 - (B) Fick's law
 - (C) Bernoulli equation
 - (D) Arrhenius equation

3. The device to measure the local velocity along a streamline is a/an
 - (A) pitot tube
 - (B) venturi meter
 - (C) orifice meter
 - (D) rotameter

4. The fitting for connecting branch lines is
 - (A) plug
 - (B) socket
 - (C) tee
 - (D) cap

5. The valve used to control the flow of a fluid in a pipeline is
 - (A) gate valve
 - (B) needle valve
 - (C) check valve
 - (D) globe valve

6. Check valve is a type of
 - (A) pressure relief valve
 - (B) pressure reducing valve
 - (C) unidirectional control valve
 - (D) None of the above

7. The SI unit of heat transfer coefficient is
 - (A) $J/m^2 K$
 - (B) $W/m^2 K$
 - (C) $W/m K$
 - (D) $J/m K$

8. Which of the following has maximum thermal conductivity?
 - (A) Iron
 - (B) Coal
 - (C) Nitrogen
 - (D) Tar

9. In a distillation column, all plates above the feed plate constitute the
- (A) rectifying section
 - (B) stripping section
 - (C) reflux
 - (D) reboiler
10. Distillation of crude oil is an example of
- (A) steam distillation
 - (B) fractional distillation
 - (C) azeotropic distillation
 - (D) extractive distillation
11. A common apparatus used in gas absorption is
- (A) evaporator
 - (B) distillation column
 - (C) heat exchanger
 - (D) packed column
12. Berl saddle and Raschig rings are examples of
- (A) building materials
 - (B) packing materials
 - (C) plastic materials
 - (D) adhesives
13. As the reflux ratio decreases, the
- (A) separation becomes more efficient
 - (B) number of plates decreases
 - (C) column diameter increases
 - (D) None of the above
14. The use of pulverized coal in boiler furnace provides
- (A) high calorific value
 - (B) better combustion
 - (C) smokeless burning
 - (D) less erosion on furnace walls
15. Which of the following has the highest calorific value?
- (A) Lignite
 - (B) Sub-bituminous coal
 - (C) Anthracite
 - (D) Peat
16. Reynolds' number is the ratio of
- (A) viscous forces to gravity forces
 - (B) inertial forces to viscous forces
 - (C) viscous forces to inertial forces
 - (D) inertial forces to gravity forces

17. Primary is necessary in which of the following pumps?
- (A) Reciprocating
 - (B) Gear
 - (C) Centrifugal
 - (D) Diaphragm
18. The sweetland filter is a later development of the
- (A) plate-and-frame filter
 - (B) vacuum filter
 - (C) pressure leaf filter
 - (D) sand filter
19. The speed of rotation of the rotary-drum filter is usually
- (A) equal to 2 r.p.m.
 - (B) more than 1 r.p.m.
 - (C) more than 2 r.p.m.
 - (D) less than 1 r.p.m.
20. The filter medium used in the rotary-drum filter is
- (A) sand
 - (B) cloth
 - (C) gravel
 - (D) charcoal
21. The two-phase mixture of mother liquor and crystals of all sizes, which occupies the crystallizer and is withdrawn as product, is called
- (A) magma
 - (B) sludge
 - (C) nucleus
 - (D) lattice
22. Crystallization is the formation of solid particles within a
- (A) heterogeneous phase
 - (B) homogeneous phase
 - (C) multilayer phase
 - (D) monolayer phase
23. Crystal growth is a/an
- (A) absorption process
 - (B) distillation process
 - (C) diffusion process
 - (D) adsorption process
24. The type of dryer used for making milk powder is a
- (A) tray dryer
 - (B) spray dryer
 - (C) rotary dryer
 - (D) vacuum dryer

25. For sensitive materials that cannot be heated to the boiling point at atmospheric pressure, the dryer used is a/an
- (A) tray dryer
 - (B) atmospheric dryer
 - (C) vacuum drum dryer
 - (D) festoon dryer
26. Comminution is a generic term for
- (A) size separation
 - (B) conveying
 - (C) sedimentation
 - (D) size reduction
27. A more realistic method of estimating the power required for crushing and grinding was given by
- (A) Bond's law
 - (B) Fourier's law
 - (C) Fick's law
 - (D) Boyle's law
28. The most versatile of all the grinding mills is the
- (A) ball mill
 - (B) hammer mill
 - (C) tube mill
 - (D) Hardinge mill
29. The type of grinding mill used in cement industry is
- (A) hammer mill
 - (B) tumbling mill
 - (C) tube ball mill
 - (D) conical mill
30. Standard screens are specified by the
- (A) diameter of the wire
 - (B) number of meshes per inch
 - (C) Both (A) and (B)
 - (D) None of the above
31. One of the well-known types of vibrating screen is the
- (A) hummer
 - (B) grizzly
 - (C) trommel
 - (D) cyclone
32. Banbury mixer is a modification of the
- (A) dry mixer
 - (B) kneading machine
 - (C) V-type mixer
 - (D) pug mill

33. Scrapper and apron are examples of
- (A) belt conveyors
 - (B) chain conveyors
 - (C) screw conveyors
 - (D) pneumatic conveyors
34. Screw conveyor is used for the transportation of
- (A) thin liquids
 - (B) dry solids
 - (C) pasty solids
 - (D) heavy particles
35. Froth flotation is the most suitable method for treating
- (A) iron ores
 - (B) sulphide ores
 - (C) quartzite
 - (D) None of the above
36. The most common type of cement is the
- (A) high alumina cement
 - (B) Portland cement
 - (C) blast furnace slag cement
 - (D) hydraulic-lime cement
37. Lime is used as a basic flux in the manufacture of
- (A) steel
 - (B) brass
 - (C) bronze
 - (D) aluminium
38. The unit process to remove double bonds in the fat and oil industry is
- (A) oxidation
 - (B) calcination
 - (C) hydrogenation
 - (D) hydrolysis
39. The removal of soluble gas from a solution by counter-current contact with an inert gas is called
- (A) evaporation
 - (B) adsorption
 - (C) crystallization
 - (D) stripping
40. The nitrogen compound with the largest production volume in the world is
- (A) melamine-formaldehyde
 - (B) urea-formaldehyde
 - (C) urea
 - (D) None of the above

41. The continuous chemical process for processing oil seeds such as groundnut, soya bean and rape-seed is
- (A) adsorption
 - (B) hydrolysis
 - (C) polymerization
 - (D) solvent extraction
42. Direct saponification using strong caustic in batch process operation is the oldest type of the manufacture of
- (A) soap
 - (B) edible oils
 - (C) paints
 - (D) varnish
43. Bagasse and molasses are by-products of which of the following industries?
- (A) Cement
 - (B) Sugar
 - (C) Soap
 - (D) Paper
44. Which of the following is not a polymerization reaction?
- (A) Bulk
 - (B) Solution
 - (C) Emulsion
 - (D) Hydrogenation
45. Most widely used catalyst in the manufacture of sulphuric acid by contact process is
- (A) platinum
 - (B) vanadium pentoxide
 - (C) alumina
 - (D) silica gel
46. In municipal water treatment, filtration is carried out by using a
- (A) sand filter
 - (B) charcoal filter
 - (C) settling tank
 - (D) None of the above
47. Solvay process is used for the manufacture of
- (A) chlorine
 - (B) soda ash
 - (C) caustic soda
 - (D) sodium chloride
48. The Fourdrinier machine is used in the manufacture of
- (A) rubber
 - (B) sugar
 - (C) cement
 - (D) paper

49. The polyolefin plastic that has the largest production is
- (A) polypropylene
 - (B) polyethylene
 - (C) polyvinyl chloride
 - (D) polyester
50. The monomers that form SBR are
- (A) sodium and butadiene
 - (B) styrene and bromine
 - (C) silicon and bromine
 - (D) styrene and butadiene
51. Baking soda is chemically represented by
- (A) Na_2CO_3
 - (B) NaHCO_3
 - (C) $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$
 - (D) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
52. Neoprene is the trade name of
- (A) polyamide
 - (B) phenol formaldehyde
 - (C) polychloroprene
 - (D) SBR
53. Blue vitriol is chemically
- (A) copper sulphate
 - (B) ferrous sulphate
 - (C) copper nitrate
 - (D) aluminium sulphate
54. The nitrogen content of ammonium nitrate is
- (A) 20%
 - (B) 33%
 - (C) 45%
 - (D) 60%
55. The main constituent of natural gas is
- (A) methane
 - (B) ethane
 - (C) propane
 - (D) butane
56. Polytetrafluoroethylene (PTFE) is known as
- (A) Bakelite
 - (B) Teflon
 - (C) Celluloid
 - (D) Dacron

57. Vulcanization of rubber

- (A) improves elasticity
- (B) improves hardness
- (C) increases resistance to organic solvents
- (D) All of the above

58. Dacron is an example of

- (A) polyester
- (B) polyethylene
- (C) polyamide
- (D) synthetic rubber

59. The percentage of alcohol in beer may be around

- (A) 0%–1%
- (B) 2%–8%
- (C) 18%–23%
- (D) 27%–32%

60. Sulphuric acid is mainly used in the manufacture of

- (A) fertilizers
- (B) steel
- (C) paper
- (D) paint

61. The percentage of CO in flue gas is determined by

- (A) spectrometer
- (B) Orsat gas analyzer
- (C) polarimeter
- (D) polarograph

62. Rank of coal indicates the

- (A) ash content
- (B) moisture content
- (C) maturity of coal
- (D) None of the above

63. Natural gas containing high amount of recoverable condensate is called

- (A) dry natural gas
- (B) water gas
- (C) wet natural gas
- (D) blue gas

64. The predominant compound in the blast furnace gas is

- (A) CO
- (B) H₂
- (C) N₂
- (D) O₂

65. When air comes in contact with ignited solid amorphous carbon, it results in the formation of
- (A) producer gas
 - (B) blue gas
 - (C) water gas
 - (D) biogas
66. The gas produced by the degradation of biological matter by the action of anaerobic bacteria in the absence of free oxygen is
- (A) natural gas
 - (B) biogas
 - (C) LPG
 - (D) CNG
67. The range of temperature maintained in electrical desalting of crude oil is
- (A) 100 °C–120 °C
 - (B) 120 °C–130 °C
 - (C) 150 °C–180 °C
 - (D) 200 °C–230 °C
68. Aviation gasoline has octane number
- (A) less than 50
 - (B) equal to 50
 - (C) less than 100
 - (D) equal to 100
69. The undesirable component in kerosene is
- (A) aromatic
 - (B) naphthene
 - (C) paraffin
 - (D) benzene
70. The lowest temperature at which vapours given off by the oil ignites and continues to burn for at least 5 seconds when a small flame is brought near to it, is
- (A) flash point
 - (B) cloud point
 - (C) smoke point
 - (D) fire point

71. The apparatus used for measuring flash point below 50 °C is

- (A) Pensky-Martens
- (B) Abel's apparatus
- (C) Cleveland
- (D) Ring and Ball

72. The carbon residue of an oil is determined by

- (A) smoke point
- (B) bomb calorimeter
- (C) Ramsbottom test
- (D) Abel's apparatus

73. Renewable energy resources include

- (A) sunlight
- (B) wind
- (C) geothermal heat
- (D) All of the above

74. Temperatures in °F and K are the same at

- (A) 0
- (B) 212
- (C) 574.6
- (D) 273.15

75. Tachometer measures the

- (A) flow rate
- (B) composition
- (C) speed (r.p.m.)
- (D) pressure

76. In Fourier's law, the proportionality constant is called the

- (A) heat transfer coefficient
- (B) thermal diffusivity
- (C) thermal conductivity
- (D) Stefan-Boltzmann constant

77. Baffles are provided in heat exchangers to

- (A) increase the fouling factor
- (B) decrease the heat transfer area
- (C) increase the heat transfer coefficient
- (D) increase the heat transfer rate

78. Perfect reproducibility means the instrument has

- (A) no drift
- (B) point drift
- (C) load drift
- (D) calibration drift

79. Which of the following is/are undesirable characteristic(s) of an instrument?
- (A) High fidelity
 - (B) High reproducibility
 - (C) High measuring lag
 - (D) Both (A) and (B)
80. Transducers may be classified according to their
- (A) method of energy conversion
 - (B) nature of output signal
 - (C) application
 - (D) All of the above
81. 1 atmospheric pressure in terms of psi at mean sea level is
- (A) 12.69
 - (B) 14.69
 - (C) 16.69
 - (D) 18.69
82. What is the purpose of a sight glass in a boiler system?
- (A) To monitor electrical conductivity
 - (B) To monitor flow rate
 - (C) To observe water level
 - (D) To measure steam temperature
83. Thermocouples employ two
- (A) dissimilar metal wires
 - (B) dissimilar metal strips
 - (C) similar metal wires
 - (D) similar metal strips
84. Which one of the following is a solid expansion thermometer?
- (A) Bimetallic thermometer
 - (B) Pyrometer
 - (C) Thermocouple
 - (D) None of the above
85. Orifice plates are usually made of
- (A) wood
 - (B) plastic
 - (C) ceramic
 - (D) stainless steel
86. The working principle of mercury in glass thermometer is
- (A) volumetric expansion
 - (B) pressure rise with temperature
 - (C) linear expansion
 - (D) None of the above

87. Which of the following is not a mechanical pressure-sensing element?
- (A) Bellow
 - (B) Diaphragm
 - (C) Bourdon tube
 - (D) U-tube manometer
88. On-off controllers are normally used for
- (A) low loads
 - (B) temperature changes
 - (C) flow-rate changes
 - (D) None of the above
89. How does resistance of a Negative Temperature Coefficient (NTC) thermistor change with increase in temperature?
- (A) Increases
 - (B) Decreases
 - (C) Increases exponentially
 - (D) Remains constant
90. Gas chromatography is used for the measurement of
- (A) temperature
 - (B) pressure
 - (C) flow rate
 - (D) concentration
91. The operation of a rotameter is based on
- (A) variable area flow
 - (B) rotation of turbine
 - (C) pressure drop across a nozzle
 - (D) pressure at a stagnation point
92. In a vortex flow meter, what is the relationship between frequency of vortices and fluid-flow rate?
- (A) Directly proportional
 - (B) Inversely proportional
 - (C) Constant
 - (D) No relationship
93. Strip chart recorder is a/an
- (A) oscillographic recorder
 - (B) non-analog recorder
 - (C) graphic recorder
 - (D) magnetic-tape recorder
94. Set-point of a system is also called
- (A) disturbance
 - (B) desired value
 - (C) measured value
 - (D) manipulated value

95. In proportional control, the output of the controller is
- (A) directly proportional to set point
 - (B) directly proportional to error
 - (C) inversely proportional to set point
 - (D) inversely proportional to error
96. Reset control action is also known as
- (A) two-position control action
 - (B) proportional control action
 - (C) integral control action
 - (D) derivative control action
97. What type of control action does a self-operated level controller typically provide?
- (A) On-off control
 - (B) Derivative control
 - (C) Proportional control
 - (D) Integral control
98. Final control elements receive signal from a controller and adjust accordingly the value of the
- (A) controlled variable
 - (B) process variable
 - (C) load variable
 - (D) manipulated variable
99. Which of the following characterizes the distributed control system?
- (A) Distributed processing
 - (B) Distributed data
 - (C) Distributed control
 - (D) All of the above
100. Process instrumentation diagram provides
- (A) process flow diagram
 - (B) schematic layout of the process and plant equipment with or without technical specifications
 - (C) requisites for process system analysis and equipment specifications
 - (D) schematic layout without specification of the process and plant equipment but together with instrumentation equipment

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