

CET (PG)-2015

Sr. No. :

209139

Question Booklet Series : A

Important : Please consult your Admit Card / Roll No. Slip before filling your Roll Number on the Test Booklet and Answer Sheet.

Roll No.

In Figures

In Words

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O.M.R. Answer Sheet Serial No.

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Signature of the Candidate :

Subject : M.Sc. (Industrial Chemistry)

Time : 90 minutes

Number of Questions : 75

Maximum Marks : 75

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO

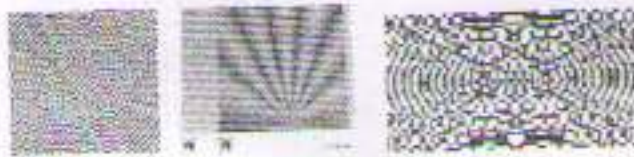
INSTRUCTIONS

1. Write your Roll No. on the Question Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Subject and Series Code of Question Booklet on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point / Black Gel pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. To open the Question Booklet remove the paper seal gently when asked to do so.
5. Please check that this Question Booklet contains **75** questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of test.
6. Each question has four alternative answers (A, B, C, D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point / Black Gel pen**.
7. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Sheet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the questions given in the Question Booklet.
9. Negative marking will be adopted for evaluation i.e., 1/4th of the marks of the question will be deducted for each wrong answer. A wrong answer means incorrect answer or wrong filling of bubble.
10. For calculations, use of simple log tables is permitted. Borrowing of log tables and any other material is not allowed.
11. For rough work only the sheets marked "**Rough Work**" at the end of the Question Booklet be used.
12. The Answer Sheet is designed for **computer evaluation**. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e., not following the instructions completely, shall be of the candidate only.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so, would be expelled from the examination.
15. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistance or found giving or receiving assistance or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
16. **Telecommunication equipment such as pager, cellular phone, wireless, scanner, etc., is not permitted inside the examination hall. Use of calculator is not allowed.**

SEAL

1. Who discovered photoelectric effect ?
(A) Edison (B) Thomson
(C) Hertz (D) Faraday
2. Synchronous satellites orbit the earth once in :
(A) 24 hours (B) $365\frac{1}{4}$ days
(C) 90 minutes (D) 27.4 days
3. Neutrino is an uncharged particle responsible for carrying weak force. How many types of neutrinos are known to exist ?
(A) 1 (B) 2
(C) 3 (D) 4
4. Which of the following is the unit of magnetic flux density ?
(A) Tesla (B) Lumens
(C) Candela (D) Weber
5. Which of the following is the most stable oscillator ?
(A) Hartley Oscillator (B) Wein Bridge Oscillator
(C) Colpitts Oscillator (D) Crystal controlled Oscillator
6. The energy equivalent to 1 atomic mass unit is :
(A) 13.58 eV (B) 938 MeV
(C) 0.512 MeV (D) 197 MeV
7. An electric motor has a power rating of 500 watts. How much work it can do in 1 minute ?
(A) 30000 J (B) 500 J
(C) .002 J (D) 0.12 J
8. What is the length of a simple pendulum which ticks seconds ?
(A) 1 m (B) 2 m
(C) 0.981 m (D) 0.6 m

9. Which of the following figures are NOT due to interference of light ?



1

2

3



4



5



6

- (A) 1 and 3
(B) 2 and 3
(C) 4, 6
(D) 1, 5
10. Which of the following statements is NOT CORRECT for holography ?
- (A) Holography is a technique
(B) It records and reproduces the 3-dimensional image of an object
(C) It makes use of the interference effects
(D) It makes use of the phenomenon of polarisation
11. Radioactive series having neptunium as parent nuclide has Mass numbers which can be represented by :
- (A) $4n+2$
(B) $4n+1$ where n is an integer
(C) $4n+3$
(D) $4n$
12. Higgs particle is classified as :
- (A) Meson
(B) Lepton
(C) Baryon
(D) Boson
13. The integral $\int_0^1 \left(\log_e \frac{1}{y} \right)^{n-1} dy$ represents a :
- (A) Beta function
(B) Error function
(C) Gamma function
(D) Exponential function

14. The velocity at which the mass of a particle becomes double its rest mass is :

(A) $\frac{\sqrt{3}}{2} c$

(B) $\sqrt{\frac{3}{2}} c$

(C) $0.99 c$

(D) $\frac{\sqrt{3}}{4} c$

15. A gas is compressed isothermally to half its volume. By what factor does the pressure of the gas change ?

(A) 2

(B) 4

(C) 0

(D) 0.5

16. The law used by Astrophysicists to determine the temperature of a star is :

(A) Kirchoff's law

(B) Newton's second law

(C) Wein's displacement law

(D) Stefan Boltzman law

17. The infrasonic frequencies are :

(A) Greater than 100 Hz

(B) Less than 20 Hz

(C) Between 20-20000 Hz

(D) Greater than 20000 Hz

18. Common base configuration of a transistor is usually not used because :

(A) It has low input impedance

(B) It has high input impedance

(C) It causes the transistor to heat up

(D) It has very low gain

19. The energy of a photon of frequency ' ν ' is :

(A) ν

(B) $h\nu$

(C) hc

(D) $h\nu/c$

20. A charged particle is subjected to uniform electric and magnetic fields simultaneously. When the electric and magnetic fields are parallel to each other, the charged particle will move in a :

(A) Circular path

(B) Helical path

(C) Linear path

(D) Parabolic path

21. The no. of moles of particles produced when 1 mole of CaCl_2 is dissolved in water is :

(A) 3

(B) 2

(C) 1

(D) Nil

22. Consider the reaction $2\text{H}_2\text{O}(\text{g}) \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$. How many liters of O_2 can be produced from 18.02 g of H_2O ?

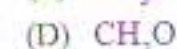
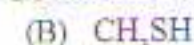
(A) 22.4 LO_2

(B) 44.8 LO_2

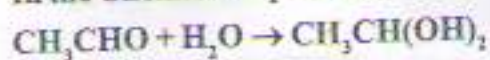
(C) 11.2 LO_2

(D) 33.1

23. Which of the following will exhibit higher boiling point due to inter molecular forces ?



24. In the Chemical Equation :



Which of the following types of reaction is represented ?

- (A) Addition (B) Condensation
(C) Elimination (D) Substitution
25. On a phase diagram the temperature and pressure at which the phase boundary between the liquid and gas ceases to exist is called the :
- (A) Critical point (B) Boiling point
(C) Triple point (D) Eutectic point
26. What is the hydrogen ion concentration of a solution with pH 3.5 ?
- (A) 3.5×10^{-4} (B) 3.16×10^{-4}
(C) 3.16×10^4 (D) 3.5×10^4
27. What volume of 0.3M H_2SO_4 is required to titrate 90 ml of 0.4M NaOH to the end point ?
- (A) 60 ml (B) 120 ml
(C) 50 ml (D) 30 ml
28. Seawater has 904 ppm of sulfur. What is the mass percent of sulfur in seawater ?
- (A) 0.0904 (B) 1.904
(C) 0.0514 (D) 9.040
29. Which of these compounds can exist in boat and chair configurations ?
- (A) cyclohexane (B) benzene
(C) cyclopentadiene (D) naphthalene
30. A buffer solution contains 0.40 mole of formic acid, HCOOH , and 0.60 mole of sodium formate, HCOONa in 1.00 liter of solution. The ionization constant, K_a , of formic acid is 1.8×10^{-4} . Calculate the pH of this solution :
- (A) 3.92 (B) 1.85
(C) 4.80 (D) 2.95
31. Nylon is prepared from :
- (A) Adipic acid and hexamethylene diamine (B) Ethylene glycol and nitric acid
(C) Hexamethylene diamine and phthalic acid (D) Ethylene glycol and adipic acid
32. The reaction $(\text{CH}_3)_3\text{CBr}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightarrow (\text{CH}_3)_3\text{COH}(\text{aq}) + \text{HBr}(\text{aq})$ follows the rate law $\text{Rate} = k[(\text{CH}_3)_3\text{CBr}]$. What will be the effect of decreasing the concentration of $(\text{CH}_3)_3\text{CBr}$?
- (A) The rate of the reaction will increase (B) More HBr will form
(C) The rate of the reaction will decrease (D) The reaction will shift to the left
33. The number of NMR signals for the compound $\text{CH}_3\text{OCH}_2\text{CH}_3$ is :
- (A) One signal (singlet) (B) Two signals (one singlet, one multiplet)
(C) Three signals (singlets) (D) Three signals (singlet, quartet, triplet)

34. What is the freezing point of a solution of 15.0 g of NaCl in 250 g of water? The molal freezing point constant, K_f for water is $1.86^\circ\text{C kg/mol}$:
- (A) -1.5°C (B) -3.8°C
 (C) 3.8°C (D) -10°C
35. The reaction of nitrogen dioxide with carbon monoxide
- $$\text{NO}_2(\text{g}) + \text{CO}(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{NO}(\text{g})$$
- has been studied and the following mechanism has been proposed:
- $$\text{NO}_2(\text{g}) + \text{NO}_2(\text{g}) \rightarrow \text{NO}_3(\text{g}) + \text{NO}(\text{g}) \text{ slow}$$
- $$\text{NO}_3(\text{g}) + \text{CO}(\text{g}) \rightarrow \text{NO}_2(\text{g}) + \text{CO}_2(\text{g}) \text{ fast}$$
- What rate law corresponds to this mechanism?
- (A) $\text{Rate} = k[\text{NO}_2]$ (B) $\text{Rate} = k[\text{NO}_2][\text{CO}]$
 (C) $\text{Rate} = k[\text{NO}_2]^2$ (D) $\text{Rate} = k[\text{NO}_2]^2[\text{CO}]$
36. Under what conditions is the Nernst equation used to calculate cell potential voltages in a voltaic cell?
- (A) non-standard state conditions only (B) non-spontaneous reactions only
 (C) reactions at equilibrium only (D) reactions of ions with the same charge only
37. Oxidation of a secondary alcohol with $\text{K}_2\text{Cr}_2\text{O}_7$ in sulfuric acid gives a product with which functional group?
- (A) Aldehyde (B) Carboxylic acid
 (C) Ester (D) Ketone
38. The 'd-d' transitions in an octahedral $[\text{NiX}_6]^{2+}$ complex are:
- (A) Laporte forbidden but spin allowed (B) Laporte forbidden and spin forbidden
 (C) Laporte allowed and spin allowed (D) Laporte allowed but spin forbidden
39. Which statement is CORRECT?
- (A) Strong field ligands cause complex ions to be *high spin*
 (B) Strong field ligands cause complex ions to be *low spin*
 (C) Large ligands favor formation of *octahedral* complex ions
 (D) A small number of ligands causes complexes to be *low spin*
40. An aqueous solution contains the ions Ag^+ , Ba^{2+} , and Ni^{2+} . Dilute aqueous solutions of NaCl , Na_2S , and Na_2SO_4 are available. In what order should these solutions be added if the goal is to precipitate each of the three cations separately?
- (A) Na_2S , Na_2SO_4 , NaCl (B) Na_2S , NaCl , Na_2SO_4
 (C) Na_2SO_4 , Na_2S , NaCl (D) NaCl , Na_2SO_4 , Na_2S

41. **Contact process :**
 (A) Yields acid of higher concentration than chamber process
 (B) Yields acid of lower concentration than chamber process
 (C) Is obsolete
 (D) Eliminates absorber
42. **Gypsum is :**
 (A) Calcium chloride
 (B) Potassium sulphate
 (C) Sodium sulphate
 (D) Calcium sulphate
43. **SO₂ is obtained at commercial scale, from :**
 (A) Sulphur
 (B) Pyrites
 (C) H₂S source
 (D) All the above
44. **Fire clay is :**
 (A) a basic refractory
 (B) an acidic refractory
 (C) a neutral refractory
 (D) not a refractory material
45. **In the manufacture of soda ash by Solvay process, catalyst may be :**
 (A) NH₃
 (B) NaCl
 (C) CaO
 (D) Coke
46. **Dense soda ash used in the manufacture of glass is :**
 (A) Na₂CO₃
 (B) Na₂CO₃.10H₂O
 (C) Na₂CO₃. H₂O
 (D) Na₂HCO₃
47. **Edible oil is :**
 (A) Palm oil
 (B) Tallowoil
 (C) Soyabean oil
 (D) Coconut oil
48. **Vanaspati Ghee is manufactured by :**
 (A) Oils
 (B) Fats
 (C) Waxes
 (D) Any one of the above
49. **Fourdrinier machine is used in the manufacture of :**
 (A) Soap
 (B) Detergent
 (C) Paper
 (D) Leather
50. **In Lurgi gasifier :**
 (A) Coking coals cannot be used
 (B) Low carbon conversion efficiency is achieved
 (C) Entrainment of solids is higher
 (D) Large quantity of coal can be processed
51. **Major use of butadiene is :**
 (A) As a plasticizer for unsaturated polyester
 (B) In the manufacture of synthetic rubber
 (C) As an anti-skimming agent in paint
 (D) None of the above

52. Analgesic drugs are :

- (A) Pain relievers (B) Antibiotics
(C) Used in treatment of T.B. (D) Used in treatment of typhoid

53. DDT stands for :

- (A) Diethyl-Diphenyl-Trichloromethane (B) Dichloro-Diphenyl-Trichloromethane
(C) Diphenyl-Dichloro-Trichloromethane (D) Dichloro-Diphenyl-Trichloroethane

54. Thermosetting materials :

- (A) are cross linked molecules (B) soften on application of heat
(C) are solvent solubles (D) none of the above

55. Chemical name of aspirin is :

- (A) Acetylsalicylic acid (B) Nicotinic acid
(C) Calcium acetate (D) Methyl salicylate

56. $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$ is called :

- (A) Washing soda (B) Soda ash
(C) Slaked lime (D) Quick lime

57. Main component of pyrex glass is :

- (A) Zinc (B) Lead
(C) Boron (D) Selenium

58. A disaccharide is :

- (A) Sucrose (B) Glucose
(C) Starch (D) Maltose

59. $\text{Ca}(\text{OCl})_2$ is a chemical formula of :

- (A) Hypo (B) Bleaching powder
(C) Plaster of Paris (D) Aqua Regia

60. Gln is :

- (A) Mainly CaO (B) Subjected to galvanising
(C) A super cooled liquid (D) All of the above

61. Let $f(x) = [x]$, the greatest integer $\leq x$, $g(x) = |x|$ the absolute value of x , the value of $\text{gof} \left(-\frac{3}{2} \right) - \text{fog}$

$\left(-\frac{3}{2} \right)$ is :

- (A) 0 (B) 1
(C) -1 (D) 2

62. $\lim_{x \rightarrow 0} \frac{e^{ax} - b^{bx}}{x}$ is equal to :

- (A) 0 (B) $a - b$
(C) $a + b$ (D) ab

63. If $(0, 0)$ and $(2, 0)$ are two vertices of an equilateral triangle lying in 1st quadrant, then the third vertex is :

- (A) $(2, 2)$ (B) $(0, 2)$
(C) $(\sqrt{3}, 1)$ (D) $(1, \sqrt{3})$

64. Let $f(x) = \begin{cases} 3x - 4 & 0 \leq x \leq 1 \\ 2x + \lambda & 1 < x \leq 2 \end{cases}$

If $f(x)$ is continuous at $x = 1$, then λ is :

- (A) -1 (B) -3
(C) 2 (D) 1

65. For the curve $x = t^2 - 1$, $y = t^2 - t$, $t \neq 0$, the tangent at a point is parallel to x axis, then the value of t is :

- (A) 0 (B) $\frac{1}{\sqrt{3}}$
(C) $\sqrt{3}$ (D) $\frac{1}{2}$

66. The roots of the equation $ax^2 + bx + b = 0$ are equal if :

- (A) $a = b$ (B) $b = 4a$
(C) $b = 0$ (D) $b = 0$ or $b = 4a$

67. The differential equation whose general solution is $y = e^x (A \cos x - B \sin x)$ is :

- (A) $\frac{d^2 y}{dx^2} - y = 0$ (B) $\frac{d^2 y}{dx^2} + y = 0$
(C) $\frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} - 2y = 0$ (D) $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 2y = 0$

68. Let m and n be respectively the order and the degree of the differential equation

$$\sqrt{1 + \left(\frac{dy}{dx}\right)^2} = \frac{d^3 y}{dx^3}, \text{ then}$$

- (A) $m = 3, n = 2$ (B) $m = 2, n = 3$
(C) $m = 2, n = 2$ (D) $m = 3, n = 3$

69. The value of x for which the function $f(x) = \sin x + \cos 2x$, $0 \leq x \leq \pi$ attains a maximum value is :

- (A) 0 (B) $\frac{\pi}{2}$
(C) π (D) $\sin^{-1} \frac{1}{4}$

70. A point P is at a distance $5\sqrt{2}$ units from origin O and OP is perpendicular to the plane $3x + 4y + 5z = 1$. The co-ordinates of P are :

- (A) (3, 4, 5) (B) $(3\sqrt{2}, 4\sqrt{2}, 5\sqrt{2})$
(C) (6, 8, 10) (D) $(6\sqrt{2}, 8\sqrt{2}, 10\sqrt{2})$

71. Let A be the set of all even integers and let B be the set of all those integers which are multiples of 3 then :

- (A) $A \cap B = \{0\}$ (B) $A \cup B$ is the set of integers
(C) $A \cap B$ is a finite set (D) Neither $A \subset B$ nor $B \subset A$

72. The value of the series :

$$\frac{1}{1.2} - \frac{1}{2.3} + \frac{1}{3.4} - \frac{1}{4.5} + \dots \text{ upto } \infty \text{ is :}$$

- (A) $2 \log 2 - 1$ (B) $2 \log 2 + 1$
(C) $\log 2 - 1$ (D) $\log 2 + 1$

73. Given three vectors \vec{a} , \vec{b} , \vec{c} such that $\vec{a} + \vec{b} + \vec{c} = 0$ and $|\vec{a}| = 3$, $|\vec{b}| = 5$, $|\vec{c}| = 7$, then angle between \vec{a} and \vec{b} is :

- (A) 30° (B) 45°
(C) 60° (D) 90°

74. The system of equations :

$$3x + y - z = 0$$

$$6x + 2y - 2z = 1$$

$$5x + 2y - 3z = 2 \text{ has :}$$

- (A) no solution (B) a unique solution
(C) two distinct solutions (D) infinite many solutions

75. The probability that a man fishing at a particular place will catch 1, 2, 3 or 4 fish is 0.4, 0.3, 0.2 and 0.1 respectively. The expected no. of fish caught is :

- (A) 1 (B) 2
(C) 3 (D) 4