

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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## M. Sc. (Industrial Chemistry) (Second Semester)

### EXAMINATION, July, 2022

#### CHEMISTRY OF MATERIALS, PETROCHEMICALS & FERTILIZERS

##### Paper Code

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Questions Booklet  
Series

B

Time : 1:30 Hours ]

[ Maximum Marks : 100

##### Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer any 75 questions in the OMR Answer-Sheet provided and not in the question booklet. If more than 75 questions are attempted by student, then the first attempted 75 questions will be considered for evaluation. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

##### परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को किन्हीं 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। यदि छात्र द्वारा 75 से अधिक प्रश्नों को हल किया जाता है तो प्रारम्भिक हल किये हुए 75 उत्तरों को ही मूल्यांकन हेतु सम्मिलित किया जाएगा। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

***(Only for Rough Work)***

1. Cement is a/an :
  - (A) Magnetic material
  - (B) Ceramic material
  - (C) Conducting material
  - (D) Electrical material
2. Neutral, acidic and basic are a part of :
  - (A) Refractories
  - (B) Cement
  - (C) Magnets
  - (D) Nano
3. A good refractory material should have :
  - (A) Excellent heat resistance
  - (B) Corrosion resistance
  - (C) Abrasion resistance
  - (D) All of the above
4. Refractories should have chemicals :
  - (A) Inert
  - (B) Active
  - (C) Superactive
  - (D) None of the above
5. Silicon carbide is a part of :
  - (A) Acid refraction
  - (B) Basic refraction
  - (C) Neutral refraction
  - (D) None of the above
6. Silica brick is a part of :
  - (A) Neutral
  - (B) Acidic
  - (C) Basic
  - (D) None of the above
7. Dolomite is a part of :
  - (A) Neutral
  - (B) Acidic
  - (C) Basic
  - (D) None of the above
8. The formula of soda ash is :
  - (A)  $K_2CO_3$
  - (B)  $K_2O$
  - (C)  $Na_2CO_3$
  - (D) None of the above

9.  $\text{P}_2\text{O}_5$  is used for improving the :  
(A) Brightness  
(B) Colour  
(C) Blackness  
(D) None of the above
10.  $\text{Cr}_2\text{O}_3$  gives the colour :  
(A) Yellow  
(B) Red  
(C) Green  
(D) Blue
11.  $\text{Na}_2\text{CO}_3 + \text{CaCO}_3 + \text{SiO}_2$  is a formula of :  
(A) Flint glass  
(B) Soda glass  
(C) Soft glass  
(D) Both (B) and (C)
12. Formula of flint glass is :  
(A)  $\text{Pb}_3\text{O}_4$   
(B)  $\text{K}_2\text{CO}_3$   
(C)  $\text{SiO}_2$   
(D) Addition of (A), (B) and (C)
13.  $\text{K}_2\text{O} \cdot \text{CaO} \cdot 6 \text{SiO}_2$  is the formula of :  
(A) Soda glass  
(B) Potash glass  
(C) Silica glass  
(D) Alumina glass
14. The composition of  $\text{SiO}_2$  and  $\text{B}_2\text{O}_3$  in borosilicate is :  
(A) 80 : 13  
(B) 80 : 03  
(C) 80 : 23  
(D) 80 : 30
15. The percentage of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$  in aluminosilicate would be :  
(A) 7 : 9  
(B) 5 : 1  
(C) 1 : 5  
(D) 55 : 23
16. Optical glass has the properties :  
(A) low viscosity  
(B) high viscosity  
(C) molten state  
(D) solid state

17. A change of colour appears after high energy radiation but reverse back to their original state is the property of :  
(A) Wired glass  
(B) Wood glass  
(C) Photochromatic glass  
(D) None of the above
18. The composite materials are made from :  
(A) Metal  
(B) Ceramics  
(C) Polymers  
(D) All of the above
19. Polymer has properties :  
(A) Low strength  
(B) Stiffness  
(C) Both (A) and (B)  
(D) Brittleness
20. The properties of fiber-reinforced composite depend upon :  
(A) Nature and proportion of fibre  
(B) Nature and proportion of matrix  
(C) Relative volume  
(D) All of the above
21. Pozzolana is a class of :  
(A) Polymer  
(B) Composite  
(C) Cement  
(D) None of the above
22. Cement has properties :  
(A) Adhesive  
(B) Cohesive  
(C) Both (A) and (B)  
(D) None of the above
23. Portland cement is also known as :  
(A) Powder  
(B) Magic powder  
(C) Surface powder  
(D) None of the above
24. The other name of metastable gel is :  
(A) Colloidal  
(B) Solid  
(C) Liquid  
(D) Semi-solid
25. The percentage composition of lime in portland cement is :  
(A) 30-40  
(B) 40-50  
(C) 50-60  
(D) 60-70

26. Ammonium nitrate is a :
- (A) Phosphorous fertilizer
  - (B) Nitrogen fertilizer
  - (C) Sulphur fertilizer
  - (D) None of the above
27. How much percentage of nitrogen is present in Ammonium nitrate ?
- (A) 10-15
  - (B) 20-30
  - (C) 32-35
  - (D) None of the above
28. Which type of plants are required nearby ammonia and nitric acid plant ?
- (A) Ammonium nitrate
  - (B) Ammonium sulphate
  - (C) Ammonium sulphite
  - (D) None of the above
29. Melting point of Ammonium nitrate is :
- (A) 170°C
  - (B) 160°C
  - (C) 150°C
  - (D) 140°C
30. The formation of ammonium nitrate would be :
- (A) Endothermic
  - (B) Exothermic
  - (C) Both (A) and (B)
  - (D) All of the above
31. How much percentage of Ammonia is present in  $(\text{NH}_4)_2\text{SO}_4$  ?
- (A) 41
  - (B) 31
  - (C) 21
  - (D) 11
32. Which type of acid is required for the preparation of Ammonium sulphate ?
- (A) HCL
  - (B)  $\text{HNO}_3$
  - (C)  $\text{H}_2\text{SO}_4$
  - (D) None of the above
33. Melting point of  $(\text{NH}_4)_2\text{SO}_4$  is :
- (A) 213°C
  - (B) 313°C
  - (C) 413°C
  - (D) 513°C

34. The most nitrogen fertilizers are maximum used in the world :
- (A)  $\text{NH}_4\text{NO}_3$
  - (B)  $\text{NH}_4(\text{SO}_4)_2$
  - (C) Urea
  - (D) DAP
35.  $\text{CO}_2$  is required for the manufacturing of :
- (A) Urea
  - (B)  $\text{NH}_4\text{NO}_3$
  - (C) DAP
  - (D) None of the above
36. Nitrogen percentage in urea is :
- (A) 15
  - (B) 25
  - (C) 35
  - (D) 45
37. Melting point of urea is :
- (A)  $101-112^\circ\text{C}$
  - (B)  $121-122^\circ\text{C}$
  - (C)  $131-132^\circ\text{C}$
  - (D) None of the above
38. Prilling tower is used for the manufacturing of :
- (A) Fertilizers
  - (B) Cement
  - (C) Composite
  - (D) None of the above
39. The term molten mass is used in the systematic diagram of :
- (A)  $\text{NH}_4\text{NO}_3$
  - (B)  $(\text{NH}_4)_2\text{SO}_4$
  - (C) Urea
  - (D) None of the above
40. The name of  $\text{Ca}(\text{H}_2\text{PO}_4)_2$  is :
- (A) Phosphate
  - (B) Diphosphate
  - (C) Superphosphate
  - (D) None of the above
41.  $\text{P}_2\text{O}_5$  is a part of :
- (A) Urea
  - (B)  $\text{NH}_4\text{NO}_3$
  - (C)  $(\text{NH}_4)_2\text{SO}_4$
  - (D) Phosphate fertilizers

42. How much percentage of  $P_2O_5$  is present in triple superphosphate ?
- (A) 10-20  
(B) 20-30  
(C) 30-40  
(D) 40-50
43.  $H_3PO_4$  is used for the preparation of :
- (A) Urea  
(B) Triple superphosphate  
(C) Normal phosphate  
(D) None of the above
44.  $Ca_3(PO_4)_2$  is used for the preparation of :
- (A) DAP  
(B) Urea  
(C)  $NH_4NO_3$   
(D) None of the above
45. Formula of Diammonium phosphate is :
- (A)  $NH_4NO_3$   
(B)  $(NH_4)_2 HPO_4$   
(C)  $NH_4PO_4$   
(D) None of the above
46. Percentage of carbon in crude oil is :
- (A) 40-50  
(B) 50-60  
(C) 60-70  
(D) 80-90
47. A hydrocarbon present in crude oils is :
- (A) Cycloalkane  
(B) Normal alkane  
(C) Branched chain  
(D) All of the above
48. Which type of organometallic compound is present in crude oil ?
- (A) Cu  
(B) Fe  
(C) Ni  
(D) All of the above
49. Chimney and loose caps are used in the formation of :
- (A) Cement  
(B) Composite  
(C) Oil  
(D) None of the above
50. Which compound is used for the removal of sulphur from crude oil ?
- (A)  $NiO_2$   
(B) CuO  
(C) MnO  
(D) FeO

51. Range of hydrocarbon in uncondensed gas is :
- (A)  $C_1-C_4$   
(B)  $C_4-C_9$   
(C)  $C_9-C_{16}$   
(D)  $C_{16}-C_{20}$
52. Boiling range of kerosene oil is :
- (A)  $100-120^\circ\text{C}$   
(B)  $120-140^\circ\text{C}$   
(C)  $140-160^\circ\text{C}$   
(D)  $180-250^\circ\text{C}$
53. Number of carbons present in heavy oil :
- (A)  $C_1-C_5$   
(B)  $C_6-C_{12}$   
(C)  $C_{13}-C_{16}$   
(D)  $> C_{17}$
54. Kerosene oil is used in :
- (A) Normal engine  
(B) Jet engine  
(C) Generator  
(D) Diesel engine
55. Octane number of *n*-heptane is :
- (A) Zero  
(B) 10  
(C) 50  
(D) 100
56. Octane number of Iso-octane is :
- (A) 100  
(B) 200  
(C) 300  
(D) 400
57. Additive TEL is used to improve the :
- (A) Mileage  
(B) Efficiency  
(C) Antiknocking properties  
(D) None of the above
58. The number hundred (100) is the octane number of :
- (A)  $C_6H_{24}$   
(B)  $C_{16}H_{24}$   
(C)  $C_{26}H_{34}$   
(D)  $C_{16}H_{34}$

59. Zero is the cetane number of :  
 (A) Naphthalene  
 (B) Anthracene  
 (C)  $\alpha$ -methyl naphthalene  
 (D) None of the above
60. Straight chain hydrocarbons are :  
 (A) Good fuel  
 (B) Bad fuel  
 (C) Both (A) and (B)  
 (D) None of the above
61. What will be the product when decane is cracked ?  
 (A)  $C_2H_2$   
 (B)  $C_2H_4$   
 (C)  $C_5H_{12}$   
 (D) None of the above
62. Fixed band and moving beds are a part of :  
 (A) Thermal cracking  
 (B) Catalytic cracking  
 (C) Both (A) and (B)  
 (D) None of the above
63. The temp. range of liquid thermal cracking is :  
 (A) 275–375  
 (B) 375–475  
 (C) 475–530  
 (D) None of the above
64. The yield of petrol in liquid-thermal cracking is :  
 (A) 10-20  
 (B) 20-30  
 (C) 30-40  
 (D) 50-60
65. Gasoline is :  
 (A) Petrol  
 (B) Motor spirit  
 (C) Both (A) and (B)  
 (D) None of the above
66. The product grease is a part of :  
 (A) Oils  
 (B) Lubricants  
 (C) Vegetable oils  
 (D) None of the above
67. Lord oil is a part of :  
 (A) Animal oil  
 (B) Vegetable oil  
 (C) Both (A) and (B)  
 (D) None of the above

68. Which type of oil is used for scientific equipment ?
- (A) Castor oil
  - (B) Palm oil
  - (C) Sperm oil
  - (D) Lord oil
69. Characteristics of good lubricants are :
- (A) High Boiling Point
  - (B) Low freezing point
  - (C) Both (A) and (B)
  - (D) None of the above
70. Aromatic amine is a/an :
- (A) Lubricating protective additive
  - (B) Surface protective additive
  - (C) Performance protective additive
  - (D) Anti-protective additive
71. Magnesium phenolate is used as :
- (A) Detergent additive
  - (B) Friction additive
  - (C) Soda additive
  - (D) Oil additive
72. Polymethacrylate is an example of :
- (A) Lubricant protective additive
  - (B) Surface protective additive
  - (C) Performance additive
  - (D) All of the above
73. Oil gives vapor at least for five seconds in case of :
- (A) Flash
  - (B) Fire
  - (C) Ignite
  - (D) None of the above
74. Which types of hydrocarbon is used in bearing and gears ?
- (A) Oil
  - (B) Petrol
  - (C) Diesel
  - (D) Greases
75. The thickeners consist of :
- (A) Soap of lithium
  - (B) Soap of sodium
  - (C) Soap of calcium
  - (D) All of the above

76. Magnetic moment originates from :
- (A) One source
  - (B) Two sources
  - (C) Three sources
  - (D) None of the above
77. The magnetic moments depends upon :
- (A) Paired electron
  - (B) Unpaired electron
  - (C) Neutral
  - (D) None of the above
78. When external magnetic field is applied, the compound behaves as a :
- (A) Diamagnetic
  - (B) Paramagnetic
  - (C) Both (A) and (B)
  - (D) None of the above
79. What type of metallic materials possess permanent magnetic moments ?
- (A) Ferromagnetic
  - (B) Antiferromagnetic
  - (C) Ferrimagnetic
  - (D) None of the above
80. When magnetic field is zero, what type of material shows magnetic properties ?
- (A) Ferromagnetic
  - (B) Paramagnetic
  - (C) Diamagnetic
  - (D) None of the above
81. The material MnO has properties :
- (A) Ferromagnetic
  - (B) Paramagnetic
  - (C) Antiferromagnetic
  - (D) None of the above
82.  $\text{Fe}_3\text{O}_4$  is an example of :
- (A) Ferromagnetic
  - (B) Antiferromagnetic
  - (C) Ferrimagnetic
  - (D) None of the above
83. When rising the temp. of solid material, the magnitude of thermal vibration would be :
- (A) Increase
  - (B) Decrease
  - (C) No effect
  - (D) None of the above

84. A domain is called :
- (A) One spin
  - (B) Two spin
  - (C) Pocket of spin
  - (D) None of the above
85. A hysteresis effect is produced when :
- (A) Magnetic field is applied
  - (B) Electric field is applied
  - (C) Heat effect
  - (D) None of the above
86. R. F. plasma is one of the methods of preparation of :
- (A) Nanoparticle
  - (B) Magnetic particle
  - (C) Electrical particle
  - (D) Conductor
87. Size of a nanoparticle is :
- (A)  $10^{-9}$
  - (B)  $10^{-6}$
  - (C)  $10^{-12}$
  - (D)  $10^{-14}$
88. Lithium nanoparticle can be prepared by :
- (A)  $\text{LiB}_3$
  - (B)  $\text{LiN}_3$
  - (C)  $\text{LiC}_5$
  - (D)  $\text{LiCl}_5$
89. Complete the reaction :
- $$\text{MoCl}_3 + 3\text{NaBEt}_3\text{H} \rightarrow ?$$
- (A)  $\text{NaCl}$
  - (B)  $\text{Mo}$
  - (C)  $\text{BEt}_3$
  - (D) All of the above
90. Lithium nanoparticle can be prepared by which method ?
- (A) Chemical method
  - (B) Thermolysis
  - (C) Pulsed laser method
  - (D) None of the above
91. The decomposition temp. of  $\text{Li N}_3$  is :
- (A) 170
  - (B) 270
  - (C) 370
  - (D) 470

92. Silver nanoparticle can be prepared by the help of :
- Chemical method
  - Pulsed laser method
  - Thermolysis method
  - None of the above
93. Nanoparticle can be characterized by :
- SEM
  - TEM
  - Both (A) and (B)
  - None of the above
94. One nanometer is equal to :
- $10^{-3}$  micron
  - $10^{-6}$  micron
  - $10^{-9}$  micron
  - None of the above
95.  $10^{-3}$  micron is equal to :
- $10^{-9}$  meter
  - $10^{-10}$  meter
  - $10^{-11}$  meter
  - $10^{-12}$  meter
96. Hysteresis is a part of :
- Magnetic material
  - Conducting material
  - Semiconductor material
  - None of the above
97. Name of  $\text{Fe}_3\text{O}_4$  is :
- Ferrite
  - Chromite
  - Oxide
  - None of the above
98. The name of  $\text{CrO}_2$  is :
- Ferrite
  - Chromite
  - Magnetite
  - Bauxite
99. The 3D-magnetic material is shown in :
- X-plane
  - X, Y plane
  - X, Y, Z plane
  - None of the above
100. The compound  $\text{K}_3 \left[ \text{Fe}(\text{CN})_6 \right]$  is :
- Diamagnetic
  - Paramagnetic
  - Ferrite
  - Antiferromagnetic

***(Only for Rough Work)***

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the most correct/appropriate answer and mark the same in the OMR Answer-Sheet as per the direction :

**Example :**

**Question :**

Q. 1 (A) ☒ (C) (D)

Q. 2 (A) (B) ☒ (D)

Q. 3 (A) ☒ (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

**Impt. :** On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से एक सबसे सही अथवा सबसे उपयुक्त उत्तर छोटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ☒ (C) (D)

प्रश्न 2 (A) (B) ☒ (D)

प्रश्न 3 (A) ☒ (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।