Roll No. .....

Question Booklet Number

O. M. R. Serial No. | | | | | | | | |

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

EXAMINATION, July, 2022

ENVIRONMENTAL CHEMISTRY & WASTE WATER MANAGEMENT

Paper Code			
MSIC	2	0	4

Questions Booklet Series
C

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)

1. Which of the following is the amount of oxygen required to oxidize only organic matter in sewage ?

(A) BOD

(B) Turbidity

(C) COD

(D) DO

2. The biochemical oxygen demand is computed by :

(A) Dissolved oxygen / Dilution factor

(B) Dissolved oxygen + Dilution factor

(C) Dissolved oxygen – Dilution factor

(D) Dissolved oxygen × Dilution factor

3. What should be the amount of BOD in drinking water ?

(A) More than 1 ppm

(B) Less than 1 ppm

(C) 5 ppm

(D) 10 ppm

4. What amount of BOD indicates high water pollution ?

(A) 4000 mg/lit

(B) 400 mg/lit

(C) 40 mg/lit

(D) 4 mg/lit

5. What is the reason for the increase in BOD ?

(A) Planting trees

(B) Collecting of sewage water

(C) Dumping of sewage in water

(D) Cleaning of water

6. Which of the following is used for the RO process ?

(A) Highly permeable membrane

(B) Permeable membrane

(C) Semi-permeable membrane

(D) Non-permeable membrane

7. In RO, pressure that is greater than naturally occurring osmotic pressure is applied in order to :

(A) Mineralize water

(B) Desaline water

(C) Decompose organics

(D) Push bacteria across membrane

8. The amount of pressure to be applied depends on :

(A) Organic matter

(B) Bacteria

(C) Membrane strength

(D) Salt concentration

9. Desalined water is called :

(A) Permeate

(B) Pure water

(C) Clear water

(D) Clean water

10. What is the average pressure at which the reverse osmosis operates for sea water desalination ?

(A) 1000–2000 psi

(B) 2000–3000 psi

(C) 800–1000 psi

(D) 5000–8000 psi

11. What principle is used in electrodialysis ?

(A) Magnetic field and permeable membrane

(B) Electric field and cation selective membrane

(C) Electric field and anion selective membrane

(D) Electric field and ion selective membrane

12. How is the arrangement of electrodialysis ?

(A) 4 membranes arranged back to back

(B) 4 membranes arranged in alternating series

(C) 2 membranes arranged in simultaneous manner

(D) 2 membranes arranged in alternating series pattern.

13. Why is the electrode rinse solution acidic ?

(A) To avoid the corrosion of electrodes

(B) To avoid formation of salts

(C) To neutralise OH^- ions

(D) To make electrodes acidic

14. Which of the following is simply detaining water for a sufficient time ?

(A) Coagulation

(B) Sedimentation

(C) Flocculation

(D) Filtration

15. Unit operations are the ..... operations to remove the impurities.

(A) Physical

(B) Chemical

(C) Biological

(D) Biochemical

16. How are the colour and odour removed ?

(A) Adsorption

(B) Sedimentation

(C) Filtration

(D) Coagulation

17. Which designing a mechanical screen, the clear space between the bars would be in what range ?

(A) > 75 mm

(B) 20–40 mm

(C) 25–50 mm

(D) 15–75 mm

18. What is the approach velocity to be considered for a mechanical screen while designing it ?

(A) 0.3–0.5 m/s

(B) 0.6–1 m/s

(C) 1–1.5 m/s

(D) 2 m/s

19. The most commonly used disinfectant for drinking water throughout the world is :

(A) Alum

(B) Nitrogen

(C) Chlorine

(D) Lime

20. Chlorine demand of water is equal to :

(A) Applied chlorine

(B) Difference of applied and residual chlorine

(C) Residual chlorine

(D) Sum of applied and residual chlorine

21. The process in which the chlorination is done beyond the breakpoint is known as :

(A) Super chlorination

(B) Post chlorination

(C) Breakpoint chlorination

(D) Hyper chlorination

22. Which of the following is not a method of water treatment for disinfection ?

(A) Chlorine use

(B) Treatment with additional lime

(C) Boiling water

(D) Aluminium treatment

23. Which of the following is the advantage of using activated carbon for water treatment ?

(A) It increases chlorine demand of treated water.

(B) Its overdose is harmful.

(C) It removes organic matter present in water.

(D) None of the above

24. The efficiency of disinfection by chlorine, in water treatment, increased by :

(A) Decrease in time of contact

(B) Increase in temperature of water

(C) Decrease in temperature of water

(D) None of the above

25. How many types of impact assessments are there ?

(A) 4

(B) 5

(C) 3

(D) 6

26. EIAs commenced in the year :

(A) 1890s

(B) 1880s

(C) 1960s

(D) 1950s

27. Domestic demand for water can be assessed using :

(A) P. Q. R.

(B) A. B. C.

(C) H. I. J.

(D) X. Y. Z.

28. The 'Agenda 21' of Rio Summit, 1992 is related to :

(A) Polluter-pays principle

(B) Sustainable development

(C) Environmental education

(D) Preservation of ozone layer

29. Red data book provides data on :

(A) All plants

(B) Endangered animals and plants

(C) All animals

(D) All animals and plants

30. In which year was Project Tiger launched ?

(A) 2004–05

(B) 1983–84

(C) 2013–14

(D) 1973–74

31. Which of the following species are not in the IUCN classification of threatened species ?

(A) Harmful

(B) Extint

(C) Vulnerable

(D) Endangered

32. Which among the following national park of India is also listed in the natural world heritage sites of UNESCO ?

(A) Namdapha National Park

(B) Dachigam National Park

(C) Keoladeo Ghana National Park

(D) Bandipur National Park

33. Which of the following states is related with 'Silent Valley Project' ?

(A) Uttarakhand

(B) Kerala

(C) Tamil Nadu

(D) Himachal Pradesh

34. Consider the following protected areas :

(1) Bandipur

(2) Bhitar Kanika

(3) Manas

(4) Sunderbans

Which of the above are declared Tiger Reserve ?

(A) (1) and (2) only

(B) (2), (3) and (4) only

(C) (1), (2), (3) and (4)

(D) (1), (3) and (4) only

35. Purification through reverse osmosis removes :

(A) Only ionic impurity

(B) Colloidal impurity

(C) High molecular weight organic matter

(D) All of the above

36. A common UV sterilization system usually contains the following units :

(A) Ultraviolet sterilization chamber

(B) Activated carbon chamber

(C) None of the above

(D) Both (A) and (B)

37. How many types of adsorption isotherms are there ?

(A) 5

(B) 4

(C) 3

(D) 2

38. On the adsorbent surface, adsorption occurs :

(A) At any side

(B) Only at sites

(C) At other than both of the above

(D) None of the above

39. Heat of adsorption at each site of an adsorbent is :

(A) Same

(B) Different

(C) Sometimes same and sometimes different

(D) None of the above

40. The sites at the adsorbent surface are :

(A) Independent on each other

(B) Depend on each other

(C) Initially independent but after sometimes depend on each other

(D) All of the above

41. Desalination of water through the technique of reverse osmosis involves the application of pressure of order :

(A) 5–10 kg/cm to the impure water

(B) 15–40 kg/cm^2 to the impure water

(C) 40–80 kg/cm^2 to the pure water

(D) None of the above

42. Most recently the semi-permeable membranes are made of :

(A) Polymethyl methacrylate polymer

(B) Polyamide polymer

(C) Both (A) and (B)

(D) None of the above

43. In ion exchange process water of very low hardness is produced which has pH value :

(A) 0

(B) 2

(C) 20

(D) 200

44. Disadvantage of lime soda process includes :

(A) A large quantity of sludge is formed

(B) This process cannot produce water with zero hardness

(C) Both (A) and (B)

(D) None of the above

45. Which of the following is used for hot lime soda process ?

(A) Intermittent type of softener

(B) Continuous type of softener

(C) None of the above

(D) Both (A) and (B)

46. Which of the following regarding hot lime soda process is true ?

(A) No coagulant is required

(B) Dissolved gases like CO_2 and O_2 are not removed

(C) More chemicals required as softening capacity is low

(D) All of the above

47. Which of the following has defined ecology as "interactions of form, functions and factors" ?

(A) Ernst Haeckel

(B) H. Strahler

(C) R. Mishra

(D) None of the above

48. Which of the following food chains begins with dead organic materials ?

(A) Parasitic chain

(B) Detritus food chain

(C) Marine food chain

(D) None of the above

49. Which of the following food chains do not require solar energy ?

(A) Detritus food chain

(B) Parasitic food chain

(C) Predator food chain

(D) All of the above

50. Which of the following is true ?

(A) Food web is linear and food chain is complex.

(B) Both food web and food chain are linear.

(C) Both food chain and food web are complex.

(D) Food chain is linear and food web is complex.

51. Soft water is :

(A) Soft in nature

(B) Gives lather with soap

(C) Contains D_2O

(D) None of the above

52. Temporary hardness is due to which of the following ?

(A) $NaHCO_3$

(B) $Ca(HCO_3)_2$

(C) Both (A) and (B)

(D) None of the above

53. A sample of hard water, when treated with soap :

(A) Does not produce lather

(B) Forms insoluble white scum

(C) Forms precipitate

(D) All of the above

54. When temporary hardened water is boiled, then :

(A) Soluble bicarbonates are decomposed to insoluble carbonates.

(B) Insoluble bicarbonates are decomposed to soluble carbonates.

(C) None of the above

(D) Both (A) and (B)

55. Which of the following is correct statement ?

(A) 1 mg/lit = 1 ppm

(B) 1 ppm = 0.07°Cl

(C) 1 g/lit = 1 ppm

(D) 1 ppm = 0.1°Fr

56. Osmosis is defined as :

(A) Movement of particles via semipermeable membrane.

(B) Movement of solute particles towards lower concentration via semipermeable membrane.

(C) Movement of solvent particles to the lower concentration via semi-permeable membrane.

(D) Movement of solute and solvent particles.

57. The hardness causing salts can be removed from water by :

(A) External treatment only

(B) Internal treatment only

(C) Both (A) and (B)

(D) None of the above

58. Which of the following methods for water treatment is a corrective method ?

(A) Internal

(B) External

(C) Both (A) and (B)

(D) None of the above

59. Free movement of water molecules and ions through zeolite is due to :

(A) Compact structure of zeolite

(B) Porous structure of zeolite

(C) Presence of silicates in zeolite

(D) None of the above

60. Advantage of zeolite in softening process is that :

(A) The equipment is compact

(B) Hot water can also be softened

(C) Anions can also be removed by this process.

(D) All of the above

61. Which of the following conditioning is internal treatment for softening of hard water ?

(A) Colloidal conditioning

(B) Carbonate conditioning

(C) Both (A) and (B)

(D) None of the above

62. Colloidal solution can be removed by :

(A) Diffusion

(B) Osmosis

(C) Demineralisation

(D) Reverse osmosis

63. Which of the following has highest calorific value ?

(A) Anthracite

(B) Bituminous

(C) Sub-bituminous

(D) Lignites

64. Lignite is also called as :

(A) Red coal

(B) Brown coal

(C) Dirty coal

(D) Black coal

65. A nuclear power plant operates through the heat generated by :

(A) Fusion of uranium nuclei

(B) Fission of uranium nuclei

(C) Both (A) and (B)

(D) None of the above

66. Nuclear fusion is :

(A) Non-conventional energy source

(B) Conventional energy source

(C) Similar to nuclear fusion

(D) All of the above

67. Biomass most often refers to plants :

(A) Animals

(B) Fossil fuel

(C) Plants

(D) None of the above

68. Who is known as father of ecology ?

(A) Billings

(B) Mishra

(C) Odum

(D) None of the above

69. Biotic component includes :

(A) Organic matter

(B) Soil

(C) Humidity

(D) Bacteria

70. Ozone layer is present in which of the following ?

(A) Stratosphere

(B) Exosphere

(C) Troposphere

(D) Mesosphere

71. Which of the following terms is used to describe biodiversity ?

(A) Gene

(B) Species

(C) Ecosystem

(D) All of the above

72. The western ghats are a chain of hills, which are also known as :

(A) Sahayadri Mountain

(B) Nilgiri Malai

(C) Shaya Par Vatam

(D) All of the above

73. Which of the following is the meaning of threatened species ?

(A) Threat to other animals

(B) Gradually decreasing in number

(C) Harmful species of the world

(D) None of the above

74. Which of the following may be the result of global warming ?

(A) Floods in rivers

(B) Cyclones

(C) Epidemics

(D) All of the above

75. Which of the following is not associated with ozone layer ?

(A) Temperature inversion

(B) Filter harmful radiations

(C) Both (A) and (B)

(D) None of the above

76. Depletion of ozone layer may result into :

(A) Marked rise in skin cancer

(B) Damage to immune system

(C) Both (A) and (B)

(D) None of the above

77. Global warming may be prevented by :

(A) Decreasing use of nitrogen fertilizers

(B) Increasing use of nitrogen fertilizers

(C) Cutting trees

(D) None of the above

78. Acid rain is caused by :

(A) Global warming

(B) Ozone layer depletion

(C) Air pollution

(D) Water pollution

79. Acid rain may affect :

(A) Herbaceous vegetations

(B) Metabolic rates of organisms

(C) Both (A) and (B)

(D) None of the above

80. Which of the following water treatments involves removing, stabilizing, rendering fine suspended matter ?

(A) Primary

(B) Secondary

(C) Tertiary

(D) All of the above

81. For normal conversation sound intensity is measured in decibel (dB) is about :

(A) 0–10 dB

(B) 10–20 dB

(C) 35–60 dB

(D) 80–100 dB

82. Which of the following are the physiological effects of noise pollution ?

(A) Headache

(B) Impairment of night vision

(C) Narrowing arteries

(D) All of the above

83. The radioactive pollution that is spread through the earth's atmosphere is called :

(A) Fall out

(B) World out

(C) World spread

(D) None of the above

84. Radioactive pollution can be controlled by :

(A) High chimney

(B) Use of closed cycle coolant system

(C) Both (A) and (B)

(D) None of the above

85. Wet acid rain may be differentiated from dry acid rain as it contains :

(A) Water vapours

(B) Sulphuric acid

(C) Nitric acid

(D) All of the above

86. Which of the following is not the possible disposal way for biomedical waste ?

(A) Incineration

(B) Sterilization

(C) None of the above

(D) All of the above

87. 'BOD' stands for :

(A) Biological Oxygen Deficiency

(B) Boron and Oxygen Demand

(C) Biological Oxygen Demand

(D) None of the above

88. Which of the following is not associated with secondary treatment of waste water ?

(A) Dissolved solids

(B) Activated sludge process

(C) Trickling filters

(D) None of the above

89. ..... devices remove materials which would damage equipment or interfere with a process.

(A) Grit

(B) Screening

(C) Oxidation

(D) Reduction

90. Which of the following represents the heavier inert matter in waste water ?

(A) Debris

(B) Waste

(C) Screens

(D) Grit

91. What is the most common used coagulant ?

(A) Alum

(B) Ferric sulphate

(C) Limestone

(D) Coal

92. What is the intermediate zone composed of in aerobic-anaerobic ponds ?

(A) Algae

(B) Aerobic bacteria

(C) Facultative bacteria

(D) Organic solids

93. Nitrification efficiency is significantly suppressed as the temperature is :

(A) Increased

(B) Decreased

(C) neutral

(D) Maintained

94. Which year was the Safe Drinking Water Act passed ?

(A) 1990

(B) 1992

(C) 1994

(D) 1996

95. Which of the following means the deactivation or killing of pathogens ?

(A) Reduction

(B) Disinfection

(C) Oxidation

(D) Pyrolysis

96. Which of the following is not a chemical disinfectant ?

(A) UV

(B) Ozone

(C) Chlorine

(D) Bromine

97. Which of the following is a process where all the living microorganisms including bacteria spores are killed ?

(A) Disinfection

(B) Sterilization

(C) Incineration

(D) Pyrolysis

98. Which of the following is not an adsorbent ?

(A) Carbon

(B) Polymers and resins

(C) Dry sponge

(D) Clay

99. Which of the following isotherms is applicable to physical adsorption ?

(A) Langmuir

(B) BET

(C) Freundlich

(D) Kisluik

100. Which of the following is not a characteristic of chemisorption ?

(A) It is irreversible

(B) It is specific

(C) It is multilayer phenomenon

(D) Heat of adsorption is about 400 kJ

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 ny 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 छाँटना 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।