VERSION CODE	Maximum Marks : 100 Total Duration : 150 Minutes Maximum Time For Answering : 120 Minutes Subject : **POLYMER SCIENCE & TECHNOLOGY**
A1	**MENTION YOUR PGCET NUMBER**

Serial Number : **123025**

Subject Code	**P-PS&T**

P-PS&T A1

DOs:

1. This question booklet is issued to you by the invigilator **after 02.20 pm.**
2. Check whether the PGCET Number has been entered and shaded in the respective circles on the OMR answer sheet.
3. The version code and serial number of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should be entered on the Nominal Roll without any mistakes.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts:

1. **The timing and marks printed on the OMR answer sheet should not be damaged / mutilated / spoiled.**
2. **The 3rd Bell rings at 2.30 p.m., till then;**
   - Do not remove the seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet or start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. In case of usage of signs and symbols in the questions, the regular textbook connotation should be considered unless stated otherwise.
2. This question booklet contains 75 questions and each question will have one statement and four different options / responses & out of which you have to choose one correct answer.
3. After the 3rd Bell is rung at 02.30 pm, remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
4. Completely **darken / shade** the relevant circle with a **blue** or **black ink ballpoint pen against the question number on the OMR answer sheet.**

ಸರಿಯಾದ ಕ್ರಮ CORRECT METHOD	ತಪ್ಪು ಕ್ರಮಗಳು WRONG METHOD
Ⓐ ● Ⓒ Ⓓ	⊗ Ⓑ Ⓒ Ⓓ Ⓐ Ⓑ Ⓒ ⊘ Ⓐ ● ● Ⓓ ◉ Ⓑ Ⓒ Ⓓ Ⓐ ◉ Ⓒ Ⓓ

5. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognized and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
6. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
7. **Last bell will ring at 4.30 pm,** stop marking on the OMR answer sheet.
8. Hand over the **OMR answer sheet** to the room invigilator as it is.
9. After separating the top sheet (KEA copy), the invigilator will return the bottom sheet replica (candidate's copy) to you to **carry home for self-evaluation.**
10. Only **Non-programmable** calculators are allowed for "M.E. / M.Tech / M.Arch." examination.

Marks Distribution	PART-1 : 50 QUESTIONS CARRY ONE MARK EACH (1 TO 50)
	PART-2: 25 QUESTIONS CARRY TWO MARKS EACH (51 TO 75)

POLYMER SCIENCE AND TECHNOLOGY/ENGINEERING

PART-1

Each question carries one mark. **(50 × 1 = 50)**

1. Which of the following is not a type of manometer?
   (A) U-tube
   (B) Inverted U-tube
   (C) Piezometer
   (D) Inclined tube

2. Two fluids are flowing through two similar pipes of the same diameter. The Reynolds number is same. For the same flow rate if the viscosity of a fluid is reduced to half the value of the first fluid, the pressure drop will _____
   (A) decrease
   (B) remains unchanged
   (C) increase
   (D) insufficient data to answer

3. For pipes, laminar flow occurs when Reynolds number is _____
   (A) less than 4000
   (B) between 2000 and 4000
   (C) more than 4000
   (D) less than 2000

4. Choose the correct statement. Mercury is generally used to measure pressure in manometer, because _____
   (A) its specific gravity is less
   (B) it provides suitable meniscus for the inclined tube
   (C) its density is high
   (D) it provides longer length for a given pressure difference

5. For measuring flow by a venturimeter, it should be installed in _____
   (A) horizontal line
   (B) inclined line with upward flow
   (C) vertical line
   (D) in any direction and location

6. A fluid in equilibrium means _____
   (A) it is free from shear stresses
   (B) shear stresses are acting on fluid but no flow behaviour is manifested
   (C) its viscosity is zero
   (D) a hypothetical situation because fluids are never in equilibrium

Space For Rough Work

7. Viscosity of liquid _____

(A) increases with increasing temperature

(B) decreases with increasing temperature

(C) decreases with decreasing temperature

(D) is unaffected by temperature rise or decrease

8. One mole of a substance is defined as the weight of the substance in _____ equal to its formula weight.

(A) kg

(B) mg

(C) grams

(D) none of A, B, C

9. An ideal solution is formed at the same temperature by mixing 60g of ethanol and 40g of methanol, what will be the mole fraction of methanol?

(A) 0.49

(B) 1.3

(C) 0.51

(D) 1.25

10. Which one of the following is an ideal gas?

(A) Nitrogen

(B) Hydrogen

(C) Carbondioxide

(D) None of A, B, C

11. Air is a mixture of mainly nitrogen and oxygen in the volume ratio approximately _____ and _____ respectively.

(A) 21% and 79%

(B) 42% and 78%

(C) 79% and 21%

(D) None of A, B, C

12. The temperature over which real gases obey ideal gas laws over a wide range of pressure, is called _____

(A) Boyle temperature

(B) inversion temperature

(C) critical temperature

(D) reduced temperature

Space For Rough Work

13. In the equation of state of an ideal gas, pV = nRT, the value of gas constant would depent only on _____

(A) the nature of gas

(B) the pressure of gas

(C) the units of measurement

(D) the temperature of gas

14. If a volume of gas is compressed to half, how many moles of gas remained in the vessel?

(A) Double

(B) Same

(C) Half

(D) Quarter

15. Which of the following graphs is not a straight line for an ideal gas?

(A) V Vs T

(B) n Vs 1/T

(C) T Vs p

(D) n Vs 1/p

16. Ideal solution is formed when its components _____

(A) have zero heat of mixing only

(B) have zero volume change on mixing only

(C) have zero heat of mixing and zero volume change

(D) can be converted into gases

17. The solubility of a gas in liquid increases with _____

(A) increase in temperature

(B) reduction of gas pressure

(C) decrease in temperature and increase in gas pressure

(D) amount of liquid taken

18. Saturated solution of NaCl on heating becomes _____

(A) supersaturated

(B) remains saturated

(C) unsaturated

(D) none of A, B, C

Space For Rough Work

19. Which of the following is not an intensive thermodynamic property?

(A) Temperature

(B) Pressure

(C) Mass

(D) Concentration

20. For an ideal gas enthalpy _____

(A) increases with pressure

(B) independent of changes in pressure

(C) decreases with pressure

(D) none of A, B, C

21. For pure Benzene vapour, which state variables must be defined for complete thermodynamic definition of the system?

(A) Pressure or temperature

(B) Pressure, temperature and enthalpy

(C) Pressure and temperature

(D) None of A, B, C

22. For a cyclic process, the condition is _____

(A) $\Delta U = 0$

(B) $\Delta U > 0$ and $\Delta H > 0$

(C) $\Delta H = 0$

(D) $\Delta U = \Delta H = 0$

23. During isothermal expansion of an ideal gas, its _____

(A) internal energy increases

(B) enthalpy decreases

(C) enthalpy remains unaffected

(D) enthalpy reduces to zero

24. When an ideal gas is compressed reversibly and adiabatically the final temperature is _____

(A) higher than initial temperature

(B) lower than the initial temperature

(C) same as initial temperature

(D) dependent on rate of compression

Space For Rough Work

25. Total energy change for a reversible isothermal cycle is _____

(A) always positive

(B) zero

(C) always negative

(D) none of A, B, C

26. The specific heat of saturated water vapour at 100°C is _____

(A) negative

(B) positive

(C) zero

(D) infinity

27. The major limitation of the first law of thermodynamics is that it does not consider _____

(A) heat as a form of energy

(B) rate of change of a process

(C) direction of change

(D) spontaneous process

28. Convection heat transfer coefficient depends on _____

(A) viscosity

(B) specific heat

(C) density

(D) all of A, B, C

29. In radiative heat transfer, a grey surface is one _____

(A) which appears grey to eye

(B) whose emissivity is independent of wavelength

(C) which has reflectivity equals to zero

(D) which appears equally bright from all directions

30. Heat is transferred from an insulated pipe to the surrounding still air by _____

(A) conduction

(B) convection

(C) radiation

(D) all of A, B, C

Space For Rough Work

31. Which of the following is not a type of distillation?

(A) Differential distillation

(B) Steam distillation

(C) Forced distillation

(D) Flash distillation

32. Separation of toluene and isooctane using phenol as a solvent is an example of _____

(A) extractive distillation

(B) steam distillation

(C) azeotropic distillation

(D) simple distillation

33. An entrainer used in azeotropic distillation must be _____

(A) Chemically stable to solution

(B) of low viscosity

(C) non-corrosive

(D) All of A, B, C

34. Polyethylene with a degree of polymerization _____ has a molecular weight of 28000

(A) 100

(B) 1000

(C) 10000

(D) 10

35. Identify the type of given molecule: $HO\text{-}CH_2\text{-}CH_2\text{-}OH$

(A) Mono-functional

(B) Bi-functional

(C) Tri-functional

(D) Tetra-functional

36. Fibre, type of polymer, have initial moduli of elasticity ranging from _____

(A) 10^2 to 10^3 psi

(B) 10 to 10^2 psi

(C) 10^3 to 10^4 psi

(D) None of A, B, C

37. Polyurethane can be made into _____ product.

(A) flexible

(B) semirigid

(C) rigid

(D) All of A, B, C

38. The function of emulsifying agent in emulsion polymerization is to regulate_____

(A) surface tension

(B) thermodynamic stability

(C) pH

(D) hydrodynamic coalescence

Space For Rough Work

39. The polymerization method used to obtain polymer in pearl or bead form is _____

(A) bulk polymerization

(B) solution polymerization

(C) emulsion polymerization

(D) suspension polymerization

40. Radicals contributing to initiation of polymerization can be produced by _____ method.

(A) thermal

(B) photochemical

(C) redox

(D) All of A, B, C

41. In radical polymerization, the degree of polymerization _____ with _____ of temperature and of initiator concentration and with _____ of monomer concentration.

(A) decrease, decrease, decrease

(B) decrease, increase, decrease

(C) increase, decrease, decrease

(D) increase, increase, increase

42. In radical polymerization the extent of conversion increases, with an increase of _____

(A) polymerization time

(B) temperature

(C) initiator and monomer concentration

(D) All of A, B, C

43. Kinetic chain length can be expressed as _____

(A) rate of propagation/rate of initiation

(B) rate of initiation/rate of termination

(C) rate of termination/rate of propagation

(D) All of A, B, C

44. In a correlation for average degree of polymerization Dp = $\sqrt{\ }$/N, where N has a value of _____ for termination by coupling and _____ for termination by disproportionation.

(A) 1, 0.5

(B) 0.5, 1

(C) 1, 1

(D) 0.5, 0.5

Space For Rough Work

45. Which are the main polymers usually calendared into sheets?

(A) PVC, ABS, rubber

(B) PE, PS, PP

(C) PET, PE, PC

(D) PA, POM, HDPE

46. Compression moulding uses _____ and after opening the mould at the end of cycle _____ product is released.

(A) thermoset, cold

(B) thermoplastic, hot

(C) thermoplastic, cold

(D) thermoset, hot

47. Soft drink bottles can be made by _____

(A) injection moulding

(B) blow moulding

(C) rotational moulding

(D) extrusion

48. Which of the following materials top the list in terms of annual consumption in blow moulding?

(A) PC

(B) PS

(C) ABS

(D) HDPE

49. Which of the following is not an advantage in the manufacture of PP by UNIPOL process?

(A) The number of process units are minimum

(B) Energy requirement is low

(C) Use of fluidised bed provides adequate agitation to maintain uniform monomer composition.

(D) No need of external cooler to remove heat of reaction.

50. Ingredients, adipic acid and hexamethylene diamine, are used to manufacture_____

(A) Nylon 6

(B) Nylon 12

(C) Nylon 6, 10

(D) Nylon 6, 6

Space For Rough Work

PART-2

Each question carries two marks. **(25 × 2 = 50)**

51. In laminar flow, maximum velocity at the centre of pipe is _____ times to average velocity.
    (A) two
    (B) four
    (C) three
    (D) none of A, B, C

52. Choose the correct statement correlating area available for flow and velocity of fluid at throat of venturimeter.
    (A) The area available for flow is minimum and velocity of fluid is maximum
    (B) The area available for flow and the velocity of fluid both are minimum
    (C) The area available for flow is maximum and velocity of fluid is minimum
    (D) The area available for flow and the velocity of fluid both are minimum

53. Bernoullis equation is derived considering the assumption _____
    (A) the flow is non-viscous
    (B) flow is steady, non-viscous, incompressible and irrotational
    (C) the flow is uniform
    (D) None of A, B, C

54. 500g of NaCl is mixed with 200g of KCl, what will be the mole% of NaCl?
    (A) 71.43%
    (B) 24.47%
    (C) 28.57%
    (D) 75.53%

55. 250 ml of Na_2CO_3 solution contains 2.65 g. of Na_2CO_3 How many ml of water is required to prepare 10ml solution of Na_2CO_3 of 0.001 M?
    (A) 90
    (B) 990
    (C) 970
    (D) 1000

56. Conversion can be expressed as _____
    (A) mole%
    (B) mass%
    (C) volume%
    (D) all of A, B, C

Space For Rough Work

57. Which of the following is an example of a closed system?

(A) Scooter engine

(B) liquid cooling system of automobile

(C) air compressor

(D) boiler in steam power plant

58. Choose the wrong statement of the following?

(A) Both heat and work cross the boundary of the system

(B) Both heat and work are path functions

(C) Both heat and work are property of system

(D) Heat flows when the system and surroundings are not in equilibrium which is not necessary for work.

59. 5 moles of an ideal gas expand isothermally and reversible from a pressure of 5 atm to 1 atm at 27°C. What is the largest mass which can be lifted through a height of 1m this expansion?

(A) 2055

(B) 2044

(C) 2048

(D) 2059

60. Finger of our hand sticks to ice tray taken out from the refrigerator. Which factor has more effect on this phenomenon?

(A) The inside temperature of the freezer

(B) Humidity of air

(C) Heat capacity of both finger and tray

(D) Thermal conductivity of tray

61. Provision of fins on a given heat transfer surface will be more if there are _____

(A) fewer number of thin fins

(B) fewer number of thick fins

(C) large number of thin fins

(D) large number of thick fins

62. Thermal transition of crystalline polymer like PE or PTFE is _____

(A) glassy → flexible crystalline → rubbery → viscous fluid

(B) flexible crystalline → rubbery → glassy → viscous fluid

(C) viscous fluid → flexible crystalline → glassy → rubbery

(D) rubbery → glassy → flexible crystalline → viscous fluid

Space For Rough Work

63. Which of the following is not a molecular motion that occurs in amorphous polymer?

(A) Translational motion

(B) Segmental jumping

(C) Atomic motion

(D) Laminar motion

64. Which of the following statements is false in context of 'atoms forming bonds in a polymer decides its thermal reactivity'?

(A) C-C, C-H bond tend to be inert and their major reaction is of substitution type

(B) Polymer containing C-C and C-F bonds are very stable and inert.

(C) Polymer containing double bond are vulnerable to oxidation

(D) Ester, amide and carbonate groups are not susceptible to hydrolysis.

65. Which of the following is not an effect of dilution in solution polymerization?

(A) Reduction in monomer concentration

(B) Decrease in rate of polymerization

(C) Propagation becomes less than termination

(D) More number of initiations and less number of propagation

66. Steady state assumption is not always unique to polymerization kinetics and is often used in developing kinetics of many small molecule reactions that involve _____ reactive intermediates present at _____ concentrated conditions in radical chain polymerization.

(A) highly, low

(B) low, highly

(C) highly, highly

(D) low, low

67. The disappearance of monomer or appearance of polymer can be followed by _____ spectroscopy.

(A) IR and UV

(B) IR, UV and NMR

(C) IR

(D) NMR

68. Considering step polymerization of A-A and B-B' where the reactivities of two functional groups in B-B' reactant are initially of different reactivities and further the reactivities of B and B' each change on reaction of the other group. Even if the reactivities of the two functional groups has reacted, the polymerization will involve _____ different rate constants.

(A) two

(B) three

(C) four

(D) None of A, B, C

Space For Rough Work

69. Which of the following statements is true in case of polycondensation?

(A) Chain branching is favoured due to chain transfer to already formed polymer molecules

(B) Chain branching is extensive

(C) Chain branching is possible only with tri-functional monomer

(D) None of A, B, C

70. Preshape needed for blow moulding can be made by _____

(A) injection process

(B) extrusion process

(C) both A and B

(D) none of A and B

71. Pressure and temperature conditions employed in thermoforming as compared to injection moulding are _____

(A) low pressure and low temperature

(B) low pressure and high temperature

(C) high pressure and high temperature

(D) high pressure and low temperature

72. In the manufacture of HDPE by Ziegler process the reactor is maintained at temperature _____

(A) around 230-370°C

(B) between 140 and 170°C

(C) below 100°C

(D) none of A, B, C

73. Batch emulsion process for PVC manufacture involves sequence of operations as _____

(A) filtration → drying → grinding → packing

(B) grinding → filtration → drying → packing

(C) drying → filtration → packing

(D) filtration → drying → packing

74. Caprolactam in the presence of water and trace quantity of acetic acid, polymerizes to _____ where water acts as _____ and acetic acid as _____

(A) Nylon 6, catalyst, molecular weight regulator

(B) Nylon 6, 6, catalyst, molecular weight regulator

(C) Nylon 6, molecular weight regulator, catalyst

(D) Nylon 6, 6, molecular weight regulator, catalyst

Space For Rough Work

75. An autoclave used to manufacture Nylon 6,6 is initially at temperature _____ which is changed to _____ after two hours.

(A) 280°C, 200°C

(B) 200°C, 280°C

(C) 100°C, 200°C

(D) 200°C, 100°C

Space For Rough Work

SPACE FOR ROUGH WORK