POST GRADUATE COMMON ENTRANCE TEST – 2011

DATE and TIME	COURSE	SUBJECT
06-08-2011 10:30 am to 12:30 pm	ME / M. Tech / M. Arch / MBA (Infrastructure Management) courses offered by VTU / UVCE / UBDTCE	POLYMER SCIENCE

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
100	150 Minutes	120 Minutes

MENTION YOUR PGCET NO.	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A_1	00000105

DOs

1. Check whether the PGCET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This question booklet is issued to you by the invigilator after the **2nd Bell, i.e. after 10:25 am.**
3. The serial number of this question booklet should be entered on the OMR answer sheet.
4. The version code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
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 10:30 am, till then;**
   - Do not remove the seals of this question booklet.
   - Do not look inside this question booklet.
   - Do not start marking on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 75 (items) questions and each question will have one statement and four answers. (Four different options / responses.)
2. After the 3rd bell is rung at 10:30 am, remove the seals 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 marking on the OMR answer sheet.
3. During the subsequent 120 minutes :
   - Read each question (item) carefully.
   - Choose one correct answer from out of the four available responses (options / choices) given under each question / item. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **only one response** for each question / item.
   - Completely **darken / shade** the relevant circle with a **blue or black ink ballpoint pen against the question number on the OMR answer sheet.**
4. 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.
5. Use the space provided at the bottom on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 12:30 pm**, stop marking on the OMR answer sheet and affix your **left hand thumb impression** on the OMR answer sheet as per the instructions.
7. Hand over the **OMR answer sheet** to the room invigilator as it is.
8. 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.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.
10. Only **Non-programmable** calculators are allowed.

Marks Distribution

PART I : 50 Questions carry one mark each (1 to 50)
PART II : 25 Questions carry two marks each (51 to 75)

SEAL

PART – I

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

1. Poise is the unit of

    (A) velocity gradient   (B) dynamic viscosity

    (C) kinematic viscosity   (D) mass density.

2. Venturimeter is used to measure

    (A) discharge   (B) average velocity

    (C) velocity at a point   (D) pressure at a point.

3. If fluid particles move in straight lines and all the lines are parallel to the surface, the flow is called

    (A) uniform   (B) compressible

    (C) laminar   (D) steady.

4. A Newtonian fluid is defined as the fluid which

    (A) is incompressible and non-viscous

    (B) obeys Newton's law of viscosity

    (C) is highly viscous

    (D) is compressible and non-viscous.

5. Bernoulli's equation is derived by making assumption that

    (A) the flow is uniform and incompressible

    (B) the flow is non-viscous, uniform and steady

    (C) the flow is steady, non-viscous, incompressible and irrotational

    (D) the flow is non-uniform, steady and compressible.

SPACE FOR ROUGH WORK

6. Reynolds number is defined as the

   (A) ratio of inertial force to gravity force

   (B) ratio of viscous force to gravity force

   (C) ratio of viscous force to elastic force

   (D) ratio of inertial force to viscous force.

7. Which one of the following is not true ?

   (A) Internal energy is a thermodynamic property of a system

   (B) Internal energy is a state function

   (C) Internal energy is independent of temperature and pressure of the system

   (D) Internal energy of a system does not change in a cyclic process.

8. The average molecular weight of air is

   (A) 0·0288 kg/mol   (B) 0·0320 kg/mol

   (C) 0·0160 kg/mol   (D) 0·0148 kg/mol.

9. The heat supplied to a system under constant pressure is equal to

   (A) the work done by the system   (B) the change in internal energy

   (C) the change in enthalpy   (D) the change in kinetic energy.

10. With increase in pressure, the heat of vaporization of liquids

    (A) remains unchanged   (B) increases

    (C) decreases   (D) may increase or decrease.

11. There exists a unique solution for a set of material balance equations if

    (A) the number of degrees of freedom is positive

    (B) the number of degrees of freedom is negative

    (C) the number of degrees of freedom is non-zero

    (D) the number of degrees of freedom is zero.

SPACE FOR ROUGH WORK

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12. The approximate density of water at room temperature is

   (A) 1 kg/m^3 (B) 10 kg/m^3

   (C) 1000 kg/m^3 (D) $0 \cdot 01 \text{ kg/m}^3$.

13. In a cyclic process involving ideal gases, the work extracted is equal to the heat supplied for

   (A)   Isobaric process   (B)   Isothermal process

   (C)   Adiabatic process   (D)   Isochoric process.

14. Fugacity coefficient of a substance is the ratio of its fugacity to

   (A)   pressure   (B)   activity

   (C)   mole fraction   (D)   activity coefficient.

15. An isolated system can exchange .... with surroundings.

   (A)   matter   (B)   energy

   (C)   both matter and energy   (D)   neither matter nor energy.

16. Change of heat content when one mole of compound is burnt in oxygen at constant pressure is called

   (A)   heat of reaction   (B)   heat of formation

   (C)   heat of combustion   (D)   calorific value.

17. PV^γ = constant is valid for .... process.

   (A)   Isothermal   (B)   Adiabatic

   (C)   Isobaric   (D)   Isotropic.

18. Which of the following is an extensive property of a system ?

   (A)   Heat capacity   (B)   Pressure

   (C)   Concentration   (D)   Volume.

SPACE FOR ROUGH WORK

19. The unit of heat flux is

   (A) $J/s\ m^2$
   (B) W/m^2

   (C) W/mm^2
   (D)   both (A) and (B).

20. The thermal conductivity of polyethylene is .... that of aluminium.

   (A)   equal to
   (B)   more than

   (C)   less than
   (D)   data insufficient.

21. Thermal resistance is given by

   (A)   K/BA
   (B)   B/KA

   (C)   KA/B
   (D)   B/K.

22. Number of gram molecular weights of a solute dissolved in 1 kg of solvent is referre
   to as

   (A)   molality
   (B)   molarity

   (C)   normality
   (D)   formality.

23. Fractional distillation is an example of mass transfer in .... phase.

   (A)   liquid-liquid
   (B)   gas-gas

   (C)   liquid-gas
   (D)   solid-liquid.

24. The kinetics of polyesterification reaction indicates that the functional group reactivity
   is

   (A)   independent on the size of the monomer molecule

   (B)   independent concentration of monomer molecule

   (C)   dependent on the size of monomer molecule

   (D)   independent on temperature.

SPACE FOR ROUGH WORK

25. The rate of polymerization is proportional to

   (A) initiator concentration and first power of monomer concentration

   (B) square root of initiator concentration and first power of monomer concentration

   (C) second power of monomer concentration

   (D) first power of initiator concentration.

26. In case of second order reaction the rate of the reaction depends on the

   (A) concentration of one of the reactants

   (B) concentration of a reactant raised to the second power

   (C) concentration of a reactant raised to the first power

   (D) concentration of reactant raised to the nth power.

27. Unit for first order reaction rate is

   (A) sec^{-1} (B) °C/sec

   (C) g/mol   (D) mole/sec.

28. The rate of reaction .... with increase in concentration of reacting species.

   (A) increases   (B) decreases

   (C) is unaltered   (D) increases followed by decreases.

29. The rate of chemical reaction is directly proportional to the product of the effective concentration of each participating molecule. This theory is known as

   (A) Collision theory   (B) Transition state theory

   (C) Law of mass action   (D) Adsorption theory.

SPACE FOR ROUGH WORK

30. Water tanks can be manufactured by

    (A) RTM   (B) Compression molding

    (C) RRIM   (D) Injection molding.

31. Films can be produced by using

    (A) Compression molding   (B) Thermofoaming

    (C) RIM   (D) Blown film extrusion.

32. Which process is referred as primary process ?

    (A) Calendering   (B) Extrusion

    (C) Injection molding   (D) Coating.

33. Clamping pressure in injection molding is

    (A) higher than injection pressure

    (B) equal to injection pressure

    (C) lower than injection pressure

    (D) does not have any significance.

34. Twin screw extruders are extensively used

    (A) for mixing and compounding   (B) to produce thermofoamed products

    (C) to get anisotropic behaviour (D) to produce pipes.

35. Hydrogen bonding exists in

    (A) PVC   (B) PP

    (C) HDPE   (D) Nylon.

SPACE FOR ROUGH WORK

36. Teflon is a trade name for

    (A) PVDF
    (B) PCTFE
    (C) PTT
    (D) PTFE.

37. Which of the following is not a Vinyl polymer ?

    (A) PVC
    (B) PMMA
    (C) PVA
    (D) PET.

38. Critical micelle concentration is related to

    (A) plasma polymerization
    (B) gas phase polymerization
    (C) solution polymerization
    (D) emulsion polymerization.

39. Polymers generally cannot be purified by

    (A) Fractional precipitation
    (B) Partial dissolution
    (C) Crystallization and distillation
    (D) Solvent extraction.

40. Crosslinked PS can be obtained when styrene is polymerized along with small amount of

    (A) Divinyl benzene
    (B) Acrylonitrile
    (C) Hydroquinone
    (D) Butadiene.

41. Geometric isomerism was obtained due to the pressure of

    (A) carbon-carbon double bond
    (B) carbon-carbon single bond
    (C) asymmetric carbon atoms
    (D) symmetric carbon atoms.

42. A rubber that has good biocompatibility is

    (A) NR
    (B) PDMS
    (C) NBR
    (D) PVC.

SPACE FOR ROUGH WORK

43. Monomer to prepare nylon 6 is

    (A) Vinyl acetate   (B) Caprolactum

    (C) Lactonide   (D) Oxirane.

44. In suspension polymerization initiator should be

    (A) media soluble   (B) monomer insoluble

    (C) monomer soluble   (D) monomer and media soluble.

45. Zeigler-Natta Catalyst is used to produce

    (A) Stereoregular polymers (B) Branched polymers

    (C) Copolymers   (D) Amorphous polymers.

46. Gel point in condensation polymerization is used to express

    (A) end of reaction   (B) control of reaction rate

    (C) start of crosslinking   (D) start of degradation.

47. Atmospheric oxygen in polymerization reaction acts as a / an

    (A) Inhibitor   (B) Initiator

    (C) Co-catalyst   (D) Oxidising agent.

48. Chain carrier in case of anionic polymerization is

    (A) Carbanion   (B) Carbonium ion

    (C) Carboxylate ion   (D) Carbonyl.

49. Expandable polystyrene beads are produced by

    (A) bulk polymerization   (B) interfacial polymerization

    (C) plasma polymerization (D) suspension polymerization.

50. Which of the following polymers is transparent ?

    (A) Iso PP   (B) HDPE

    (C) PMMA   (D) ABS.

SPACE FOR ROUGH WORK

PART – II

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

51. The specific weight of pure water is

(A) 1.24 kg/m^3 (B) 1000 kg/m^3

(C) 9810 kg/cm^3 (D) 13.6×10^3 kg/m^3.

52. What is the mass in grams of 0.4 mole oxygen molecules ?

(A) 12.8 (B) 12.0

(C) 16.0 (D) 12.2.

53. A heat engine operates between a heat source at 700 K and a heat sink at 300 K. What is the maximum efficiency of the engine ?

(A)   60%   (B)   52%

(C)   68%   (D)   57%.

54. What is the change in entropy when 1 k mol of an ideal gas at 335 K and 10 bar is expanded irreversibly to 300 K and 1 bar ? $\left(C_p = 29.3 \text{ kJ/mol.K} \right)$

(A) 15.0 kJ/k.mol.K   (B) 15.91 kJ/k.mol.K

(C) 16.9 kJ/k.mol.K   (D) 16.2 kJ/k.mol.K.

55. Molecular weight of Na_2CO_3 is

(A)   116   (B)   100

(C)   106   (D)   110.

56. If a bucket holds 2 kg of NH_3, it contains

(A)   1 k mol of NH_3 (B) 0.117 k mol of NH_3

(C) 0.99 k mol of NH_3 (D)   34 k mol of NH_3.

57. If PE has a molecular weight (M_n) of 2,80,000, what is its degree of polymerization ?

(A)   100   (B)   1000

(C)   10000   (D)   2800.

SPACE FOR ROUGH WORK

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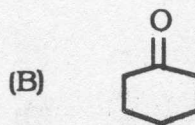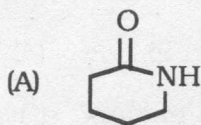58. Functionalities of butadiene and ethylene glycol are

   (A)   2 and 2   (B)   4 and 2

   (C)   4 and 3   (D)   2 and 4.

59. The epoxy/glass fibre composite contains 40% of glass fibre. The densities of epox
    and glass fibre are 1·2 and 2·2 respectively. The density of the epoxy composite in th
    units of g/c.c. is

   (A)   1·7   (B)   1·75

   (C)   1·6   (D)   1·55.

60. The structure of caprolactum is

   (A)

   (B)

   (C)

   (D)
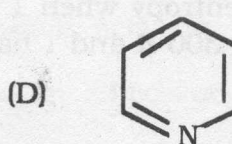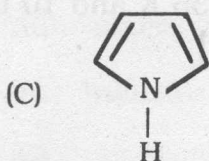
61. Crystallinity of the three different types of PE follows the order

   (A)   HDPE > LLDPE > LDPE   (B)   LDPE > LLDPE > HDPE

   (C)   HDPE > LDPE > LLDPE   (D)   LLDPE > LDPE > HDPE.

62. The temperature at which thermoforming is best carried out is

   (A)   softening temperature

   (B)   melting temperature

   (C)   glass transition temperature

   (D)   20°C – 30°C above melting temperature.

SPACE FOR ROUGH WORK

63. During chain growth polymerization, the molecular weight of the polymer

   (A)   increases with conversion

   (B)   decreases with conversion

   (C)   does not change with conversion

   (D)   first decreases and then increases with conversion.

64. For a second order reaction, the half-life is

   (A)   inversely proportional to the initial concentration

   (B)   independent of the initial concentration

   (C)   directly proportional to the initial concentration

   (D)   dependent of the initial concentration.

65. The number average degree of polymerization in a polymerization process carried to 99% conversion is

   (A)   100   (B)   99

   (C)   199   (D)   98.

66. Examples for inorganic polymers are

   (A)   silicone rubber and polyphosphate

   (B)   Polygermane and lignin

   (C)   cellulose and polypeptide

   (D)   silicone rubber and polypyrrole.

67. Examples for high symmetrical polymers are

   (A)   PP & PS   (B)   PTFE & PVDF

   (C)   HDPE & PAN   (D)   HDPE & PTFE.

SPACE FOR ROUGH WORK

68. Examples for free radical initiators are

   (A)   Benzoyl peroxide, BF_3, hydroquinone, $AlCl_3$

   (B)   Benzoyl peroxide, AIBN, potassium persulphate, H_2O_2

   (C)   AIBN, nitrobenzene, hydroquinone, DCP

   (D)   Benzoyl peroxide, AIBN, dinitrobenzene, lauroyl peroxide.

69. The rate constant for half change for a first order reaction is

   (A) $k = \dfrac{1}{t_{1/2}}$

   (B) $ln\ k = \dfrac{0 \cdot 693}{t_{1/2}}$

   (C) $k = \dfrac{0 \cdot 693}{t_{1/2}}$

   (D) $k = \left(t_{1/2} \right)^2$

70. The group of polymers consisting of PS, PMMA, PVA, HDPE and PAN is best categorised as

   (A)   Engineering polymers

   (B)   Polymers of addition polymerization

   (C)   Polymers of condensation polymerization

   (D)   Polymers of ring opening polymerization.

71. Which polymerization methods adopted to prepare nylon 66 and nylon 6 ?

   (A)   Condensation and ring opening

   (B)   Condensation and polyaddition

   (C)   Condensation and condensation

   (D)   Condensation and insertion.

SPACE FOR ROUGH WORK

72. How much chloride (chlorine) can be obtained from 58·5 kg of NaCl ?

    (A) 23   (B) 35·5

    (C) 35·0   (D) 37·0.

73. The starting material to prepare polyurethane is

    (A) Diol + di-isocyanate   (B) Diol + diacid

    (C) Diacid + diamine   (D) Diol + diol.

74. The melting points of nylon 66 and nylon 6 are

    (A) 260°C & 220°C   (B) 220°C & 200°C

    (C) 260°C & 200°C   (D) 220°C & 260°C.

75. Addition polymerization is also known as

    (A) chain and vinyl polymerization

    (B) chain and insertion polymerization

    (C) chain and polyaddition polymerization

    (D) chain and melt polycondensation.

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