Seat No. _____ Enrolment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

M.Sc. Polymer Science & Technology – SEMESTER 3

November 2021 EXAMINATION

Course Title: Polymer Rheology

Course Code: 101340301

Total Printed Pages : 2

Date: 16/11/2021 **Time: 1:30 PM to 3:30 PM** **Maximum Marks: 60**

Instructions:

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q. 1 **Answer the following Multiple Choice Questions.** **(12)**

(1) Avogadro's number is _____.
(i) 6.02×10^{23} (ii) 6.00×10^{24} (iii) 6.04×10^{23} (iv) 6.02×10^{22}

(2) Container can be made from _____.
(i) rotational moulding (ii) blow moulding (iii) both 1& 2 (iv) not 1 & 2.

(3) Latex paint is an example of _____ materials.
(i) reopexy (ii) thixotropy (iii) anti-thixotropy (iv) reopexy.

(4) In extruder if more viscous melt, the _____ pressure drops.
(i) low (ii) average (iii) greater (iv) slow.

(5) At die _____ by giving proper tapering the molecules get proper arrangement inside the die.
(i) exit (ii) entry (iii) compression (iv) none of above.

(6) _____ have a lower apparent viscosity at higher shear rate.
(i) Newtonian fluid (ii) Dilatants fluid (iii) Bingham plastics (iv) Pseudoplastic fluid

(7) Polymer exhibits a time dependent strain response to a constant applied stress. This behavior is called _____.
(i) fatigue (ii) creep (iii) Bingham plastics (iv) modulus.

(8) Swelling ratio = _____.
(i) Diameter of extrudate / Diameter of die (ii) Diameter of die / Diameter of extrudate (iii) Extrudate / Die (iv) Die / Extrudate

(9) _____ is closely related with pressure and temperature.
(i) T_g (ii) T_m (iii) T_p (iv) T_c

(10) Free volume theory suggests that below glass transition temperature there is _____.
(i) complete free volume (ii) no free volume (iii) average volume (iv) all.

(11) Surface irregularity is known as _____.
(i) die swell (ii) parison sag (iii) sharkskin (iv) All.

(12) Distributive mixing achieve _____ of composition.
(i) uniformity (ii) break down (iii) separation (iv) distribution.

Q.2 Attempt **any eight** of the following. **(16)**

(1) Explain Weissenberg effect.

(2) Why polymeric liquids are non – Newtonian?

(3) Explain different fundamental concept depends on molecular structure.

(4) Explain effects of pressure.

(5) Define rheology and state its importance in processing of polymer materials.

(6) Explain rheological equation of state.

(7) Define: (1) Elasto viscous behaviour (2) Stress

(8) Write dispersion in mixing process.

(9) Explain volume viscosity.

(10) Explain jetting and fountain effect.

Q. 3 Explain the effects of temperature on flow properties of polymers. **(08)**

OR

Q.3 Give an account on effects of molecular structure on flow properties of polymers. **(08)**

Q. 4 Derive Rabinowitch equation used for flow through capillary. **(08)**

OR

Q. 4 Answer the following. **(08)**

1. Define sharkskin. How it can be reduced during polymer processing?
2. Derive the relation used for the shear stress at the wall during flow through parallel plate.

Q. 5 Derive $F = \frac{3\eta V^2}{8\pi t H^4}$ for compression moulding process. **(08)**

OR

Q. 5 Write a note on melting, material transfer, shaping and finishing in polymer melt process. **(08)**

Q. 6 Write a note on capillary rheometer. **(08)**

OR

Q. 6 How strain enhancement under constant stress of viscoelastic materials can be understood using Kelvin – Voight model? **(08)**

Seat No. _____ Enrollment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

M.Sc. Polymer Science & Technology – SEMESTER 3

November 2021 EXAMINATION

Course Title: Polymer Composites & Fibre Technology

Course Code: 101340302

Total Printed Pages : 2

Date: 17/11/2021 **Time: 1:30 PM to 3:30 PM** **Maximum Marks: 60**

Instructions:

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q.1 **Multiple choice questions.** **(12)**

(1) _____type of mould are required for process such as resin injection, foam reservoir moulding
(a) matching (b) wooden (c) Plaster (d) None of these

(2) Which is the third stage in curing of polyester resin
(a) Hardening (b) Gelation (c) maturing (d) none of these

(3) Which procedure is used for thick casting?
(a) two stage casting (b) single one port moulds (c) matching moulds (d) none of these

(4) Which is the reactive diluents in epoxy resin
(a) phenyl glycidyl ether (b) benzyl alcohol (c) toluene (d) all of these

(5) _____ is an unsaturated monomer for unsaturated polyester resin
(a) Formic acid (b) maleic anhydride (c) Lactic acid (d) all of these

(6) _____is used as inhibitor for preparation of unsaturated polyester resin
(a) Hydroquinone (b) maleic anhydride (c) Lactic acid (d) all of these

(7) _____glass fiber grade can be recommended for use inside atomic reactor.
(a) E-glass (b) S-glass (c) C-glass (d) none of these

(8) _____is used as accelerator in curing of unsaturated polyester resin
(a) N,N dimethyl aniline (b) benzyl alcohol (c) Methyl ethyl ketone peroxide (d) all of these

(09) Which monomer improves chemical resistance and hydrolytic stability in polyester resin?
(a) propylene glycol (b) neopentyl glycol (c) maleic acid (d) styrene

(10) _____can be used as precursor for producing carbon fiber
(a) polyacrylonitrile (b) cellulose (c) both a & b (d) none of these

(11) _____require an accelerator to ensure full cure at room temperature
(a) DETA (b) TETA (c) N-aminoethyl piperazine (d) None of these

(12) _____type of monomer act as a solvent and to crosslink the polymer chain in unsaturated polyester resin

(a) Toluene (b) Xylene (c) styrene (d) None of these

Q.2 **Answer the following (any Eight)** **(16)**

(1) Write a note on plaster mould

(2) Define composite. Give the classification of composite based on reinforcement material.

(3) Write the advantage and disadvantage of composite.

(4) Write a note on wooden mould.

(5) How to calculate Amount of hardner needed for 200 gm of epoxy resin. We can use epoxy equivalent weight = 250 , and hardner used is Triethylene tetraamine

(6) Explain the amine based curing system in epoxide resin

(7) Write a note on pressure bag moulding

(8) Discuss the glass fiber production process and explain its properties

(9) Write a note on single one –part mould

(10) Explain the significance of accelerator in unsaturated polyester resin

Q.3 Write a note on single stage & two stages casting of epoxide resin mould. **(08)**

OR

Q.3 Write the factor affecting the material selection and process selection in designing of FRP. **(08)**

Q.4 Write the mechanism of epoxy resin formation and Explain the anhydride curing reaction of epoxide resin **(08)**

OR

Q.4 **Answer the following** **(08)**

1. Explain the role of inhibitor in unsaturated polyester resin
2. Explain the reactive and non reactive diluents in epoxy resin

Q.5 Explain the significance of saturated acid, unsaturated acid, glycol, and monomer in unsaturated polyester resin. Explain curing reaction of unsaturated polyester resin **(08)**

OR

Q.5 Explain gelcoat, top coat and low shrink unsaturated polyester resin. Which are three different stages for curing of polyester resin? Explain it. **(08)**

Q.6 Explain hand lay- up and spray lay-up technique. **(08)**

OR

Q.6 **Write a note on** **(08)**

(i) Sheet moulding compound

(ii) Filament winding

Seat No. _____ Enrollment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

M.Sc. Polymer Science & Technology – SEMESTER 3

November 2021 EXAMINATION

Course Title: Petrochemicals

Course Code: 101340303

Total Printed Pages : 2

Date: 18/11/2021 **Time: 1:30 PM to 3:30 PM** **Maximum Marks: 60**

Instructions:

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q.1 **Multiple choice questions.** **(12)**

(1) Steam to hydrocarbon weight ratio for olefin production is _____for liquid feeds
(a) 0.2 – 1.0 (b) 0.4 – 0.6 (c) 0.8 – 1.0 (d) 1.0 – 1.2

(2) _____is the example of acidic sulphur compound
(a) Dimethyl sulphide (b) Thiocyclohexane (c) methyl mercaptant (d) none of these

(3) Non catalytic gas phase reactions are carried out in _____reactor
(a) Adiabatic (b) Tabular (c) Fluidised bed reactor (d) Stirred flow reactor

(4) _____is known as Isohexane
(a) 2,2 – dimethyl butane (b) 2,3 -dimethylbutane (c) 3- methylpentane (d) 2-methyl pentane

(5) _____good extractant for aromatic hydrocarbon
(a) methanol (b) tertramethylene sulfone (c) liquid propane (d) None of these

(6) In petrochemical Industry, _____compounds are known as naphthenes
(a) Alkane (b) cycloalkane (c) aromatic (d) olefins

(7) In the butadiene production from acetylene and formaldehyde, _____is used as catalyst in the vapour phase
(a) Zinc oxide (b) Copper Acetylide (c) Magnesia & Chromium (d) Platinum

(8) _____is the example of basic nitrogen compound
(a) Pyrrole (b) porphirins (c) quinoline (d) none of these

(9) Thermal cracking reaction mechanism are carried out by _____mechanism
(a) free radical (b) anionic (c) cationic (d) None of these

(10) Dimethyl ether of polyethylene glycol is used as a solvent in _____ process.
(a) selexol (b) sulfinol (c) rectisol (d) None of these

(11) Styrene is made from benzene and _____
(a) ethylene (b) propylene (c) butadiene (d) None of these

(12) _____is used as oxygenates in petrol manufacture
(a) 2,2 – dimethyl butane (b) Methyl tertiary butyl ether (c) 3- methylpentane (d) 2-methyl pentane

Q.2 **Answer any eight of following.** **(16)**

(1) Discuss the dehydrocyclisation

(2) Write a note on viscosity breaking process

(3) What are the advantages of conversion process?

(4) Discuss the different fractions of natural gas liquid (NGL) and write the properties of natural gas liquids.

(5) What are the different costing parameters in petrochemical processing? Explain

(6) Why petroleum refining is required? Write different fractions from distillation of crude oil

(7) Discuss the production and uses of formaldehyde

(8) How the internal combustion engines work?

(9) What is octane number? Discuss the additives used in petrol manufacture

(10) Discuss the Isomerization process

Q.3 Why natural gas required treatment process? Explain the acid gas treatment process. **(08)**

OR

Answer the following **(08)**

1. Discuss the sulphur and nitrogen containing compound in crude oil composition
2. Which type of reactor used in petrochemical process technology? Explain it

Q.4 Discuss the production of ethylene with flow diagram from ethane in steam cracking process and What are the different process variable in steam cracking process? Explain **(08)**

OR

What is coking process? Explain delayed and fluid coking process **(08)**

Q.5 Discuss the petrochemical process technology with schematic flow diagram which is used in continuous processing of styrene. Explain it **(08)**

OR

Answer the following **(08)**

1. Write and discuss the synthesis, properties and uses of phenol from benzene via cumene
2. Write a note on maleic anhydride

Q.6 Which are the different routes for the production of Isoprene and butadiene? Explain it **(08)**

OR

Answer the following **(08)**

1. Discuss the production and uses of acetone from Isopropanol
2. Write a note on production of chloromethanes

Seat No. _____ Enrollment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

M.Sc. – POLYMER SCIENCE & TECHNOLOGY

SEMESTER – III

WINTER 2021 EXAMINATION

Course Title: Analytical Techniques
Course Code: 101340307
Total Printed Pages : 02
Date: 19-11-2021, Friday **Time: 1.30 to 3.30 pm** **Maximum Marks: 60**

Instructions:

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q. 1 Answer the following muitiple choice questions. (12)

(1) A basic requirements of Good Manufacturing Practice is_____.
(a) operators are trained to carryout procedures correctly
(b) By any way profit must be more
(c) Production must be focused more
(d) Only legal documentation is taken care of

(2) Accuracy deals with_____of the results.
(a) correctness (b)equality (c)intensity (d)gap between

(3) The Head of QC has responsibility to_____.
(a) evaluate batch records (b)change the records
(c) manipulate results (d)none of these

(4) In HPLC, selection of mobile phase(solvent) depends on_____.
(a) quality of solvents (b)quality of sample and stationary phase
(c) quality of instrument (d)quality of column

(5) _____is the non-destructive type detector used in chromatography.
(a)flame ionization detector (b)flame photo metric detector
(c) electron capture detector (d) thermal conductivity detector

(6) Which of the following can be used as carrier gas for Gas Chromatography.
(a)nitrogen (b)argon (c) helium (d) all of these

(7) For non linear molecule in IR determinations, number of modes of vibration can be calculated as,_____.
(a) 5N-3 (b)3N-5 (c)3N-6 (d)3N-1

(8) NMR is the studly of absorption of_____by nuclei in a magnetic field.
(a) infra red radiations (b)radio frequency radiation
(c)ultraviolet radiation (d)microwave radiation

(9) In a nuclei, if number of protons and neutrons are even then it will have __.
(a)half integer spin (b)double spin (c)zero spin (d) all of these

(10) Thermal analysis can be defined as_____.
(a) measurement of physical properties as a function of temperature
(b) measurement of chemical properties as a function of temperature
(c) measurement of physical properties as a function of applied stress
(d) measurement of chemical properties as a function of applied stress

(11) Which of the following technique can measure weight loss as a function of temperature.
(a) thermogravimetry analysis(TGA) (b)differential scanning calorimetry (DSC)
(c) thermomechanical analysis (TMA) (d) all of these

(12) Glass transition temperature can be measured by_____.
(b) thermogravimetry analysis(TGA) (b)differential scanning calorimetry (DSC)
(c) thermomechanical analysis (TMA) (d) all of these

Q.2 Attempt **any eight** of the following. **(16)**

(1) What is Validation?
(2) List out Validation parameters.
(3) How thin layer of adsorbent is prepared in TLC?
(4) explain what is Migration Parameter.
(5) Draw a neat diagram for HPLC Chromatogram and label it.
(6) Explain Hooke's law.
(7) Why TMS is used as an internal standard in NMR spectroscopy?
(8) Discuss on different modes of vibrations in molecule.
(9) Discuss basic principle of SEM.
(10) Discuss advantages and limitations of (Differential Thermal Analysis) DTA

Q. 3 Discuss important steps followed for the analysis of samples. **(08)**

OR

Q. 3 Discuss the role of Accuracy, Precision and Range (linearity) during Good Manufacturing Practice. **(08)**

Q. 4 Write a brief note on Gas Chromatography with suitable diagram. **(08)**

OR

Q. 4 Write a complete note on paper chromatography with suitable diagrams. **(08)**

Q. 5 Discuss factors affecting vibrational frequencies during IR determination. **(08)**

OR

Q. 5 Discuss on sampling in IR and applications of NMR spectroscopy. **(08)**

Q. 6 Discuss advantages and disadvantages of SEM and; compare SEM with TEM. **(08)**

OR

Q. 6 Discuss main advantages, limitations and applications of DMA. **(08)**

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