



CENTRAL INSTITUTE OF PETROCHEMICALS ENGINEERING & TECHNOLOGY  
 HEAD OFFICE : GUINDY, CHENNAI – 600 032.  
 ACADEMIC CELL  
 FIRST SEMESTER EXAMINATION – JANUARY - 2023

Duration : 3 Hours  
 Course : PGD - PPT  
 Subject : Polymer Science & Technology

Max. Marks: 60  
 Date : 09.01.2023  
 Time : 10.00 a.m. to 01.00 p.m.

**(DO NOT CHANGE SEQUENCE OF QUESTION NUMBER IN ANSWER SCRIPT)**

**PART – A**

Answer **all** questions

30 x 1 = 30

1. Importance of stereoregularity to crystallinity in polymers is because of the \_\_\_\_\_ of the side groups in atactic polymers like PS and PMMA.
  - a) Bulky
  - b) Small
  - c) Normal
  - d) none of these.
2. \_\_\_\_\_ is also known as size –exclusion chromatography
  - a) Dynamic Light Scattering
  - b) DSC
  - c) Gas Chromatography
  - d) Gel permeation chromatography
3. The process in which the molecular weight of polymer almost remains unchanged with the progress reaction is a \_\_\_\_\_.
  - a) Addition polymerization
  - b) condensation polymerization
  - c) step growth polymerization
  - d) bulk polymerization
4. Many polymers including fibers are partially \_\_\_\_\_.
  - a) Crystalline
  - b) Amorphous
  - c) Dark
  - d) Light
5. Above glass transition temperature rubber become.
  - a) Brittle
  - b) soft
  - c) Hard
  - d) Glassy
6. Typical crystalline polymers are those whose molecules are chemically and geometrically \_\_\_\_\_ in structure.
  - a) Regular
  - b) Irregular
  - c) Branched
  - d) None of the above
7. A functionality of  $f = 2$  a linear polymer is formed by polymerizing a thermoplastic, is called
  - a) Uni-functional
  - b) Di-functional
  - c) Tri-functional
  - d) Tetra-functional
8. Stabilizer is used in plastic to.
  - a) Reduce thermal stability
  - b) improve strength
  - c) Reduced weight
  - d) improve thermal stability.
9. An example of biodegradable polymer.
  - a) PLA
  - b) PVC
  - c) Polyethylene
  - d) poly acetylene
10. Addition of reinforcing filler such as carbon black in rubber leads to stiffer, stronger and tougher products due to \_\_\_\_\_.
  - a) Crosslinking
  - b) Linking
  - c) Moulding
  - d) None of the above
11. Which one of the following is not a biodegradable polymer
  - a) PLA
  - b) PBAT
  - c) PLGA
  - d) PVC
12. The addition of a plasticizer usually \_\_\_\_\_ the stiffness, hardness and brittleness of overall polymer.
  - a) reduces
  - b) increases
  - c) does not alter
  - d) None of the above
13. In emulsion polymerization monomer polymerize inside.
  - a) Micelles
  - b) monomer droplets
  - c) aqueous phase
  - d) surface of reactor
14. The strength of the polymer increase with \_\_\_\_\_ in molecular weight.
  - a) Increases
  - b) decreases
  - c) no change
  - d) slightly decrease.
15. Polymorphism in polyethylene means \_\_\_\_\_.
16. Polyisoprenes and Polychloprenes are \_\_\_\_\_.
17. Having two functional group is called as \_\_\_\_\_.
18. High temperature, high performance polymeric materials are called \_\_\_\_\_ polymers.
19. Isotactic polymers are \_\_\_\_\_.
20. The degree of polymerization is usually much higher than 1, and it can take any of the whole numbered values between the minimal and maximal. State true or false.
21. The chain growth process is usually much slower than the step growth process. State true or false.
22. Many isotactic polymers crystallize with a helical conformation in which alternate chain bonds take trans and gauche positions. State true or false.

23. Tacticity ie stereoisomerism is when a chiral center is present in a polymer molecule, different configurations or optical isomers are possible. State true or false.
24. Copolymer and Ter-polymer have more than one monomer as repeating units. State true or false.
25. DSC in equipment stands for \_\_\_\_\_.
26. PDI in dispersity stands for\_.
27. Tg stands for\_\_\_\_\_.
28. GPC in chromatography stands for\_\_\_.
29. Mn in molecular weight stands for\_.
30. The degree of crystallinity is the percentage \_\_\_\_\_ content of a semicrystalline substance.  
a) crystalline                      b) amorphous                      c) no content                      d) none of the above.

**PART – B**

Answer **all** questions (Max. 40 words)

4 x 2 = 8

1. What is degree of polymerization?
2. Write down the usefulness of number average molecular weight.
3. Define: glass transition temperature.
4. What is molecular weight distribution (MWD)?

**PART – C**

Answer any **four** questions (Max. 100 words)

4 x 3 = 12

1. Write short notes on Dispersity and derive  $D_m = M_w / M_n$ .
2. Explain the working principle of DMA
3. Explain the mechanism of condensation polymerization.
4. Mention the applications of GPC in short (any three)
5. Explain degradation & stabilizer of polymer.

**PART – D**

Answer any **two** questions (Max. 300 words)

2 x 5 = 10

1. Explain 4 types of Polymerization techniques
2. Explain the 5 effects of crystallinity on the properties of polymers
  - Processability
  - Thermal
  - Mechanical
  - Optical
  - Chemical
3. Describe the Glass transition, Cold crystallization, Recrystallization, Melting, Oxidation induction time and Decomposition using differential scanning calorimetry (DSC)

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CENTRAL INSTITUTE OF PETROCHEMICALS ENGINEERING & TECHNOLOGY  
HEAD OFFICE : GUINDY, CHENNAI – 600 032.  
ACADEMIC CELL  
FIRST SEMESTER EXAMINATION – JANUARY - 2023

Duration : 3 Hours  
Course : PGD - PPT  
Subject : Plastics Materials and its Applications-I

Max. Marks: 60  
Date : 10.01.2023  
Time : 10.00 a.m. to 01.00 p.m.

**(DO NOT CHANGE SEQUENCE OF QUESTION NUMBER IN ANSWER SCRIPT)**

**PART – A**

Answer **all** questions

30 x 1 = 30

- Annealing of Nylon 6 is done in order to \_\_\_\_  
a) Enhance properties of part      b) Arrest crazing  
c) Avoid moisture absorption      d) Increase weather ability
- Which of the following is not a characteristic of rubber?  
a) Non-crystalline      b) Electrical conductivity      c) Chemical resistance      d) Low softening temperature
- PC/ABS is an \_\_\_\_\_  
a) Blend      b) Alloy      c) Copolymer      d) None of these
- Suitable material for making a blend with PET is \_\_\_\_\_  
a) PC      b) PE      c) PP      d) None of these
- Fiber obtained by chemical treatment of Wood Pulp is called \_\_\_\_\_  
a) Natural silk      b) Rayon      c) Nylon      d) Polyester
- Nylon materials applications are in \_\_\_\_\_  
a) Automotive      b) Sewing Machine      c) Fuel System      d) All of These
- Density of LLDPE in g/cc  
a) 0.910-0.925      b) 0.925-0.935      c) 0.935-0.945      d) None of these
- HDPE is manufactured by which of the following process  
a) Low Pressure Process      b) Ziegler Process      c) Philips Process      d) All the above
- Polyethylene are characterized by toughness, near zero  
a) Hardness      b) Strength      c) % Elongation      d) Moisture absorption
- Celluloid is widely used for manufacturing of items  
a) Brushes      b) Combs      c) Glue      d) all the above
- Polypropylene has excellent  
a) Impact strength      b) Chemical property      c) Hinge property      d) Scratch resistance property
- PVC is commercially produced by  
a) Bulk Polymerization      b) Solution Polymerization      c) Suspension Polymerization      d) None of these
- Which of the following material has the lowest shrinkage?  
a) PC      b) PP      c) PBT      d) Nylon 6
- Choose the material showing self extinguishing characteristics  
a) HDPE      b) PVC      c) ABS      d) None of these
- Glass Transition Temperature of Cellulose acetate  
a) 150°C      b) 157°C      c) 100°C      d) 120°C
- .....material exhibits exceptional barrier resistance to oxygen
- Specific gravity of PBT \_\_\_\_\_.
- ..... Material is most suitable for Electroplating.
- K-value is calculated for \_\_\_\_\_.
- Polyethylene can be cross linked to form .....thermoplastic material
- PC is a condensation product of Bisphenol A and Phosgenes. Say True or False
- The suitable material for X-ray film is PET. Say True or False
- POM is belongs to acetal polymers. Say True Or False
- PC materials show weak properties such as stress cracking and low chemical resistivity. Say true or false.
- Nylon shows Mould shrinkage due to its Semi crystalline / crystalline nature. Say true or false.
- Expand XLDPE \_\_\_\_\_.
- Full form of HDPE \_\_\_\_\_.
- Abbreviate MDPE \_\_\_\_\_.
- ABS stands for \_\_\_\_\_.
- PC stands for \_\_\_\_\_.

**PART – B**

Answer **all** questions (Max. 40 words)

4 x 2 = 8

1. What is the source for ethylene monomer?
2. Write important applications of nylons.
3. Write two general properties of PS.
4. Write characteristic properties of Polypropylene?

**PART – C**

Answer any **four** questions (Max. 100 words)

4 x 3 = 12

1. Write Structure Property Relationship of Polypropylene.
2. Explain the properties of SAN..
3. Write properties of Engineering plastics.
4. Commodity plastics are widely used in house hold applications – Justify the statement in details
5. Describe the various properties of poly ethylene and explain their processing behaviour.

**PART – D**

Answer any **two** questions (Max. 300 words)

2 x 5 = 10

1. Describe the vulcanization process of natural rubber and classify the different grades of rubbers.
2. Describe the manufacturing process of Polyvinyl Chloride by emulsion polymerization process and illustrate the various properties of the resin.
3. Explain the properties & applications of (1) Polycarbonate (2) PMMA.

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20-213

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FIRST SEMESTER EXAMINATION – JANUARY - 2023

Duration : 3 Hours  
Course : PGD - PPT  
Subject : Plastics Processing Technology – I

Max. Marks: 60  
Date : 11.01.2023  
Time : 10.00 a.m. to 01.00 p.m.

**(DO NOT CHANGE SEQUENCE OF QUESTION NUMBER IN ANSWER SCRIPT)**

**PART – A**

Answer **all** questions

30 x 1 = 30

1. Fluids which obey Newton's Law of viscosity is called \_\_\_\_\_
2. Root cause of voids in the injection moulded product is \_\_\_\_\_  
(a) Higher melt temperature (b) Volatile gases and moisture  
(c) Higher mould temperature (d) low injection pressure
3. Cavity pressure will be \_\_\_\_\_  
(a) Lower than the injection pressure (b) Higher than the injection pressure  
(c) Higher than the back pressure (d) lower than the back pressure
4. If cushion is zero then \_\_\_\_\_  
(a) Flash will occurs in the moulding (b) Holding will not effects  
(c) Streaks will occurs in the moulding (d) degradation will occurs
5. Which of the following will be higher in injection moulding cycle ?  
(a) Refilling time (b) Cooling time (c) Injection time (d) Deflashing time
6. Curing Means  
(a) Material Solidify under heat & Pressure (b) Material degrade  
(c) Material injecting during process (d) Material cooled & become solid
7. Abbreviate: HMHDPE
8. The unit of measurement of Viscosity is \_\_\_\_\_.
9. Rheology refers to the study of deformation and flow of matter – Say True or False
10. Three plate moulds are used for \_\_\_\_\_.  
(a) Automatically degating parts (b) Part to be  
(c) Multi cavity moulding (d) Four
11. Function of thermocouple is \_\_\_\_\_  
(a) to increase the temperature (b) to decrease the temperature  
(c) to sense the temperature (d) none of these
12. Main root cause for "burn mark" defect in injection moulding is  
(a) Material contamination (b) Excessive melt temperature  
(c) Low injection pressure (d) None of the above
13. As the temperature decreases then viscosity is increase. Say True or False
14. Expand : MFI.
15. Power consumption of conventional injection moulding will be \_\_\_\_\_ the micro processed controlled injection moulding machine.  
(a) Equal to (b) Lower than (c) Higher than (d) Equal or lower than
16. Robots can help in increasing productivity by reducing dead time. Say True or False.
17. Relationship between Viscosity and MFI is  
(a) Viscosity is proportional to MFI (b) Viscosity is inversely proportional to MFI  
(c) Viscosity is equals to MFI (d) No relationship
18. In thermo set material, raise in temperature will \_\_\_\_\_.  
(a) Not affect the properties (b) Slower the curing  
(c) Faster the curing (d) Improves the flow
19. Abbreviate: SAN
20. Depression on the moulded component is called \_\_\_\_\_ defect.
21. Abbreviate: TPU
22. In Compression Moulding mould is in heated condition Say True or False
23. As the screw rotates which force will be applied on the melt?  
(a) Tensile force (b) Compressive force (c) Shear force (d) Injection force

24. For hands touch free products which of the following is used  
 (a) Auto loaders      (b) Robots      (c) Conveyors      (d) Hot runner
25. Breathing is associated with compression and transfer molding? Say True or False
26. Suck back is given to avoid \_\_\_\_\_
27. Expand: LLDPE
28. What is the purpose of locating ring?  
 (a) For Mould Loading      (c) For Screw movement  
 (b) For nozzle alignment with sprue bush      (d) All the above
29. \_\_\_\_\_ is the part of centralized material feeding system.  
 (a) Dehumidifier      (b) Receivers      (c) Auto loaders      (d) All the above.
30. A depression in the ejection half of an injection mould, opposite the sprue to receive the first front is called \_\_\_\_\_

**PART – B**

Answer **all** questions (Max. 40 words)

4 x 2 = 8

1. What do you mean by thrust bearing?
2. Write five thermoset materials
3. What is maximum day light?
4. Define Helix angle of screw?

**PART – C**

Answer any **four** questions (Max. 100 words)

4 x 3 = 12

1. Write down any Six defects and Causes in Injection Moulding process?
2. What are faults and remedies in Compression & Transfer Molding?
3. List out the different types gates used in two plate and three plate molds of Injection Molding process?
4. What is barrel residence time? Write down the effect of long residence time of material on processing.
5. Define preheating, perform and charge in compression moulding process?

**PART – D**

Answer any **two** questions (Max. 300 words)

2 x 5 = 10

1. Explain the compression moulding process and draw a neat sketch of downward stroke machine?
2. Write short notes on 1. L/D Ratio and CR Ratio of screw    2. Plasticizing capacity    3. Positive type Mold    4. Bulk Density    5. Curing
3. What are the advantages & disadvantages of Rotational moulding and list out the defects appeared in rotational moulded products?

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**ACADEMIC CELL**  
**FIRST SEMESTER EXAMINATION – JANUARY - 2023**

Duration : 3 Hours  
 Course : PGD - PPT  
 Subject : Plastics Testing – I

Max. Marks: 60  
 Date : 12.01.2023  
 Time : 10.00 a.m. to 01.00 p.m.

**(DO NOT CHANGE SEQUENCE OF QUESTION NUMBER IN ANSWER SCRIPT)**

**PART – A**

Answer all questions

30 x 1 = 30

1. Which of the following materials has density more than that of water?  
 a) Polypropylene    b) HDPE    c) LLDPE    d) None of the above
2. \_\_\_\_\_ is used as solvent for the determination viscosity of PVC solution.  
 a) Heptane    b) Acetone    c) Decalin    d) Cyclohexanone
3. Which of the following is the standard rate of rise of temperature in VST test?  
 a) 2 °C/Hr    b) 200 °C/Hr    c) 120 °C/Hr    d) 50 °C/Hr
4. Which of the following test methods is used for HDT test?  
 a) ASTM D790    b) ASTM D648    c) ASTM D732    d) ASTM D638
5. Which of the following test is related to VST of plastics?  
 a) ASTM D1525    b) ASTM D638    c) ASTM D2508    d) ASTM D790
6. The ASTM test used for Density is \_\_\_\_\_.  
 a) ASTM 1525    b) ASTM 1693    c) ASTM D792    d) ASTM D 1238
7. The dimensions of test specimen for HDT as per ASTM standard is \_\_\_\_\_.  
 a) 127×12.7×5 mm    b) 127×12.7×3.2 mm    c) 150×20× mm    d) 12.7×12.7×25.4 mm
8. 1 mm = \_\_\_\_\_ microns.  
 a) 100    b) 1000    c) 2540    d) 10
9. As per ASTM D 618, the ambient temperature and humidity for conditioning is \_\_\_\_\_.  
 a) 23±5°C, 60±5% RH    b) 23±2°C, 50±5% RH    c) 28±5°C, 50±5% RH    d) 30±2°C, 50±5% RH
10. The specimen preparation technique for preparing tear resistance test specimen of thin flexible sheet is  
 a) Contour cutting    b) Contour punching    c) Injection molding    d) None of the above
11. Which of the following is unit of Density?  
 a) g/cc    b) g/ml    c) kg/m<sup>3</sup>    d) All of the above
12. The density of Isopropyl alcohol at 23 °C \_\_\_\_\_ is ?  
 a) 0.786 g/cc    b) 0.895 g/cc    c) 0.914 g/cc    d) 1.0 g/cc
13. HDT test is carried at \_\_\_\_\_ MPa stress.  
 a) 1.82    b) 10.8    c) 45.5    d) None of the above
14. MFI test for HDPE is carried out at which of the following temperature?  
 a) 136 °C    b) 230 °C    c) 200    d) 190 °C
15. Which of the following instrument is used for measurement of Thickness of Pipe  
 a) Ball ended micrometer    b) Pyrometer    c) Pie Tape    d) None of the above
16. Unit of CLTE is \_\_\_\_\_.
17. Unit for VST is \_\_\_\_\_.
18. Needle used in VST test as per ASTM method has \_\_\_\_\_ mm<sup>2</sup> circular cross section area.
19. 1 Inch = \_\_\_\_\_ mm
20. The rate of rise of temperature in HDT test as per ASTM method is \_\_\_\_\_ °C/min.
21. Polystyrene produces metallic sound when is dropped on hard surfaces- True or False.
22. Glass Transition temperature is determined by DSC. -True or False.
23. MFI test for HDPE is carried at 190 °C – True or False.
24. Melting point of Nylon 6 is above 200 °C - True or False.
25. Viscosity of Polypropylene is directly proportional to shear rate-True or False.
26. Write full form of CLTE
27. Write full form of DMA
28. Write full form of DSC
29. Write full form of TGA
30. Write full form of ASTM

**PART – B**

Answer **all** questions (Max. 40 words)

4 x 2 = 8

1. Write the formula for calculation of Load in HDT test of plastics.
2. Define Bulk density.
3. What are various the techniques of testing specimen preparation?
4. Why moisture analysis of plastics is important?

**PART – C**

Answer any **four** questions (Max. 100 words)

4 x 3 = 12

1. Explain the importance of conditioning in testing plastics?
2. Write short note on DSC.
3. What are the various factors that affect the HDT test result of plastics?
4. Write short note on Spiral flow test.
5. Write the applications of TGA.

**PART – D**

Answer any **two** questions (Max. 300 words)

2 x 5 = 10

1. Briefly describe the MFI test and factors affecting the test results.
2. Briefly describe the procedure for the identification of plastic.
3. Explain the Dilute Solution Viscosity method to determine Molecular weight.

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**HEAD OFFICE : GUINDY, CHENNAI – 600 032.**  
**ACADEMIC CELL**  
**FIRST SEMESTER EXAMINATION – JANUARY - 2023**

Duration : 3 Hours  
 Course : PGD - PPT  
 Subject : Plastics Product and Mould Design

Max. Marks: 60  
 Date : 13.01.2023  
 Time : 10.00 a.m. to 01.00 p.m.

**(DO NOT CHANGE SEQUENCE OF QUESTION NUMBER IN ANSWER SCRIPT)**

**PART – A**

Answer **all** questions

30 x 1 = 30

1. What is the size of A4 drawing sheet in mm?  
 (a) 420 x 594                      (b) 594 x 891                      (c) 297 x 420                      (d) 210 x 297
2. The drawing which comprises of the detailed drawings of the individual parts, sub-assembly and the assembly drawings of the machine is known as \_\_\_\_\_ assembly drawing.  
 (a) Working Drawing                      (b) General                      (c) Layout                      (d) Installation
3. The section lining should be drawn \_\_\_\_\_ to the contour of the view.  
 (a) Perpendicular                      (b) Parallel                      (c) at 45°                      (d) at 60°
4. \_\_\_\_\_ eliminates internal stresses, Warpage, Sink mark, and Cracking in Plastic parts.  
 (a) Uniform Wall thickness                      (b) Uniform Ribs                      (c) Uniform Bosses                      (d) Uniform Threads
5. \_\_\_\_\_ in a Plastic part prevents stress concentrations.  
 (a) Ribs                      (b) Bosses                      (c) Fillets                      (d) Draft
6. Runner is one of the elements of \_\_\_\_\_ system of the mould.  
 (a) Cooling                      (b) Ejection                      (c) Injection                      (d) Feed
7. The injection Mould plates are manufactured by \_\_\_\_\_ material.  
 (a) Cast Iron                      (b) Aluminum                      (c) Copper                      (d) Alloy Steel
8. Maximum weight of the material that may be injected per cycle is known as \_\_\_\_\_.  
 (a) Shot capacity                      (b) Plasticizing Capacity                      (c) Clamping Force                      (d) Day Light
9. \_\_\_\_\_ type Runner is designed for simple Two Plate Mould with flat parting surface  
 (a) Semi-Circular                      (b) Fully Rounded / Circular                      (c) Trapezoidal                      (d) Modified Trapezoidal
10. \_\_\_\_\_ type Gate is designed for large thin walled mouldings.  
 (a) Pin Gate                      (b) Tab Gate                      (c) Ring Gate                      (d) Film Gate
11. Bulk factor is considered for designing of \_\_\_\_\_ moulds.  
 (a) Compression                      (b) Blow                      (c) Injection                      (d) Advanced Injection
12. Pinch-off is considered for designing of \_\_\_\_\_ moulds.  
 (a) Compression                      (b) Blow                      (c) Injection                      (d) Advanced Injection
13. Loose Cores is designed for \_\_\_\_\_ moulds.  
 (a) Compression                      (b) Blow                      (c) Injection                      (d) Advanced Injection
14. D -Shaped ejector pin is the type of \_\_\_\_\_.  
 (a) Sleeve Ejection                      (b) Pin Ejection                      (c) Blade Ejection                      (d) Valve Ejection
15. Baffles are used for \_\_\_\_\_ system of the moulds  
 (a) Ejection                      (b) Feed                      (c) Injection                      (d) Cooling
16. The long protrusions on the plastic part be designed for providing strength are known as \_\_\_\_\_
17. \_\_\_\_\_ is a female part of a guiding system that provides a suitable wear resisting surface.
18. The part of a mould that forms the internal shape of the moulding is known as \_\_\_\_\_
19. \_\_\_\_\_ Pin is designed to take back the ejector assembly after the ejection.
20. \_\_\_\_\_ is used to create the space for the ejection system in the mould.
21. Two Plate mold has only one parting plane – Say True
22. Finger Cam Actuation method is designed for Blow moulds – Say True or False
23. Compressed Air is also used for ejection of the injection mouldings - Say True or False
24. ABS Plastic material is suitable for Blow mouldings - Say True or False
25. Thermoset materials are suitable for Compression mouldings - Say True or False

**Expand the followings:**

26. BIS
27. RPT
28. L/D Ratio
29. 3D Sketch
30. mm

**PART – B**

Answer **all** questions (Max. 40 words)

4 x 2 = 8

1. What do you mean by Undercut in Plastic parts?
2. What is Shot Capacity?
3. Define Gate
4. Write down types of Compression Mould

**PART – C**

Answer any **four** questions (Max. 100 words)

4 x 3 = 12

1. Define Orthographic Projection. Explain it with neat sketches
2. Explain design of Wall Thickness with neat sketches
3. Explain the Ejector Plate assembly with neat sketch
4. Define RPT . Write down the RPT techniques
5. Write short notes on Blow mould design parameters

**PART – D**

Answer any **two** questions (Max. 300 words)

2 x 5 = 10

1. Explain Three Plate Mould with neat sketch
2. Explain 3D Printing technique with neat sketch
3. Explain the terminology of Blow Mould with neat sketch

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