VALLIAMMAI ENGINEERING COLLEGE

(A Member of SRM Group of Institutions)

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SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CHEMISTRY

Academic Year: 2016-17

Question Bank-Odd Semester

Programme : **B.E.,/B.Tech.,** (Common to all branches)
Subject : **CY6151 – Engineering Chemistry - I**
Semester / Branch : I- All Branches

UNIT-I
POLYMER CHEMISTRY
PART-A

S.No.	Question	Competency	BTL
1.	What is meant by Polymerization?	Remembering	1
2.	Define degree of Polymerization?	Remembering	1
3.	Differentiate homochain and hetero chain polymers? Give examples.	Analysing	4
4.	Describe functionality with a suitable example.	Understanding	2
5.	State tacticity?	Remembering	1
6.	What are syndiotactic polymers?	Remembering	1
7.	Discuss how copolymerisation is carried out? Give an example.	Understanding	2
8.	Explain glass transition temperature.	Understanding	2
9.	Illustrate how solution polymerization is carried out?	Applying	3
10.	Distinguish between addition and condensation polymerization.	Analysing	4
11.	Discuss Polydispersity index.	Understanding	2
12.	Demonstrate the various techniques of polymerization.	Applying	3
13.	Justify Condensation polymerization with an example.	Evaluating	5
14.	Illustrate the advantages and disadvantages of Plastics?	Applying	3
15.	Compare thermo and thermosetting plastics? Give examples.	Analysing	4
16.	Justify disproportion of polymer chains?	Evaluating	5
17.	Formulate AIBN. Mention its role in polymerization reaction?	Creating	6
18.	State the classification of Polymers.	Remembering	1
19.	What are epoxy resins? State its preparation.	Remembering	1
20.	Formulate Nylon 6,6 preparation? State its properties and uses.	Creating	6

Prepared by: Ms. K. Anandhi & Ms. M. Meera

UNIT-I
PART-B

S.No.	Question	Competency	BTL
1.	i)Differentiate thermoplastics and thermosetting plastics. (6) ii)Explain the mechanism of free radical polymerization of polyvinyl chloride.(10)	Analysing	4
2.	i)Explain the mechanism of cationic polymerization. (8) ii)Explain how molecular weight of a polymer is calculated by number average method.(8)	Understanding	2
3.	i)Explain the mechanism of anionic polymerization.(8) ii)Explain how molecular weight of the polymer is calculated by weight average method.(8)	Understanding	2
4.	i)Give detailed account on techniques of polymerization.(8) ii)Explain various functionality of a polymer with example and state its significance.(8)	Remembering	1
5.	i)What are stereospecific polymers? Explain its various types.(8) ii)How are Polymers classified? Explain.(8)	Remembering	1
6.	Explain the following properties of polymers. i)Glass transition temperature, ii)Tacticity , iii)PDI(6+6+4)	Understanding	2
7.	Demonstrate the preparation properties and uses of i)Nylon-6.6,ii)Epoxy resin (8+8)	Applying	3
8.	i)What are Plastics? Explain its advantages and disadvantages (8) ii)Explain the bulk polymerization technique and mention the polymers that can be prepared by this technique.(8)	Remembering	1
9.	i)Solve the mechanism of condensation polymerization in detail.(8) ii)Explain the nomenclature of polymers.(8)	Applying	3
10.	i)Defend Emulsion polymerization technique. Give two examples.(8) ii)Evaluate the Suspension Polymerization technique. Give two examples.(8)	Evaluating	5
11.	Formulate Cationic and anionic Polymerisation (16)	Creating	6
12.	i)List out number average and weight average molecular mass calculation(8) ii)epoxy resin prepared from epichlorohydrin. (8)	Remembering	1
13.	Classify polymers according to their stereospecificity (16)	Analysing	4
14.	i)Compare Addition polymerisation and condensation polymerization (10) ii)Explain any four properties of polymers in detail(6)	Analysing	4

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UNIT-II
CHEMICAL THERMODYNAMICS
PART-A

S.No.	Question	Competency	BTL
1.	Distinguish open, closed and isolated system.	Analysing	4
2.	Define entropy for an ideal gas?	Remembering	1
3.	Compare adiabatic process and isothermal process.	Analysing	4
4.	What are the limitations of 1st law of thermodynamics?(OR) What is the need for 2nd law of thermodynamics	Remembering	1
5.	State any two statements of 2nd law of thermodynamics.	Remembering	1
6.	Illustrate how does the entropy of a system changes, when (a) Ice is melted (b) solid I_2 is sublimated to its vapor (c) I_2 vapor is sublimated to I_2 solid	Applying	3
7.	State 2nd law of thermodynamics in terms of entropy.	Remembering	1
8.	Evaluate ΔS for fusion of ice. Given that T = 0ºC, ΔH_f=80Cal/g.	Evaluating	5
9.	What is a spontaneous process?	Remembering	1
10.	Define work function? Give its significance.	Remembering	1
11.	Explain Gibb's free energy with example.	Understanding	2
12.	State any two applications of Gibb's Helmholtz equation.	Understanding	2
13.	Formulate any two Maxwell relations.	Creating	6
14.	Explain reversible process & irreversible Process.	Understanding	2
15.	Formulate the entropy change for the reversible isothermal expansion of 10 moles of an ideal gas to 50 times its original volume at 298K.	Creating	6
16.	Demonstrate the relation between (i) ΔH & ΔG (ii) EMF & ΔG	Applying	3
17.	Solve ΔHv for a system with P_1 = 1 atm, P_2 = 10 atm, T_1 = 273k, T_2 = 373 k.	Applying	3
18.	Evaluate the ΔS for a isochoric process for one mole of a gas with C_v = 1.7 cal/g with initial temperature 273 K to 373 K.	Evaluating	5
19.	Describe how ΔG determine the nature of the process.	Understanding	2
20.	Distinguish intensive and extensive property with example.	Analysing	4

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UNIT-II
PART-B

S.No.	Question	Competency	BTL
1.	i) Derive an expression for entropy change of an ideal gas at constant temperature (10) ii) Compute free energy change when 5 moles of an ideal gas expands reversibly and isothermally at 300 K from an initial volume of 50 L to 1000 L (6)	Remembering	1
2.	i) Derive Gibb's Helmholtz equation and explain (8) ii) Evaluate the significance of free energy. (8)	Evaluating	5
3.	i) State the applications of Gibb's Helmholtz equation. (8) ii) Discuss the criteria for chemical reaction to be spontaneous. (8)	Remembering	1
4.	i)Write Clausius Clayperon equation. Mention its significance.(10) ii) Solve, $H_2 + ½ O_2 \rightarrow H_2O$, ΔH =-68.32, ΔS = - 56.69. Calculate the value of free energy change at 25ºC. (6)	Applying	3
5.	Write Maxwell relations. (16)	Applying	3
6.	Examine Vant Hoff's reaction isotherm? Derive the expression for a reaction isotherm of the general reaction, aA+bB→cC+dD (16)	Analysing	4
7.	State an expression for the variation of equilibrium constant of a reaction with temperature. (16)	Remembering	1
8.	Discuss the following relation (8+8) $\frac{\partial S}{\partial V} = \frac{\partial P}{\partial T}$ $\frac{\partial V}{\partial T} = -\frac{\partial S}{\partial P}$	Understanding	2
9.	i)What is a system? Discuss the various types of system (8) ii) The equilibrium constant for the reaction $N_2 + 3H_2 \rightarrow 2NH_3$ at 400°C is 1.644 X 10^{-4} and at 500°C is 1.44 X 10^{-4} atm. Calculate the heat of formation of 1 mole of ammonia from its elements within given range of temperature. (8)	Remembering	1
10.	i) Describe a) Extensive property b) Intensive property iii)Macroscopic properties. (4+4+4) ii) Calculate the ΔG when one mole of the ideal gas expands reversibly isothermally at 37ºC from an initial volume of 55dm^3 to 1000 dm^3. (4)	Understanding	2
11.	Distinguish between (a)Thermodynamically reversible and irreversible process (b) Isothermal and adiabatic process (8+8)	Analysing	4
12.	i) Discuss the various conditions for spontaneity and equilibrium state of a system (8) ii) Formulate that $\Delta S > 0$ for an irreversible process. (8)	Creating	6
13.	On the basis of thermodynamics state the relation, analyse (8) $\frac{\partial T}{\partial v} = -\frac{\partial P}{\partial S}$ $\frac{\partial T}{\partial P} = \frac{\partial V}{\partial S}$ ii) Calculate the entropy change in the evaporation of one mole of water at 100ºC. Latent heat of vapourisation at 100ºC is 540 Cal/g. (8)	Analysing	4
14.	Discuss the significance of entropy and deduce entropy for $\Delta S \geq/\leq 0$. (16)	Understanding	2

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UNIT-III
PHOTOCHEMISTRY & SPECTROSCOPY
PART-A

S.No.	Question	Competency	BTL
1.	What is photochemistry?	Remembering	1
2.	Explain dark reactions?	Understanding	2
3.	Differentiate photochemical and thermal reactions?	Analysing	4
4.	Describe Grotthus-Draper Law.	Understanding	2
5.	State Stark-Einstein law of photochemical equivalence.	Remembering	1
6.	State Lambertz law.	Remembering	1
7.	Define Beer-Lambertz law.	Remembering	1
8.	Explain Quantum Yield.	Understanding	2
9.	Describe Photosensitization.	Understanding	2
10.	Illustrate quenching.	Applying	3
11.	Demonstrate fluorescence.	Applying	3
12.	What is phosphorescence?	Remembering	1
13.	Distinguish IC and ISC?	Analysing	4
14.	What is chemiluminescene?	Remembering	1
15.	Evaluate the term absorption spectroscopy?	Evaluating	5
16.	Differentiate chromophores and auxochromes with examples.	Analysing	4
17.	Formulate the various types of electronic transitions.	Creating	6
18.	Illustrate finger print region. Mention its important uses?	Applying	3
19.	Evaluate the term Bathochromic Shift.	Evaluating	5
20.	Formulate the energy per mole of light having wavelength of 85 nm.	Creating	6

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UNIT-III
PART-B

S.No.	Question	Competency	BTL
1.	(i) With the help of jablonski diagram, explain the radiative and non-radiative pathways for an electronic transition.(10) (ii) How is quantum efficiency determined experimentally? (6)	Remembering	1
2.	(i) Distinguish between (a) Fluorescence and Phosphorescence (b) Thermal and photochemical reactions (4+4) (ii) Define and mention reason for high and low quantum yield? (8)	Analysing	4
3.	(i) Explain the statement, derivation and the limitations of Beer-lambertz law? (10) (ii) A monochromatic light is passed through a cell of 1 cm length. The intensity is reduced by 10%.If the same radiation is passed through the same solution in a cell of length 8 cm, what is the transmittance? Calculate the length of the cell in order to have 20% absorption.I0 = 100%, I=90% because reduction in intensity is 10%. (6)	Remembering	1
4.	(i) Explain the Chemiluminescence and Photosensitization with suitable examples.(10) (ii) Calculate the energy associated with (a) one photon, (b) one Einstein of radiation of wavelength 8000 Å. (6)	Understanding	2
5.	(i) (a) How do atomic spectra differ from molecular spectra ? (b) How do emission spectra differ from absorption spectra? (4+4) (ii) What are electromagnetic spectrum and explain the characteristics of it. (8)	Analysing	4
6.	(i) Illustrate in detail about the Rotational, Vibrational and Electronic transitions.(8) (ii) Explain the various changes occurring during absorption of radiation and what are the factors affecting it.(8)	Applying	3
7.	Evaluate the principle of IR spectroscopy and discuss the functions of various components in IR spectrophotometer. (16)	Evaluating	5
8.	Formulate the principle, instrumentation and working mechanism of UV-Visible spectroscopy. (16)	Creating	6
9.	(i) Write a note on a) Finger print region b) Phosphorescence.(4+4) (ii) Explain the types of stretching and bending vibrations with suitable examples. (8)	Remembering	1
10.	(i) State the following (a) Hypsochromic shift, (b) Hyper chromic shift, (c) Hypochromic shift, and (d) Bathochromic shift(2+2+2+2) (ii) Differentiate Chromophore from Auxochrome.(8)	Remembering	1
11.	i)How do rotational vibrations differ from electronic vibrations. Give Example. (8) ii)What type of transitions occurs in fluorescence and phosphorescence (8)	Analysing	4
12.	Illustrate Jablonski diagram and explain all the possible transitions. (16)	Applying	3
13.	Discuss the applications of UV-Visible spectroscopy. (16)	Understanding	2
14.	Discuss the applications of IR spectroscopy. (16)	Understanding	2

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UNIT-IV
PHASE RULE AND ALLOYS
PART-A

S.No.	Question	Competency	BTL
1.	Define phase. In what way does it differ from 'state of matter'?	Remembering	1
2.	Define a component. In what way does it differ from a constituent?	Remembering	1
3.	Describe degree of freedom. What is the degree of freedom of a given quantity of a gas?	Understanding	2
4.	Solve the no. of phases of the following i) Sulphur(monoclinic)⇋Sulphur (rhombic)⇋Sulphur (liquid) ii) Water+Alcohol ⇋ Vapour	Applying	3
5.	Write the degree of freedom for i) $CuSO_4 .5H_2O(s) \leftrightharpoons CuSO_4.H_2O(s) + 4H_2O(v)$ ii) $PCl_{5(}s) \leftrightharpoons PCl_{3(}l) + Cl_2(v)$	Applying	3
6.	Illustrate the no. of components i) $CuSO_4 .5H_2O(s) \leftrightharpoons CuSO_4.H_2O(s) + 4H_2O(v)$ ii) $PCl_{5(}s) \leftrightharpoons PCl_{3(}v) + Cl_2(v)$	Applying	3
7.	What is phase rule? Explain.	Remembering	1
8.	State the merits and demerits of phase rule.	Remembering	1
9.	What is condensed phase rule? State its significance.	Remembering	1
10.	What is meant by triple point? State its characteristics.	Remembering	1
11.	Discuss eutectic point. Mention its characteristics.	Understanding	2
12.	What is the difference in the phase diagram of a system forming simple eutectic and compound formation?	Analysing	4
13.	Evaluate thermal analysis. Mention its uses.	Evaluating	5
14.	Mention the differences between triple point and eutectic point.	Analysing	4
15.	Distinguish melting point, boiling point and triple point.	Analysing	4
16.	Explain congruent melting point? Give an example.	Understanding	2
17.	Explain alloy. Give example for ferrous and nonferrous alloy.	Understanding	2
18.	Formulate the composition and uses of brass and bronze.	Creating	6
19.	Write the significance of increasing the carbon content in steel.	Creating	6
20.	Select the composition of Dutch metal and Gun metal?	Evaluating	5

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UNIT-IV
PART-B

S.No.	Question	Competency	BTL
1.	(i) State Phase rule and explain the terms involved in it. (10) (ii) Explain thermal analysis. Mention its uses.(6)	Remembering	1
2.	(i) Draw a neat one component water system and explain in detail. (10) (ii) Describe Pattinson's process of desilverisation of lead. (6)	Understanding	2
3.	(i) Discuss the phase diagram of a two component system with congruent melting point. (10) (ii) Explain the heat treatment processes, i) Annealing ii) Tempering iii) Hardening.(2+2+2)	Understanding	2
4.	Explain the lead silver system with a suitable phase diagram. (16)	Understanding	2
5.	Illustrate a neat Zn-Mg system and explain in detail.(16)	Applying	3
6.	(i) Evaluate the effect of Ni, Cr and Mn in the alloying of steel.(8) (ii) Defend a) Heat resisting alloy steel, b) Magnetic steel (8)	Evaluating	5
7.	(i) What is stainless steel? Describe the different types of stainless steel. (8) (ii) What are Non-ferrous alloys? What are its applications? Write about any two Non-ferrous alloys. (8)	Remembering	1
8.	(i) Criticize Nichrome with its composition and applications (8) (ii) What are ferrous alloys? Give their properties(8)	Analysing	4
9.	(i) Write the composition, properties and uses of any two ferrous alloys. (10) (ii) Mention the limitations of Phase rule. (6)	Applying	3
10.	Evaluate the composition, properties and uses of various types of Brass and Bronze. (16)	Analysing	4
11.	Examine the heat treatment of steel with its significance (16)	Analysing	4
12.	i)Explain the heat treatment processes, i) Nitriding ii) Normalizing iii) Carburizing. (2+2+2) (ii) What are the types of alloys? Discuss the purpose of making alloys. (10)	Remembering	1
13.	i)Formulate the phase rule and terms involved in it for H_2O (10) ii)Discuss the various types of plots in Phase rule.(6)	Creating	6
14.	What is condensed phase rule? What is the number of degrees of freedom at the Eutectic point (16)	Remembering	1

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UNIT-V
NANOCHEMISTRY
PART-A

S.No.	Question	Competency	BTL
1.	What is nanochemistry?	Remembering	1
2.	List out the differences between nanomaterials and bulk materials?	Analysing	4
3.	Illustrate the size dependent property of nanoparticles?	Applying	3
4.	What are nanowires?	Remembering	1
5.	What are nanoclusters?	Remembering	1
6.	What are nanorods? Mention their specific applications.	Remembering	1
7.	Discuss any four nanomaterials.	Understanding	2
8.	Illustrate some characteristic properties of nonmaterials?	Applying	3
9.	Describe few applications of nanomaterials.	Understanding	2
10.	What are carbon nanotubes?	Remembering	1
11.	Distinguish between Single-walled carbon nanotube (SWCNT) and Multi-walled carbon nanotube (MWCNT).	Analysing	4
12.	Explain laser ablation?	Understanding	2
13.	Evaluate Chemical Vapour Deposition (CVD).	Evaluating	5
14.	Formulate Electro-Deposition.	Creating	6
15.	Formulate the applications of nanowires and nanoclusters.	Creating	6
16.	Support how nanoparticles prepared by precipitation method.	Evaluating	5
17.	What is the role of CNT in the $H_2 - O_2$ fuel cell?	Remembering	1
18.	Discuss the applications of nanomaterials in Electronics?	Understanding	2
19.	Distinguish between top-down and bottom-up approach in the preparation of nanomaterial.	Analysing	4
20.	Illustrate Hydrothermal and Solvothermal synthesis of nanoparticles.	Applying	3

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UNIT-V
PART-B

S.No.	Question	Competency	BTL
1.	(i) Discuss the size dependent properties of nanomaterials. (8) (ii)Distinguish molecules, nanoparticles and bulk materials. (8)	Analysing	4
2.	(i) Explain laser ablation method of preparing nanoparticles. (8) (ii) Discuss precipitation process with example in preparing nanoparticles. (8)	Understanding	2
3.	(i) Describe the hydrothermal synthesis of nanoparticles. (8) (ii) Explain solvo thermal process for the preparation of nanoparticles. (8)	Understanding	2
4.	Describe the synthesis, properties and applications of carbon nanorods. (16)	Creating	1
5.	(i) Write note on carbon nanotubes and its properties? (8) (ii) Discuss Chemical Vapour Deposition (CVD) method for the synthesis of nanomaterials. (8)	Creating	1
6.	(i) Explain Electo-deposition method for the synthesis of nanomaterial. (8) (ii) Discuss the vibrational properties of CNTs with suitable diagram. (8)	Understanding	2
7.	(i) What are nanoclusters and nanowires? Explain their properties and applications. (8) (ii) Discuss various types of synthesis involved in the preparation of nanomaterials. (8)	Creating	1
8.	(i)How are carbon nanotubes are synthesized explain in detail. (8) (ii) Explain various applications of carbon nanotubes. (8)	Creating	1
9.	(i) Illustrate the various properties of nanomaterials. (8) (ii) Write note on top–down and bottom–up approach for nanomaterial preparation with examples. (8)	Applying	3
10.	(i) Demonstrate medicinal and industrial application of nanomaterials. (8) (ii) Illustrate electronics and biomaterials applications of nanomaterials. (8)	Applying	3
11.	(i)Discuss the electrical properties of CNTs. (8) (ii)Compare botton-up & top-down approach in nanomaterial synthesis. (8)	Analysing	4
12.	Compare hydrothermal and solvothermal synthesis of nanomaterials with suitable examples (16)	Analysing	4
13.	i)Differentiate Nanorods, nanotubes, Nanowires (8) ii)Evaluate molecules and Nanomaterials with bulk materials (8)	Evaluating	5
14.	Formulate the various applications of nanomaterials with suitable applications (16)	Creating	6

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