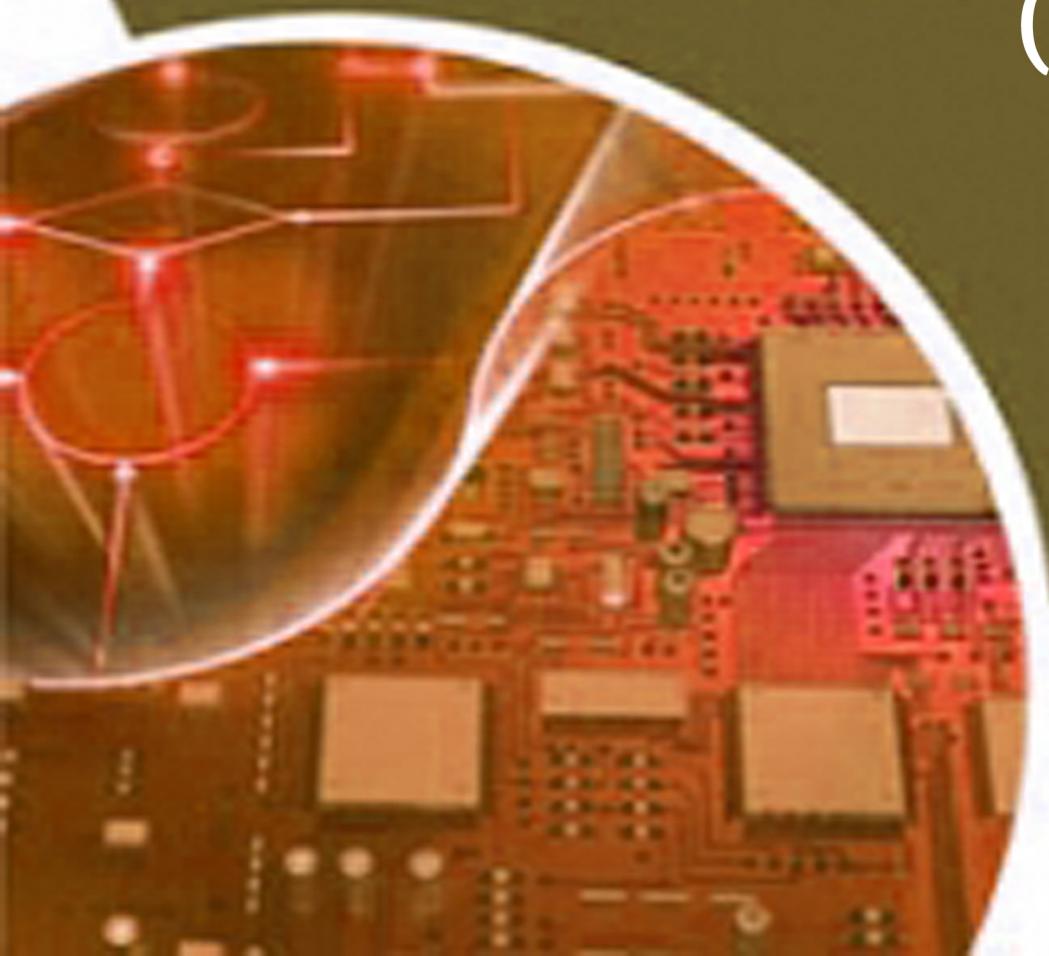


PUNE UNIVERSITY
3rd & 4th
Semester
QUESTION PAPERS

Bachelor of Engineering

Chemical Engineering
(2009-2014)



UNIVERSITY OF PUNE
[4362-192]
S.E.(Chemical) Examination-2013
Chemistry -I
(2008 pattern)

Time-Three hours

Maximum Marks-100

Total No. of Question=12

[Total no. of printed pages= 5]

Instructions:

- (1) Answers to the two sections should be written in separate answer books.
- (2) Neat diagram must be drawn wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data wherever necessary.
- (5) Use of logarithmic tables, slide-rule, Mollier charts, calculator and steam tables is allowed.

SECTION-I

- Q.1 (a) What are the postulates of molecular orbital theory? Explain paramagnetic behaviour of O_2 molecule. (6)
- (b) Draw resonance structures of phenol and benzaldehyde? (4)
- (c) Explain the relative order of stability of free radicals and carbanions? (6)

OR

- Q.2 (a) What is LCAO approximation? Draw molecular orbital structure of butadiene? (6)

(b)What are the conditions necessary for resonance? (6)

(c)Give reason for the following. (4)

(i)Pyrrole is a weak base

(ii)Phenol is acidic in nature. (4)

Q.3 (a)Explain the stereochemical changes taking place during SN^1 and SN^2 reactions. (8)

(b)Give the mechanism of acylation of benzene. (4)

(c)Describe briefly Beckman's rearrangement. (4)

OR

Q.4 (a)Give the mechanism of E_1 and E_2 eliminations. (8)

(b)Write a note on diazocoupling. (4)

(c)Explain why $-NO_2$ group is deactivating and m-directing. (4)

Q.5 (a)Define and explain. (6)

(i)Cell Constant

(ii)Specific conductance

(iii)Equivalent conductance

(b)Discuss the principle,interferences and limitations of plane photometry. (6)

(c) State and explain Kohlrausch's law. The $\Lambda^\circ_{CH_3COONa}$, Λ°_{HCl} and Λ°_{NaCl} are 91, 426.16 and 126.45 $Ohm^{-1} cm^2 equiv^{-1}$ respectively at $25^\circ C$. Calculate $\Lambda^\circ_{CH_3COOH}$. (6)

OR

Q.6 (a) Define conductometric titrations. Explain the conductometric titration curve for the following. (6)

(1) Strong acid with strong base

(2) Weak acid with strong base.

(b) Define potentiometric titrations and explain redox titration. (6)

(c) What are ion selective electrodes?

Describe the working and construction of a glass electrode. (6)

SECTION-II

Q.7 (a) Derive the integrated rate equation for second order kinetics for two reactants same initial conc? (6)

(b) What is steady state approximation? Explain it with suitable example. (6)

(c) Explain any two methods for the rate determination of reaction. (4)

OR

Q.8 (a) Explain the activated complex theory & derive the expression for rate equation. (6)

(b) Derive the photochemical rate law for reaction of H_2 & Cl_2 (6)

(c) Show that the time required for a first order reaction to complete 99.9% reaction is approximately 10 times its half life period. (4)

Q. 9 (a) What are the different types of chromatography? Explain thin layer chromatography in terms of Principle, technique & applications. (6)

(b) Define fuel cell. Explain construction, working & applications of H_2-O_2 fuel cell. (6)

(c) Explain applications of HPLC. (4)

OR

Q.10 (a) Give the instrumentation of gas chromatography. (6)

(b) Explain construction, working & applications of polymer electrolyte membrane fuel cell. (6)

(c) Define. (4)

(i) charge discharge cycle

(ii) Energy density

(iii) Specific energy

(iv) Power density

Q.11 (a) Write any three methods for the synthesis of pyridine. (6)

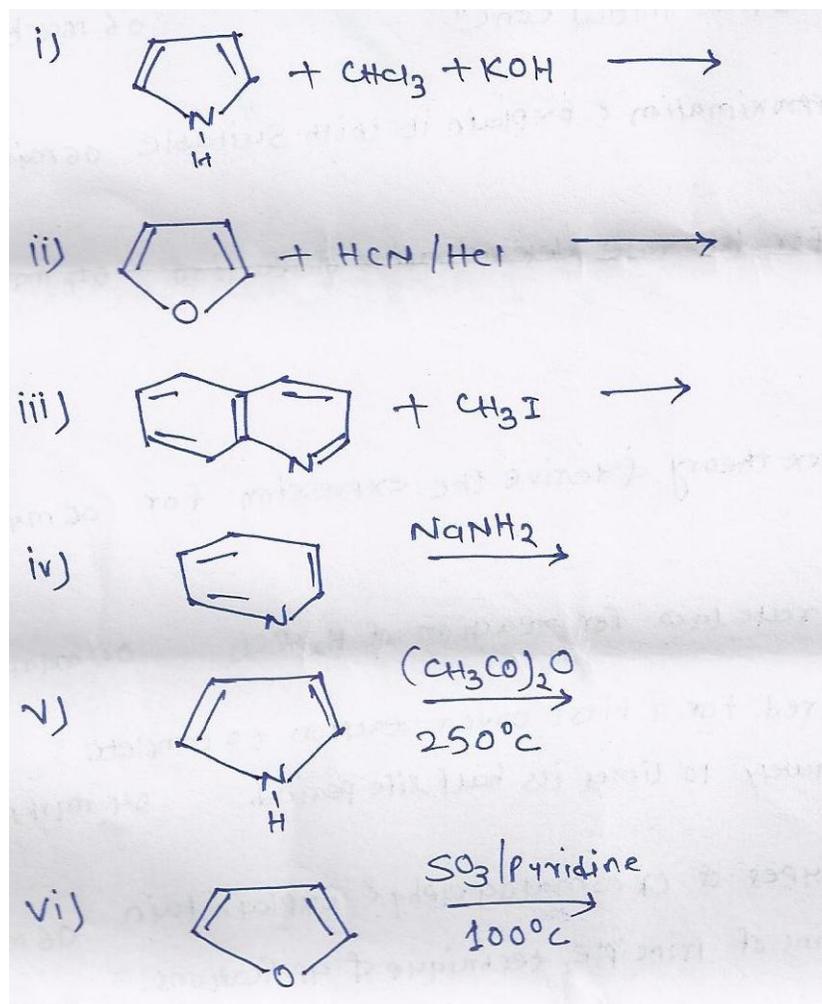
(b) Describe the methods of synthesis for the following types. (6)

(i) phenolphthalein

(ii) Alizarin

(c) Compare the following reactions.

(6)



OR

Q.12 (a) How will you prepare quinoline from aniline?

(6)

(b) Explain the classification of dyes on the basis of applications.

(6)

(c) Explain why electrophilic substitution reaction takes place preferentially at position 2 & or 5 in furan.

(6)

Total No. of Questions—12]

[Total No. of Printed Pages—4+2

Seat No.	
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[4262]-183

**S.E. (Chemical) (I Sem.) EXAMINATION, 2012
CHEMICAL ENGINEERING FLUID MECHANICS
(2008 PATTERN)**

Time : Three Hours

Maximum Marks : 100

- N.B. :—** (i) Answer *three* questions from Section I and *three* questions from Section II.
- (ii) Answers to the two Sections should be written in separate answer-books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (vi) Assume suitable data, if necessary.

SECTION I

1. (a) Discuss the following : [12]
- (i) Laminar and turbulent flow
- (ii) Steady and unsteady flow
- (iii) Path line and streak line
- (iv) Rotational and irrotational flow.
- (b) Certain liquid has the kinematic viscosity 5.00 stokes and specific gravity 2.00. Calculate its dynamic viscosity. [4]

P.T.O.

Or

2. (a) Define the following and give their SI units : [8]
- (i) Vapour pressure
 - (ii) Specific gravity
 - (iii) Kinematic viscosity
 - (iv) Specific volume.
- (b) What is rheology ? How are fluids classified according to their rheological behaviour ? [8]
3. (a) Derive a general equation for the variation of pressure due to gravity from point to point in a static fluid. [8]
- (b) Give practical application of the following : [4]
- (i) Differential manometer
 - (ii) Pitot tube.
- (c) Prove that product of slope of equipotential line and stream line is -1 . [4]

Or

4. (a) Define stream line, path line and equipotential line. Give *one* practical example of : [6]
- (i) Uniform flow
 - (ii) Turbulent flow
 - (iii) Unsteady flow.
- (b) At what depth below the free surface of oil having a density of 900 kg/m^3 will the pressure be equal to 2 bar ? [5]

- (c) In case of U tube differential mercury manometer shown in Fig. Show that the difference of pressure head between two points is equal to the X where height of deflection of mercury column in X : [5]

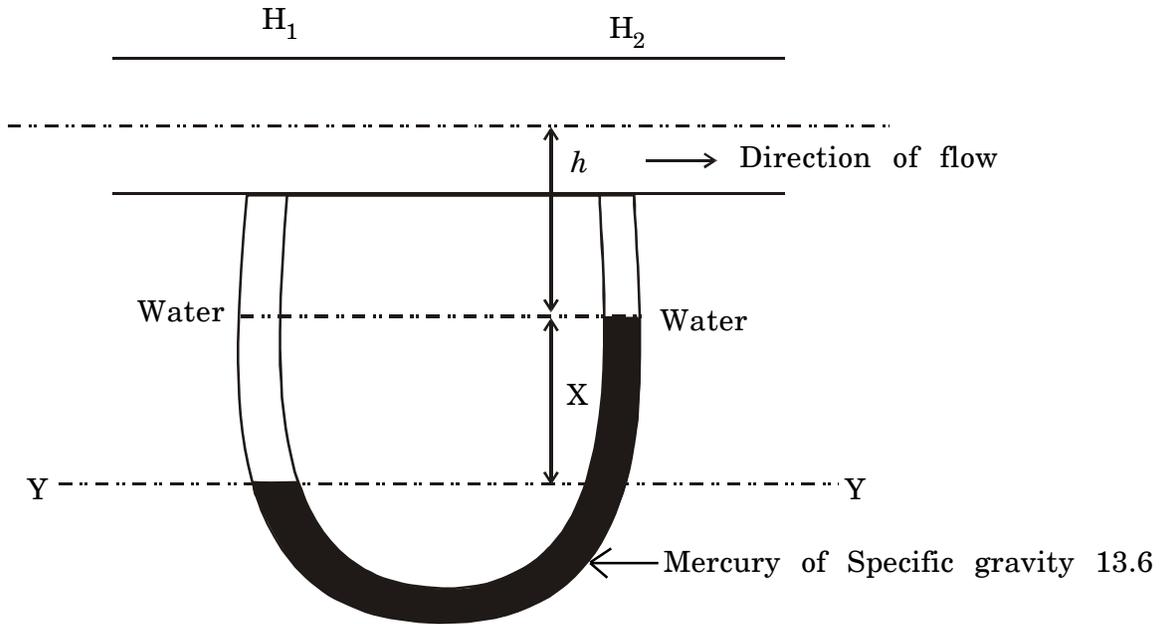


Fig.

5. (a) For laminar flow through inclined circular pipe, show that : [10]

$$\frac{U_{\max}}{u} = 2.$$

- (b) Oil of dynamic viscosity 1.5 poise and specific gravity 0.9 flows through 920 mm diameter, 20 m long vertical pipe. The pressures at the section 1 and 2 of the pipe are 6 bar and 200 kPa respectively. Find the direction and rate of flow through the pipe. [8]

Or

6. (a) For laminar flow through horizontal circular pipe, show that : [10]

$$u = \left[1 - \left(\frac{r}{r_0} \right)^2 \right].$$

- (b) Derive Hagen Poisuille equation and state the important assumptions. [8]

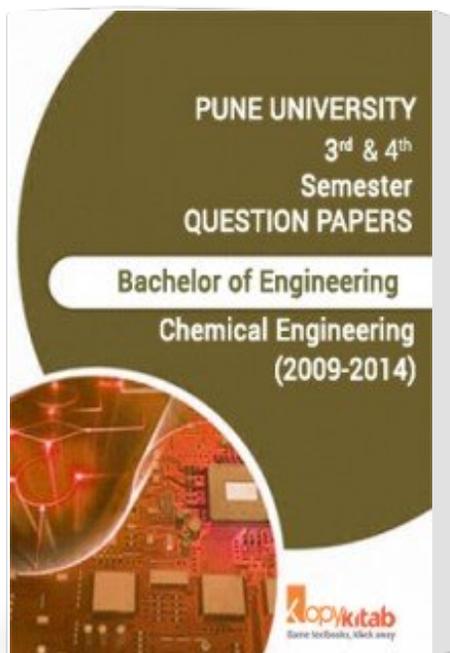
SECTION II

7. (a) The drag force F on a partially submerged body depends upon relative velocity (V) between body and fluid, characteristics linear dimension L , fluid density ρ , height of surface roughness K , viscosity μ and acceleration due to gravity. Obtain an expression for drag force using Buckingham's π -theorem. [10]
- (b) Explain growth of boundary layer on flat plate. [8]

Or

8. (a) What are model laws ? State the importance of the following model laws : [8]
- (i) Froude's model law
 - (ii) Reynold's model law
 - (iii) Mach model law.

PUNE UNIVERSITY QUESTION QUESTION PAPERS 2nd Year Chemical Engineering (2009-2014)



Publisher : Faculty Notes

Author : Panel Of Experts

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