

UNIVERSITY OF PUNE
[4361]-103
F. E. Examination - 2013
ENGINEERING CHEMISTRY
(2012 Pattern)

[Time : 2 Hours]

[Max. Marks : 50]

Instructions :

- (1) Answer **Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8**.
- (2) Black figures to the right indicate full marks.
- (3) Neat diagrams must be drawn wherever necessary.
- (4) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.
- (5) Assume suitable data, if necessary.

Q1 a) Explain boiler corrosion and caustic embrittlement as ill effects of using hard water in boilers. State their causes and preventive measures. [6]

b) Which are possible transitions, that occur when molecule absorbs uv- visible radiation? Which type of electronic transitions will be possible in following molecules. [3]

i) $\text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}_3$ ii) $\text{CH}_3-\text{CH}_2-\text{OH}$

ii) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ iv) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$

c) State the reference electrode and standard electrode used in pH metery, potentiometry and conductometry. [3]

OR

Q2 a) 50 ml std. hard water containing 1.2 gm CaCO_3 per lit. required 15 ml EDTA solution for the end point. Whereas 50 ml sample water required 19ml of EDTA soln. and 50 ml boiled sample water required 11ml of EDTA soln. for the end point. Calculate, total, temporary and permanent hardness of sample water in ppm. [3]

b) What are the drawbacks of traditional synthesis of Indigo dye? Which is the starting substance in its green route synthesis? What are the advantages of green route synthesis over traditional? [3]

c) i) Explain effect of dilution on specific conductance and equivalent conductance. [3]

ii) Explain the titration curve for conductometric titration in case of strong acid -weak base titration. [3]

Q3 a) Define vulcanization. Explain vulcanization of natural rubber along with Chemical reaction involved. Compare natural rubber with vulcanized rubber w.r.t. their properties. [6]

b) A gas used in internal combustion engine contain, $H_2=45\%$; $CH_4=35\%$; $CO=15\%$ and $N_2=5\%$ by volume. Find the minimum quantity (volume) of air required per m^3 gas for its complete combustion. [3]

c) Define - Gross/higher calorific value and justify the relationship between GCV and NCV of the fuel, if fuel contains H % hydrogen. [3]

OR

Q4 a) Explain free-radical reaction mechanism for addition polymerization w.r.t monomer as vinyl chloride and initiator as acetyl peroxide. [3]

b) What are intrinsic and extrinsic polymers? Explain with their examples [3]

c) Explain knocking in petrol engine. Define octane number and explain effect of chemical structure of hydrocarbons present in petrol on knocking. [6]

Q5 a) Explain chemical storage of hydrogen in the form of metal hydrides. [5]

How sodium alanates can be used in hydrogen storage.

b) Explain preparation and structure of activated carbon and carbon black. [4]

c) What are carbon nanotubes. Explain their types in detail. [4]

OR

Q6

- a) Explain production of hydrogen by water splitting using solar energy. [4]
- b) Explain how saline hydrides are formed. Give preparation and application of any one saline hydride. [4]
- c) Explain the structure and applications of graphene. [5]

Q7

- a) Explain various factors affecting corrosion on the basis of nature of metal [5]
- b) Describe Anodic protection of metal for corrosion control. [4]
- c) Compare: Galvanizing and Tinning [4]

OR

Q8

- a) What is Powder coating? Explain any one method. [4]
- b) Explain corrosion control using proper designing and material selection method. [4]
- c) Define oxidation corrosion. Explain general mechanism of oxidation corrosion. Compare oxidation corrosion which occurs in Na metal Cu metal and Molybdenum (Mo) metal. [5]