

Total No. of Questions : 9]

SEAT No. :

PB-3589

[Total No. of Pages : 4

[6260]-4

F.E.

**ENGINEERING CHEMISTRY**  
**(2019 Pattern) (Semester - I/II) (107009)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Question No. 1 is compulsory.*
- 2) *Solve any one of Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic table slide rule, molar charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume Suitable data, if necessary.*

**Q1) Multiple Choice Questions :**

**[10]**

- i) CDs, DVDs can be made from -
  - a) Polycarbonate
  - b) Polypropylene
  - c) Polyacetylene
  - d) Kevlar
- ii) Matrix phase in a composite is formed by -
  - a) Fibers
  - b) Particulars
  - c) Polymer
  - d) Flakes
- iii) Which of the following is used for N-doping in conducting polymers -
  - a) Iodine
  - b) Chloride
  - c) Sodium
  - d) Fluoride
- iv)  $NCV = GCV - \text{_____} \times 587 \text{ kcal/kg}$ 
  - a) 0.90H
  - b) 9.0H
  - c) 0.9H
  - d) 0.09H

**P.T.O.**

- v) Cooling correction should be \_\_\_\_\_ during calculation of GCV of a fuel by bomb calorimeter, correctly
- added
  - subtracted
  - multiplied
  - neglected
- vi) According to lambert's law
- $A \propto x$
  - $A \propto c$
  - $A = -\log \frac{1}{T}$
  - $A = -\log T$
- vii) Which of the following is a chromophore
- $C = C$
  - $C - OH$
  - $C - NH_2$
  - $C - Br$
- viii) The possible number of fundamental mode of vibration in case of  $H_2O$  molecule is
- 2
  - 3
  - 4
  - 5
- ix) Rate of corrosion \_\_\_\_\_ with decrease in pH of metal
- Decrease
  - Increase
  - Remain same
  - Initially increase and then remain constant
- x) Corrosion between the dissimilar metal is called as -
- Galvanic corrosion
  - Dry corrosion
  - Concentration corrosion
  - Oxidation corrosion

- Q2)** a) What are biodegradable polymer. Explain three factors responsible for biodegradation. Give the structure of PHBV and its application. [6]
- b) Define nanomaterials. How are nanomaterial classified on the basis of dimension? Give example of each. [5]
- c) What are Quantum dots? Give properties and application of quantum dots. [4]

OR

**Q3) a)** What is conducting polymer? Explain intrinsically and extrinsically conducting polymer with example. how the conductivity of trans polyacetylene can be improved? [6]

**b)** Explain structure of graphene with diagram. Give its four application. [5]

**c)** Give structure, properties and applications of PPV as an electroluminiscent polymer. [4]

**Q4) a)** Explain steam reforming of coke and methane with reaction conditions for industrial production of hydrogen. Give process of  $\text{CO}_2$  removal. [6]

**b)** Give the principle of fractional distillation of petroleum crude with diagram. Write composition and boiling range and use of any one fraction obtained during refining of petroleum. [5]

**c)** The following observations were noted in the Boy's gas calorimeter experiments - [4]

Volume of gas burnt at STP =  $0.15 \text{ m}^3$

Mass of cooling water used =  $27 \text{ kg}$

Temperature of Inlet water =  $24.1^\circ\text{C}$

Temperature of outlet water =  $29.8^\circ\text{C}$

Mass of steam condensed =  $0.04 \text{ kg}$

Find GCV and NCV of the fuel

OR

**Q5) a)** Draw net labeled diagram with principle of Bomb calorimeter. Give construction and working of Bomb calorimeter to determine GCV of a fuel. State the formula of GCV. [6]

**b)** What is power Alcohol. Give procedure for preparation of ethanol with reaction. Give any two advantages of power alcohol. [5]

**c)** A sample of coal was analysed as follows - Exactly  $150 \text{ gm}$  coal sample was heated for  $1 \text{ hr}$  at  $105\text{--}110^\circ\text{C}$ , the residue weight  $1.435 \text{ gm}$ . The crucible next was covered with a vented lid and strongly heated for exactly  $7 \text{ min}$  at  $950^\circ \pm 20^\circ\text{C}$ . The residue weight  $1.027 \text{ gm}$ . The crucible was then heated without cover, until a constant weight was obtained. The last residue was found to weight  $0.117 \text{ gm}$ . Calculate the percentage results of above analysis. [4]

- Q6)** a) Give the principle of IR spectrophotometer with help of block diagram. Explain any four application of IR spectroscopy. [6]

b) Explain mode of vibration with stretching and bending vibrations. [5]

c) Define - [4]

i) Hypochromic shift	ii) Bathochromic shift
iii) Beer's law	iv) Chromophore

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- Q7)** a) Explain different types of electronic transitions with diagram which occurs an absorption of uv-visible radiations by an organic molecule. State the forbidden transition. [6]

b) Give any five application of uv-visible spectroscopy. [5]

c) What are conditions of absorption of IR radiations by the molecule. [4]

**Q8)** a) Explain Hydrogen evolution and oxygen absorption mechanism of wet corrosion. [6]  
b) Explain cathodic protection method using sacrificial anode with respect to principle diagram, method and applications. [5]  
c) Discuss any four factors w.r.t. nature of metal affecting rate of corrosion. [4]

OR

- Q9)** a) State the pilling-Bedworth Ratio with their significance. Give reaction involved and mention the type of oxide film formed on the oxidation corrosion of Fe, Al, Ag and Mo. [6]

b) What is galvanization? Explain process with diagram. Give any two application of galvanization. [5]

c) Distinguish between anodic and cathodic coating. [4]

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