

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 CO₂ 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 m³

Mass of cooling water used = 27 kg

Temperature of Inlet water = 24.1°C

Temperature of outlet water = 29.8°C

Mass of steam condensed = 0.04 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 1.50 gm coal sample was heated for 1 hr at 105–110°C, the residue weight 1.435 gm. The crucible next was covered with a vented lid and strongly heated for exactly 7 min at 950° ± 20°C. The residue weight 1.027 gm. The crucible was then heated without cover, until a constant weight was obtained. The last residue was found to weight 0.117 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

OR

- 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]

QR

- 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]

