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, mollar charts, electronic pocket calculator and steam tubles is allowed.***
6) ***Assume Suitable data, if necessary.***

Q1) Multiple Choice Questions : **[10]**

i) CDs, DVDs can be mode 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 – _____ X 587 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

a) added
b) subtracted
c) multiplied
d) neglected

vi) According to lambert's law

a) $A \alpha x$
b) $A \alpha c$
c) $A = -\log \frac{1}{T}$
d) $A = -\log T$

vii) Which of the following is a chromophore

a) C = C
b) C – OH
c) $C - NH_2$
d) C – Br

viii) The possible number of fundamental mode of vibration in case of H_2O molecule is

a) 2
b) 3
c) 4
d) 5

ix) Rate of corrosion _____ with decrease in pH of metal

a) Decrease
b) Increase
c) Remain same
d) Initially increase and then remain constant

x) Corrosion between the dissimilar metal is called as -

a) Galvanic corrosion
b) Dry corrosion
c) Concentration corrosion
d) 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 CO_2 removal. **[6]**

b) Give the principle of fractional distilation 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]**

Valume of gas burnt at STP = 0.15 m^3

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]**

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]**

⌘⌘⌘