Total No. of Questions : 9]

SEAT No. :

PC1678

[Total No. of Pages :4

[6351]-104

F.E.

ENGINEERING CHEMISTRY

(2019 Pattern) (Semester-I/II) (Credit System) (107009)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.No. 1 is compulsory.***
2) ***Solve Q.No.2 or Q.No.3, Q.No.4 or Q.No.5, Q.No.6 or Q.No.7, and Q.No.8 or Q.No.9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***

Q1) Multiple choice questions.

a) In p-doping of conducting polymers _____ is used as dopant and _____ reaction occurs. **[2]**

i) I_2, reduction ii) Na, oxidation

iii) I_2, oxidation iv) Na, reduction

b) Size of nanomaterials is in the range _____. **[1]**

i) 1 μm - 100 μm ii) 1 nm - 100 nm

iii) 1 mm - 100 cm iv) 1 mm - 100 mm

c) Calorific value of gaseous fuel can be determined using _____ **[1]**

i) Colorimeter ii) Bomb calorimeter

iii) Viscometer iv) Boy's calorimeter

P.T.O.

d) Choose the correct option that is true for biodiesel. **[1]**

i) Biodiesel attacks rubber hoses.

ii) Biodiesel is prepared by fermentation of molasses.

iii) Biodiesel has high octane number.

iv) All of the above

e) H_2O and NH_3 show ____ and ____ fundamental modes of vibrations, respectively. **[2]**

i) 3, 6 ii) 5, 3

iii) 5, 8 iv) 2, 4

f) Shift of absorption maxima of a compound to longer wavelength is _____ shift. **[1]**

i) Blue ii) Hyperchromic

iii) Red iv) Hypochromic

g) Galvanising is coating of _____. **[1]**

i) Sn on Fe ii) Fe on Sn

iii) Fe on Zn iv) Zn on Fe

h) Which amongst the following is an example of cathodic coating? **[1]**

i) Sn on Fe ii) Zn on Fe

iii) Zn on Sn iv) Fe on Sn

Q2) a) What are polymer composites? give their classification based on the dispersed phase. State four properties of fibre reinforced polymer composites. **[6]**

b) Define quantum dots. Give their classification. State 2 applications of quantum dots. **[5]**

c) Give the structure, 3 properties and 3 applications of poly para phenylene vinylene (PPV). **[4]**

OR

Q3) a) Describe the structure of graphene with the help of diagram. Give 3 properties & 3 applications of graphene. **[6]**

b) What are biodegradable polymers? Give structure, 3 properties and 3 applications of Biopol. **[5]**

c) Give classification of nanomaterials with examples. **[4]**

Q4) a) Draw neat labelled diagram of Bomb calorimeter. Give the principle and explain the working of Bomb calorimeter. State the formula with corrections to calculate GCV of a fuel. **[6]**

b) What is power alcohol? Give the procedure and reactions involved in the preparation of ethanol from molasses. List 2 advantages of power alcohol. **[5]**

c) 1.2 g of coal sample on complete combustion increased the weight of U-tube containing $CaCl_2$ by 0.8 g and tube containing KOH by 2.4 g. Calculate % of C & H in wal. **[4]**

OR

Q5) a) Discuss the production of hydrogen by steam reforming of methane and coke with reaction conditions and removal of CO_2. **[6]**

b) Give the principle and describe the process of fractional distillation of Petroleum with labelled diagram. **[5]**

c) 1.0 g of coal sample after heating for 1 hour at 110 ºC gave a residue of 0.85 g . The residue was then ignited to a constant weight of 0.12 g. In an another experiment, 1.0 g of the same coal sample was heated at 950 ± 20ºC for exactly 7 minutes. The weight of the residue was 0.62 g. Calculate % moisture, volatile matter, ash and fixed carbon. **[4]**

Q6) a) Draw block diagram of single beam UV-Vis spectrophotometer. Explain its various components and give function of each. **[6]**

b) Discuss any 5 applications of IR spectroscopy. **[5]**

c) Define: **[4]**

i) Chromophore

ii) Auxochrome

iii) Hyperchromic shift

iv) Hypochromic shift

OR

Q7) a) Explain the fundamental modes of stretching and bending vibrations in IR spectroscopy. **[6]**

b) Explain the possible transitions occuring on absorption of UV-Vis radiations by an organic molecule. **[5]**

c) What are the conditions of absorption of IR radiations by a molecule? Calculate the possible number of fundamental modes of vibration in CH_4 & CO_2. **[4]**

Q8) a) Explain any 6 factors affecting the rate of corrosion of metals. **[6]**

b) Give the principle and explain the process of electroplating with diagram and reactions. Give two applications of electroplating. **[5]**

c) State the nature of oxide film formed in the oxidation corrosion of Na, Al and give reactions involved. **[4]**

OR

Q9) a) Explain hydrogen evolution and oxygen absorption mechanism of wet corrosion. **[6]**

b) Give the principle of cathodic protection. Explain cathodic protection using impressed current. Give advantage and limitations of this process. **[5]**

c) What is tinning? Explain the process with neat labelled diagram. **[4]**