Total No. of Questions : 9]

SEAT No. : ____

PD4027

[Total No. of Pages : 4

[6401]-1904
F.E.
ENGINEERING CHEMISTRY
(2019 Pattern) (Credit System) (Semester - I/II) (107009)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Attempt 2 or 3, 4 or 5 6 or 7 & 8 or 9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Multiple choice questions: **[10]**

a) Poly Phenylene Vinylene (PPV) shows the property of.

i) Bioluminescence ii) Luminescence

iii) Chemiluminescence iv) Electroluminescence

b) P-doping of conducting polymer is done by

i) I_2 ii) Na

iii) Li iv) $SnCl_2$

c) Nanomaterials are the materials in which size of particles ranges from

i) 1 nm - 100 nm ii) 1 cm - 100 cm

iii) 1 mm - 100 mm iv) 1 m - 100 m

d) Catalyst used in shift reaction of H_2 production is

i) FeO ii) Ni

iii) CH_3ONa iv) None of these

e) The relation between Gross and Net calorific value is

i) GCV = NCV ii) GCV > NCV

iii) GCV < NCV iv) None of these

f) The detector used in UV-Visible spectrophotometer is

i) Phototube ii) Photomultiplier tube

iii) Photovoltaic cell iv) All of these

P.T.O.

g) If absorption of molecule is shifted to wards longer wave length due to solvent effect is called as

i) Hypsochromic shift ii) Hypochromic shift

iii) Bathochromic shift iv) Hyperchromic shift

h) Bending vibrations are characterised by

i) Change in bond angle between two covalent bonds

ii) Change in bond lenght between two covalent bonds

iii) Change in geometry of molecule

iv) No any change

i) Galvanising is coating of

i) Fe on Sn ii) Zn on Fe

iii) Sn on Fe iv) Fe on Zn

j) Which type of reaction occur in anodic areas

i) Oxidation ii) Reduction

iii) Displacement iv) Addition

Q2) a) What are Biodegradable polymers? Give the structure of PHBV. Explain three factors responsible for biodegradation. Give its any two applications. **[6]**

b) What are carbon nanotubes? Discuss the different types of carbon nanotubes with respect to their structure. Give any two applications. **[5]**

c) Give the structure, any two properties and two applications of polycarbonate. **[4]**

OR

Q3) a) Explain the structure of Graphene with the help of diagram and mention three properties and three applications. **[6]**

b) Define polymer composites. What is the role of matrix phase and disperse phase in composites. Give any two advantages. **[5]**

c) What are nanomaterials. Classify any three on the basis of dimensions. **[4]**

Q4) a) Give construction with figure, working and give corrected formula for finding gross calorific value of a solid fuel by Bomb calorimeter. **[6]**

b) Give the preparation on reaction of Biodiesel. State three advantages of biodiesel. **[5]**

c) 1.5 gm of coal sample in kjeldhal's experiment, librated ammonia which was absorbed in 25/ml 0.1N H_2SO_4. The resultant solution required 14ml of 0.1N NaOH for complete neutralisation of H_2SO_4. In back titration. The reading of blank titration was 25ml. Find the percent of nitrogen in coal. **[4]**

OR

Q5) a) Explain in brief the process with diagram for distillation of crude petroleum. Give composition, boiling range and uses of any two fractions obtained. **[6]**

b) What is Power alcohol? Give any three merits and three demerits of power alcohol. **[5]**

c) The following data was obtained in Boy's Jas calorimeter experiment. **[4]**

i) Volume of gas burat at STP = $0.12m^3$

ii) Mass of cooling water = 32kg

iii) Rise in temperature of water = 7.8^oC

iv) Mass of steam condensed = 0.09kg

Calculate GCV and NCV of the fuel.

Q6) a) Draw the block diagram of IR spectrophotometer. Explain its four components and give their function. **[6]**

b) Explain the possible electronic transitions that occure in the molecule after absorption of UV radiations with suitable examples and labelled diagram. **[5]**

c) Explain any four applications of UV-Visible spectroscopy. **[4]**

OR

Q7) a) i) State and give mathematical expression of Beers and Lambert's law of absorption. **[4]**

ii) Define- **[2]**

1) Auxochrome
2) Hypsochromic shift

b) What are the conditions of IR radiations by the molecule? Explain the fundamental modes of streching vibrations. **[5]**

c) Give the principle of IR spectroscopy. Calculate the fundamental modes of vibrations for the following molecules. **[4]**

i) NO

ii) H_2O

iii) C_2H_6

Q8) a) State Pilling Bedworth ratio and give its significance. Give the different types of oxide films with suitable example formed during the oxidation corrosion of metals. **[6]**

b) What is principle of cathodic protection? Explain the method involved using sacrificial anode and give its two applications. **[5]**

c) What are anodic and cathodic coatings? Which one is more protective and why? **[4]**

OR

Q9) a) Explain the mechanism of wet corrosion by hydrogen evolution and oxygen absorption with diagram and reactions. **[6]**

b) Explain any five factors affecting the rate of corrosion related to metal. **[5]**

c) Define electroplating. Give the electroplating reactions with respect to the metals like Ag, Ni and Cr. **[4]**