Total No. of Questions : 9]

SEAT No. : ____

P6487

[Total No. of Pages : 4

[5868]-103
F.E. (Semester - I & II)
ENGINEERING CHEMISTRY
(2019 Pattern) (Paper - II) (107009)

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

Instructions to the candidates:

1) ***Questions No. 1 is compulsory. 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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Multiple choice questions -

i) PPV shows _____ fluorescence on application of electric field and can be used in _____ **[2]**

A) blue, sutures B) yellow-green, organic LEDs

C) red, eye-wear lenses D) violet, drug - delivery

ii) C atoms in graphene show _____ hybridisation. **[1]**

A) sp^3 B) sp

C) sp^2 D) sp^3d^2

iii) Power alcohol is advantageous because it _____. **[1]**

A) decreases octane number B) burns clean

C) increases calorific value D) increases cetane number

iv) Units of calorific value are _____. **[1]**

A) Cal/g B) Cal/m

C) Joules D) Kg/m^3

P.T.O.

v) CO_2 is _____ and shows _____ fundamental modes of vibration. **[2]**

A) linear, 3 B) non-linear, 3

C) linear, 4 D) non-linear, 4

vi) Electromagnetic radiations with wavelength 10-400 nm are called _____ radiations. **[1]**

A) Visible B) Microwave

C) IR D) Ultra violet

vii) Tinning is coating of _____. **[1]**

A) Fe on Sn B) Zn on Fe

C) Sn on Fe D) Fe on Zn

viii) Rate of corrosion _____ with increase in purity of the metal. **[1]**

A) decreases

B) increases

C) remains same

D) initially increases and then remains constant

Q2) a) What are biodegradable polymers? Explain three factors responsible for biodegradation. Give two properties and two uses of biodegradable polymer. **[6]**

b) What are nanomaterials? Discuss in brief two properties and applications of nanomaterials. **[5]**

c) Give the structure and three properties and applications each of polycarbonate. **[4]**

OR

Q3) a) What are carbon nano-tubes? Discuss the different types of carbon nanotubes with respect to their structure. **[6]**

b) Explain the structure of graphene with the help of diagram and mention its two properties and two applications. **[5]**

c) What are conducting polymers? State the structural requirements for a polymer to be conducting and give any three applications of conducting polymers. **[4]**

Q4) a) What is proximate analysis of coal? Give the procedure and formula for determination of each constituent. **[6]**

b) Explain the production of hydrogen by steam reforming of coke and methane with reaction conditions. **[5]**

c) The following data was obtained in a Boy's gas

Calorimeter experiment -

Volume of gas burnt at STP = $0.1m^3$

Mass of cooling water = 30 kg

Rise in temperature of cooling water = 8.1°C

Mass of steam condensed = 0.08 kg

Calculate GCV and NCV of the fuel **[4]**

OR

Q5) a) Give the principle and explain the process of fractional distillation of crude oil with labelled diagram. Give the composition and boiling range of any one fraction obtained during refining. **[6]**

b) Give the preparation reaction of biodiesel. State four advantages and two limitations of biodiesel. **[5]**

c) 1.0g of coal sample on complete combustion increased the weight of U-tube containing $CaCl_2$ by 0.5g and tube containing KOH by 2.4g. Calculate % of C and H in the given coal sample. **[4]**

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

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

c) Explain any four applications of IR spectroscopy. **[4]**

OR

Q7) a) Draw block diagram of single beam UV-vis spectrophotometer. Explain its four components and give their function. **[6]**

b) Give the principle of IR spectroscopy. Explain fundamental modes of bending vibrations. **[5]**

c) Define the following terms - **[4]**

i) Chromophore

ii) Hypsochromic shift

iii) Auxochrome

iv) Hypochromic shift

Q8) a) Explain hydrogen evolution and oxygen absorption mechanism of wet corrosion. **[6]**

b) What is electroplating? Explain the process with diagram and reactions. Give applications of electroplating. **[5]**

c) What are anodic and cathodic coatings? Which are better and why? **[4]**

OR

Q9) 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) Explain any five factors affecting the rate of corrosion. **[5]**

c) What is the principle of cathodic protection? Explain any one method of cathodic protection. **[4]**