Total No. of Questions : 9]

SEAT No. : ____

P-3920

[Total No. of Pages : 4

[6001]-4003

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 Q.2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q.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 :

i) Electroluminiscent polymers are used in : **[1]**

a) Solar cell technology b) Digital display
c) LED d) All of above

ii) Properties of polymer composite depends on : **[1]**

a) colour of particle b) monomer
c) size of particle d) none of the above

iii) Which of following industries have prominant applications for quantum dots? **[1]**

a) Electronic b) Agriculture
c) Medical d) None

iv) In _____ λ_{max} shift to higher side. **[1]**

a) hyperchromic effect
b) hypochromic effect
c) bathochromic shift
d) blue shift

P.T.O.

v) Following is the most important characteristic of a good fuel. **[1]**

a) high heat value b) bright light
c) high sound d) colourful smoke

vi) Following is not a prominant application of UV spectroscopy. **[1]**

a) Study of reaction kinetics
b) Detection of functional group
c) Quantitative analysis
d) Qualitative analysis

vii) The possible number of fundamental modes of vibrations in case of CO_2 molecule is **[1]**

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

viii) In the process of tinning : **[1]**

a) Zn is coated on Fe
b) Sn is coated on Fe
c) Sn is coated on Zn
d) Fe is coated on Zn

ix) Ideal pilling Bed worth ratio for effective protection of metal against corrosion is **[1]**

a) PBR < 1
b) PBR $\geq$ 1
c) PBR > 2
d) PBR > 2.5

x) Sacrificial anode is **[1]**

a) anodic protection method
b) cathodic protection method
c) an example of metal cladding
d) an example of powder coating

Q2) a) What are conductive polymer? Give types of conducting polymers. Explain doping with reactions and give any two applications of conducting polymers. **[6]**

b) Give classification and any four applications of SWCNT. **[5]**

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

OR

Q3) a) Explain with diagram the structure of graphene. Give three properties and three applications of it. **[6]**

b) What is biodegradable polymer? Give three factors affecting biodegradation process of a polymer. Give any two applications of biodegradable polymer. **[5]**

c) What are quantum dots? Give any two types of quantum dots. Write any two applications of Q.D.S. **[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) Explain fractional distillation process with diagram for petroleum crude. Give composition, boiling temperature range and use of any one fraction. **[5]**

c) Exactly 2.500 gram was weighed into silica crucible. After heating for one hour at 110ºC the residue weighed 2.415 gram. The crucible next was covered with vented lid and strongly heated for exactly seven minutes at 950 $\pm$ 20ºC. The residue weighed 1.528 gram. The crucible was then heated without the cover, until a constant weight was obtained. The last residue was found to weight 0.245 gram. Calculate % moisture, % volatile matter, % ash and % Fixed carbon. **[4]**

OR

Q5) a) Give construction with figure and working of Bomb calorimeter. Write corrected formula to find out Gross calorific value of a coal using Bomb calorimeter. **[6]**

b) What is 'Power Alcohol'? Give procedure for preparation of ethanol with reactions. Give any two advantages of Power alcohol. **[5]**

c) Observations in the Boy's Gas calorimeter experiments are given below; find GCV and NCV of fuel. **[4]**

Volume of gas burnt at STP = $0.08m^3$

Mass of cooling water used = 29.5 kg

Rise in temperature of circulatting water = 9.1ºC

Mass of steam condensed = 0.04 kg

Q6) a) Explain with diagram the possible electronic transitions those may occur in organic molecule on absorption of UV-radiations. Also state forbidden electronic transitions. **[6]**

b) Explain conditions for IR radiation absorption by organic molecule. Describe any three applications of IR spectroscopy. **[5]**

c) Give statement and mathematical expression of Lambert-Beer's Law. **[4]**

OR

Q7) a) With the help of diagram explain construction of IR spectrometer. Describe different components of IR spectrometer. **[6]**

b) Give any five applications of UV-visible spectroscopy. **[5]**

c) Explain bending vibrations observed in IR spectroscopy. **[4]**

Q8) a) Explain hydrogen evolution and oxygen absorption mechanisms of wet corrosion with diagram and reactions. **[6]**

b) Explain any five factors responsible for corrosion of metals. **[5]**

c) What is galvanisation? Explain process with diagram. **[4]**

OR

Q9) a) Explain types of oxide films with corrosion reactions for metals, Na, Al, Ag, Mo. **[6]**

b) Explain process of electroplatting with the help of neat labeled diagram. Give any four applications of electroplatting. **[5]**

c) Distinguish between anodic and cathodic coatings. **[4]**

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