Total No. of Questions : 9]

SEAT No. : [ ]

P-9068

[Total No. of Pages : 4

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F.E.

ENGINEERING CHEMISTRY

(2019 Course) (Semester - I / II) (107009)

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

Instructions to the candidates:

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

Q1) Multiple Choice Questions :

a) Which of the following is used for p-doping in conducting polymers? **[1]**

i) Lithium ii) Iodine
iii) Sodium iv) Calcium

b) Electroluminescent polymers are used in _____. **[1]**

i) LED ii) Sutures
iii) Safety goggles iv) Rechargable batteries

c) Which among the following is an example of quantum dots? **[1]**

i) Se ii) K
iii) CdSe iv) AsF_5

d) Unit of calorific value for solid fuel is _____. **[1]**

i) $Kcal/m^3$ ii) cal/g
iii) Joules iv) J/m^3

e) The enzyme used for conversion of glucose to ethanol is _____. **[1]**

i) lactase ii) maltase
iii) invertase iv) zymase

P.T.O.

f) Electromagnetic radiations with wavelength 10 to 400 nm are called as _____ radiations. **[1]**

i) Visible ii) IR

iii) X-ray iv) UV

g) According to Beer's law _____. **[1]**

i) A α x ii) A α c

iii) A = –log 1/T iv) A = –log T

h) _____ is used as a source of light in UV-vis spectrophotometer. **[1]**

i) Nernst filament ii) Globar

iii) Tungsten lamp iv) Mercury arc

i) Galvanisation is coating of _____. **[1]**

i) Fe on Zn ii) Sn on Zn

iii) Sn on Fe iv) Zn on Fe

j) Pilling Bedworth ratio gives an idea regarding _____. **[1]**

i) rate of combustion ii) quality of fuel

iii) amount of light absorbed iv) nature of oxide film formed

Q2) a) Discuss three important factors responsible for biodegradation of polymers. Draw the structure of PHBV and give its two applications. **[6]**

b) Explain structure of graphene with diagram. Mention its four applications. **[5]**

c) How are nanomaterials classified on basis of dimensions? Give example of each type. **[4]**

OR

Q3) a) Discuss the different types of carbon nanotubes w.r.t. their structure. Give any two applications of CNT. **[6]**

b) Classify polymer composites on the basis of reinforcement. Give two properties and two applications of polymer composites. **[5]**

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

Q4) a) Discuss the construction and working of Bomb colorimeter with diagram for determination of GCV of fuel. State the formula (without corrections) to calculate GCV. **[6]**

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

c) 1.2g of coal sample on complete combustion increased the weight of U-tube containing $CaCl_2$ by 0.7g and U-tube containing KoH by 2.5g. Calculate % C, % H in coal. **[4]**

OR

Q5) a) State the principle and explain the process of fractional distillation of petroleum with diagram. Give the composition, boiling range and application of any one fraction obtained. **[6]**

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

c) 1.0 g of coal sample was heated for 1 hr. at 105-110°C, weight of the residue obtained was 0.9 g. The crucible was then heated without lid till a constant weight of 0.15 g was obtained. In an another experiment, 1.0g of the same coal sample was taken in a crucible with a vented lid and heated at 925°C for 7 minutes. The weight of the residue was 0.55 g. Calculate % moisture, % volatile matter, % ash and % fixed carbon. **[4]**

Q6) a) What are the conditions of absorption of IR radiations by molecules? Explain the fundamental modes of bending vibrations. **[6]**

b) Discuss any five applications of UV-vis spectroscopy. **[5]**

c) Define : **[4]**

i) Hypochromic shift ii) Chromophore

iii) Red shift iv) Blue shift

OR

Q7) a) Explain the different types of electronic transitions with diagram which occur on absorption of UV-vis radiations by an organic molecule. State the forbidden transitions. **[6]**

b) Draw block diagram of IR spectrophotometer. Explain and give function of its four components. **[5]**

c) Calculate fundamental modes of vibrations for - **[4]**

i) NO ii) CH_4

iii) NH_3 iv) CO_2

Q8) a) Give the reaction involved and mention the type of oxide film formed on the oxidation corrosion of Na, Mg, Cr, Mo. **[6]**

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

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

OR

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

b) Discuss any five factors w.r.t. nature of metal affecting rate of corrosion. **[5]**

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

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