

Total No. of Questions : 9]

SEAT No. :

P-9068

[Total No. of Pages : 4

[6178]-3

E.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 logarithmic 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) Rechargeable batteries
- c) Which among the following is an example of quantum dots? [1]
  - i) Se
  - ii) K
  - iii) CdSe
  - iv) AsF<sub>5</sub>
- d) Unit of calorific value for solid fuel is \_\_\_\_\_. [1]
  - i) Kcal/m<sup>3</sup>
  - ii) cal/g
  - iii) Joules
  - iv) J/m<sup>3</sup>
- 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)  $A \propto x$  ii)  $A \propto c$   
iii)  $A = -\log I/T$  iv)  $A = -\log T$
- h) \_\_\_\_\_ is used as a source of light in UV-vis spectrophotometer. [1]
- i) Nernst filament ii) Gლობар  
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 calorimeter 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  $\text{CaCl}_2$  by 0.7g and U-tube containing  $\text{KOH}$  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  $105-110^\circ\text{C}$ , 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  $925^\circ\text{C}$  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) $\text{CH}_4$ |
| iii) $\text{NH}_3$ | iv) $\text{CO}_2$ |

- 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]

