

Total No. of Questions—8]

[Total No. of Printed Pages—4

Seat No.	
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[5667]-1004

F.E. (I Semester) EXAMINATION, 2019

ENGINEERING CHEMISTRY

(2019 PATTERN)

Time : 2½ Hours

Maximum Marks : 70

**N.B. :-** (i) Solve either Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 Or Q. No. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(v) Assume suitable data, if necessary.

1. (a) Classify the composites on the basis of reinforcement. Give any *three* properties and application of polymer composites. [7]

(b) (i) Define quantum dots. Give any *two* properties of quantum dots. [3]

(ii) What are nanomaterials ? Give any *two* important applications of nanomaterials with example. [3]

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- (c) What is biodegradable polymer ? Explain the favourable conditions for biodegradation. Give any *two* applications of biodegradable polymer. [5]

Or

2. (a) What are carbon nanotubes ? Discuss the different types of carbon nanotubes with respect to their structure. Give any *three* applications of it. [7]
- (b) Give the structure, properties and applications of : [6]
- (i) Polycarbonate
- (ii) Polyphenylene vinylene (PPV).
- (c) Explain the structure of graphene with the help of diagram. Give any *three* applications of graphene. [5]
3. (a) (i) 0.5 gm of coal sample on complete combustion was found to increase the weight of  $\text{CaCl}_2$  U-tube by 0.2 gm and KOH U-tube by 1.2 gm. Calculate % C and % H in the given coal sample. [4]
- (ii) Write chemical reaction for production of Biodiesel and give its any *two* advantages. [3]
- (b) Explain in brief the process with diagram for distillation of crude petroleum. Give composition, boiling range and uses of any *two* fractions obtained. [5]
- (c) Explain the production of hydrogen by steam reforming of methane and coke with reaction conditions. [5]

Or

4. (a) (i) On burning 0.84 gm of solid fuel in a bomb-calorimeter, the temperature of 3000 gm of water increased from 26.8°C to 29.6°C. Water equivalent and latent heat of steam are 380 gm and 587 cal/gm respectively. If the fuel contains 0.7% hydrogen, calculate its gross and net calorific value. [4]
- (ii) Define gross and net calorific value and justify the relationship between GCV and NCV of the fuel, if the fuel contains hydrogen. [3]
- (b) What is power alcohol ? Give any *three* merits and demerits of power alcohol. [5]
- (c) What is proximate analysis of coal ? Explain the procedure for determination of each constituent with its formula. [5]
5. (a) Give the principle, instrumentation and applications of UV-visible spectrophotometer. [7]
- (b) What are the conditions of absorption of IR radiations by the molecule. Draw a block diagram of IR spectrophotometer. Explain any *three* components of IR spectrophotometer with their functions. [6]
- (c) (i) State and give mathematical expression of Beers and Lambert's law. [3]
- (ii) Define the following : [2]
- (1) Chromophore
- (2) Bathochromic shift.

Or

6. (a) Give principle of IR spectroscopy. Explain modes of vibrations with stretching and bending vibrations. [7]
- (b) Explain different types of electronic transitions that occur in an organic molecule after absorbing UV-radiations. [6]
- (c) Explain any *five* applications of IR spectroscopy. [5]
7. (a) (i) Define oxidation corrosion. Explain general mechanism of oxidative corrosion. [4]
- (ii) What is galvanising ? Explain process with neat labelled diagram to protect iron from corrosion. [3]
- (b) Explain any *five* factors affecting corrosion on the basis of nature of metal. [5]
- (c) Define electroplating. Explain electroplating process with neat labelled diagram and applications. [5]

Or

8. (a) (i) What is principle of cathodic protection ? Explain it with any *one* suitable method. [4]
- (ii) Distinguish between anodic and cathodic coatings. [3]
- (b) What is Pilling-Bedworth ratio ? Give *four* types of oxide films formed on surface of metal with suitable example. [5]
- (c) Define corrosion. State the condition under which wet corrosion occurs. Explain hydrogen evolution mechanism of wet corrosion. [5]