# University of Mumbai
## Examination 2020 under cluster 3 (Lead College: FCRIT)

**Program: FE**
**Curriculum Scheme: Rev2019**
**Examination: FE Semester II**

**Course Code: FEC203** **Course Name: Engineering chemistry II**

**Time: $1\frac{1}{2}$ hour** **Max. Marks: 60**

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.** |
|---|---|
| | ***2 M each*** |
| 1. | Selection rule to produce rotational spectra is |
| Option A: | Dipole moment of molecule must change during vibrations |
| Option B: | Molecule must have permanent dipole moment |
| Option C: | Presence of chromophore in a molecule |
| Option D: | Presence of unpaired electron in a molecule |
| | |
| 2. | Benzene is an important industrial solvent which is classified as |
| Option A: | Non-toxic |
| Option B: | Non-flammable |
| Option C: | Biodegradable |
| Option D: | Carcinogenic |
| | |
| 3. | Which of the following statement is incorrect about an electrochemical cell |
| Option A: | Oxidation occurs at anode and reduction at cathode |
| Option B: | Chemical energy is converted into electrical energy |
| Option C: | Cell can work indefinitely |
| Option D: | Salt bridge maintains electrical neutrality of the electrolytes |
| | |
| 4. | If a metal rod exhibits holes on its surface, the type of corrosion is |
| Option A: | Waterline |
| Option B: | Galvanic |
| Option C: | Pitting |
| Option D: | Stress |
| | |
| 5. | A good fuel has |
| Option A: | Low ignition temperature and high calorific value |
| Option B: | Low ignition temperature and low calorific value |
| Option C: | High ignition temperature and high calorific value |
| Option D: | Moderate ignition temperature and high calorific value |
| | |
| 6. | Spin multiplicity for the two unpaired electrons in excited singlet state is |
| Option A: | 3 |
| Option B: | 2 |
| Option C: | 1 |

| | |
|---|---|
| Option D: | 4 |
| | |
| 7. | Cell reaction will be spontaneous if its Emf is |
| Option A: | Positive |
| Option B: | Negative |
| Option C: | Zero |
| Option D: | Fixed |
| | |
| 8. | Proximate analysis of coal is used to determine |
| Option A: | % of Nitrogen |
| Option B: | % of Sulphur |
| Option C: | % of Hydrogen |
| Option D: | % of Moisture |
| | |
| 9. | Season cracking and Caustic embrittlement are special case of |
| Option A: | Chemical corrosion |
| Option B: | Stress corrosion |
| Option C: | Concentration cell corrosion |
| Option D: | Waterline corrosion |
| | |
| 10. | Which is not an application of Flame Photometry |
| Option A: | Analysis of water, soil |
| Option B: | Na/K concentration in body fluids |
| Option C: | To determine Mg/Ca in cement |
| Option D: | Detection of Glucose |
| | |
| 11. | The feedstock used for greener route synthesis of Adipic acid |
| Option A: | Aniline |
| Option B: | Glucose |
| Option C: | Naphthol |
| Option D: | Iso-butyl benzene |
| | |
| 12. | In impressed current cathodic protection, anode is provided with a gypsum backfill because |
| Option A: | It enhances the rate of reaction |
| Option B: | It decreases metal to metal contact |
| Option C: | It enhances electrical contact with surrounding soil |
| Option D: | It decreases electrical contact with soil |
| | |
| 13. | Arrange n-heptane, Iso-octane, Naphthalene in increasing order of their knocking tendency in Petrol IC engine. |
| Option A: | Naphthalene < Iso-octane< n-heptane |
| Option B: | Iso-octane <n-heptane < Naphthalene |
| Option C: | n-heptane < Naphthalene < Iso-octane |
| Option D: | Naphthalene < n-heptane < Iso-octane |
| | |
| 14. | As per Pilling- Bedworth rule, Greater the specific volume ratio, |
| Option A: | Higher is the oxidation corrosion |
| Option B: | Higher is the reduction corrosion |
| Option C: | Lower is the oxidation corrosion |

| | |
|---|---|
| Option D: | Lower is the reduction corrosion |
| | |
| 15. | Calculate Gross calorific value of coal sample containing C= 83%, H = 6%, O=3%, S = 3.7%, N = 2.5%, ash = 1.8% |
| Option A: | 8629.90 Kcal/Kg |
| Option B: | 8610.2 Kcal/Kg |
| Option C: | 8729.90 Kcal/Kg |
| Option D: | 8523.50 Kcal/Kg |
| | |
| **Q2.** | |
| **Q2A** | **Solve any Two** ***5 M each*** |
| i. | *With the help of Jablonski diagram, describe Fluorescence, Phosphorescence and explain why Triplet states are more stable than Singlet state.* |
| ii. | *Write the Nernst Equation and calculate Emf of the following cell at 298K:* $Mg_{(s)}/Mg^{2+}(0.001M)$ \|\| $Cu^{2+}(0.0001M)/Cu_{(s)}$. *Given:* $E^0_{Cu2+/Cu} = 0.34\ V$ *and* $E^0_{Mg2+/Mg} = -2.37\ V$ |
| iii. | Highlight the green chemistry principle involved in the synthesis of Carbaryl and Write the greener route reaction for the synthesis of Carbaryl. |
| **Q2B** | **Solve any One** ***5 M*** |
| i. | *What is Differential Aeration corrosion? Explain why a "pure Zinc metal rod half immersed vertically in saline water starts corroding at the bottom" with neat diagram, reactions & corrosion product formation.* |
| ii. | *A sample of coal was found to contain C = 80%, H = 5%, O = 1%, N = 2%, Ash=12%. Calculate the minimum amount of air required for complete combustion of 1kg of coal sample.* |
| **Q3** | |
| **Q3A** | ***Solve any Two*** ***5 M each*** |
| i | *Draw the energy level diagram showing various molecular energies and explain why molecular spectra contains broad bands whereas atomic spectra consist of sharp lines.* |
| ii | *A cell uses* $Zn^{2+}/Zn$ *and* $Ag^{+}/Ag$ *electrodes. Write the cell representation, Half-cell reactions, Net cell reactions and calculate the standard Emf of the cell.* *Given:* $E^0_{Zn2+/Zn} = -0.76\ V$ *and* $E^0_{Ag+/Ag} = 0.8\ V$ |
| iii | *Define Green chemistry. As per Green chemistry Principles, why is it essential to design energy efficient process. Explain with suitable examples.* |
| **Q3B** | ***Solve any One*** ***5M*** |
| i | *What is oxidation corrosion. Name the different types of oxide layer formed and state which oxide layers are non-protective in nature. Explain with suitable examples.* |
| ii | *Determine C, H, N elements as % from the following observations in experiments of analysis of coal.* *0.25g coal on burning in a combustion tube and passing the gases through tubes containing anhydrous* $CaCl_2$ *and KOH increases their weight by 0.09 g and 0.8g respectively. In Kjeldahl's method, ammonia evolved by 0.42g coal was absorbed in 49.5ml of 0.12 N HCl solution. After absorption, the excess acid required 36.5ml of 0.12 N NaOH for neutralization.* |

# University of Mumbai

## Examination 2020 under cluster 3 (Lead College: FCRIT)

Program: **FE**

Curriculum Scheme: Rev2019

Examination: FE Semester II

Course Code: FEC203 Course Name: Engineering Chemistry II

Time: $\mathbf{1\frac{1}{2}}$ **hour** Max. Marks: 60

==========

| Question Number | Correct Option (Enter either 'A' or 'B' or 'C' or 'D') |
|---|---|
| Q1. | B |
| Q2. | D |
| Q3. | C |
| Q4 | C |
| Q5 | D |
| Q6 | C |
| Q7 | A |
| Q8. | D |
| Q9. | B |
| Q10. | D |
| Q11. | B |
| Q12. | C |
| Q13. | A |
| Q14. | C |
| Q15. | C |