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Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, June 2021

Course: Chemistry Program: B. Tech. (EE, ECE, APE-UP, ASE, ASE-Avionics) Course Code: CHEM 1011	Semester: II Time 03 hrs. Max. Marks: 100
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SECTION A

1. Each question will carry 5 marks
2. Instruction: Complete the statement/ Select the correct answer

S. No.	Question	Marks	CO
Q 1	<p>(i) The octane number of a fuel containing 80% of n-heptane and 20% of 2, 2, 4-trimethylpentane will be ...</p> <p>(ii) Unburned material remaining after 750 °C during the proximate analysis of coal is known as...</p> <p>(iii) Among cyclopropane, cyclobutane, cyclopentane, cyclohexane and cycloheptane which two are more stable?</p> <p>(iv) Write any two characteristic points of an aromatic compounds.</p> <p>(v) Out of NO₂⁻, NO₂⁺, HNO₃ and NO₃, which one is the reactive species for the nitration of benzene?</p>	5	CO1
Q 2	<p>(i) Before the establishment of Lindemann theory, it was difficult to justify the mechanism of ... order of reaction. (First/Second/Third/All)</p> <p>(ii) The concentration of a reactant of a reaction was measured by UV-Vis technique, at two time intervals with proceeding of the reaction. At the first time interval, the concentration of the reactant is 0.45 mol L⁻¹; 240 seconds later, the concentration is 0.25 mol L⁻¹. What is the rate the reaction in mol L⁻¹ min⁻¹?</p> <p>(iii) The half-life period for a first order reaction is 15 minutes; calculate the time taken in minute, for completion of 75, 80 and 90 % completion of the reaction.</p>	(1+1+3)	CO2
Q 3	<p>(i) Write the name of any two methods by which the order of reaction can be determined.</p> <p>(ii) The following concentrations (in moles/liter) were obtained for the formation of NH₃ from N₂ and H₂ at equilibrium at 500 K. [N₂] = 0.015, [H₂] = 0.03 and [NH₃] = 0.012. The equilibrium constant of the reaction will be...</p> <p>(iii) What will be the value of K_c if the K_p is 0.61 for a reaction, PCl₅ ⇌ PCl₃ + Cl₂ at 25 °C?</p>	(1+2+2)	CO2

Q 4	<p>(i) On increasing dilution, the equivalent conductance of the solution will ...</p> <p>(ii) We can store a one molar CuSO₄ solution in Zn container. (True/False)</p> <p>(iii) We can store a two normal ZnSO₄ solution in Cu container. (True/False)</p> <p>(iv) Kohlrausch law is not applicable for calculation of conductivity of weak electrolyte.(True/False)</p> <p>(v) The equivalent conductance of Ca²⁺ and Cl⁻ are 77 and 76 Ohm⁻¹ cm⁻¹ eq⁻¹ at infinite dilution, respectively. The equivalent conductance of CaCl₂ at infinite dilution will be..... Ohm⁻¹ cm⁻¹ eq⁻¹.</p>	5	CO3
Q 5	<p>(i) Two important advantages of hard water are and</p> <p>(ii) Permanent hardness of water is due to ... and</p> <p>(iii) Temporary hardness of water may be due the presence of and salts.</p> <p>(iv) Zeolite process uses thesalt for its regeneration.</p> <p>(v) Fluoride ion is removed by R.O; usingion exchange resin. (Cation/Anion)</p>	5	CO4
Q 6	<p>(i) Urea-formaldehyde resin is a thermosetting plastic. (True/False)</p> <p>(ii) Nylon is a type of polyamide. (True/False)</p> <p>(iii) Paints are synthesized using bulk polymerization. (True/False)</p> <p>(iv) Weight average molecular weight is always lower than number average molecular weight, of polymers. (True/False)</p> <p>(v) Write the name of any two methods for preparation of nano particles.</p>	5	CO5
<p>SECTION B</p> <p>1. Each question will carry 10 marks</p> <p>2. Instruction: Write short / brief notes</p>			
Q 1	<p>(i) Derive the rate constant equation for a second order reaction (2 A → Product).</p> <p>(ii) Derive the rate expression for given below type of isomerisation reaction in the chemical refinery.</p> $\text{Cyclopropane} \xrightleftharpoons[k_2]{k_1} \text{Propene}$ <p>Where K₁ & K₂ are the rate constant for forward and backward reaction respectively.</p>	(4+6)	CO2
Q 2	<p>The emf of cell-</p> $\text{Ni(s) / Ni}^{2+} \text{(a) // Cu}^{2+} \text{(0.75M) / Cu(s); is 0.601 V at 25 }^{\circ}\text{C.}$ <p>E⁰ (Ni/Ni²⁺) = +0.25 V, E⁰ (Cu²⁺/Cu) = +0.34 V.</p> <p>(i) Write down the half-cell reaction & complete cell reaction.</p> <p>(ii) Find out the concentration of Ni²⁺ i.e. the value of “a”.</p> <p>(iii) Does temperature have any effect on the value of E_{cell}? Describe the same in two lines, what happen on the value of E_{cell} of above reaction if it will increase or decrease.</p>	(4+4+2)	CO3

(ii) Describe the need of ultimate analysis in chemistry in short. During estimation of nitrogen present in organic compound by Kjeldahl's method, 3.12 g of an organic substance was heated with conc. sulphuric acid and then distilled with excess of strong alkali. The ammonia gas evolved was absorbed in 50 ml of N/10 HCl. After absorption, the excess acid requires 12.5 ml of 0.1 N NaOH for neutralization. Determine the percentage of nitrogen in the substance.

OR

Write down the limitation of the proximate analysis in a paragraph. An organic compound (0.2346 g) containing carbon, hydrogen and oxygen only, was analyzed by the combustion method. The increase in weight of the U-tube and the potash bulbs at the end of the operation was found to be 0.2754 g and 0.4488 g respectively. Calculate the percentage of carbon, hydrogen and oxygen in it.