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PES University, Bengaluru

(Established under Karnataka Act No. 16 of 2013)

UE15/16CY101

DECEMBER 2021: END SEMESTER ASSESSMENT (ESA) B TECH 1ST SEMESTER
UE15/16CY101 – ENGINEERING CHEMISTRY

Time: 3 Hrs	Answer All Questions	Max Marks: 100

1	a)	Define phase. Write the no of phases and no of components exist in the following equilibrium system. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$	3
	b)	Draw a neat labeled phase diagram of water system. Calculate the degree of freedom at the triple point. Why melting point curve has negative slope?	5
	c)	For a rigid rotor diatomic molecule: (i) Draw the energy level diagram for a rigid rotor diatomic molecule upto J=3. (ii) Calculate the value of moment of inertia and bond length of HCl. The atomic masses of H and Cl are 1.008amu and 35.45amu. (Given: $C=3x10^8$ m/s, $\pi=3.14$, $h=6.625x10^{-34}$ Js, 1 amu $=1.66x10^{-27}$ kg, rotational constant $B=10.59$ cm^{-1}).	8
	d)	State franck condon principle. With the help of a suitable diagram, show the electronic transitions and the corresponding spectra in the following case: (i) The electronic transition take place from v''=0 to v'=0.	4
2	a)	Discuss the origin of electrode potential.	4
	b)	An electrochemical cell consists of nickel electrode dipped in 0.19M $NiSO_4$ and zinc electrode in 0.29M $ZnSO_4$ solution. (Given: $E^\circ_{Ni^{2+}/Ni} = -0.25V$, $E^\circ_{Zn^{2+}/Zn} = -0.76V$ and F=96500 C/mole) (i) Write the cell representation (ii) Write the half cell reactions (iii) Calculate the emf of the cell at 298K (iv) Calculate the maximum work done for the cell and (v) Comment on the spontaneity of the reaction.	8
	c)	Explain the construction and working of silver-silver chloride electrode.	4
	d)	Determination of pH of an unknown solution using glass electrode.	4
3	a)	Give the construction and working of Lithium-ion battery. Why is electricity storage density of lithium batteries high?	6
	b)	Discuss the following battery characteristics. (i) Capacity (ii) Power density	4
	c)	Define fuel cell. Explain the construction and working of H_2-O_2 alkaline fuel cell. Calculate the potential of the cell if its efficiency is 83.18%. (Given the enthalpy of formation of water is -285.83 kj/mole).	7
	d)	What is oxygen sensor? Write any two applications of oxygen sensor.	3
4	a)	Why do the metals undergo corrosion? Explain differential aeration corrosion with an example.	6
	b)	Discuss how the following factors affecting the rate of corrosion: (i) Nature of the corrosion product (ii) Temperature	4
	c)	Explain the process of tinning, mention one advantage and disadvantage of tinning.	6
	d)	Explain the electroplating process of decorative chromium.	4
5	a)	Discuss how the structure of polymers affect the following properties: (i) Tensile strength (ii) Crystallinity	6
	b)	Give the synthesis and application of PMMA (plexiglass).	5
	c)	Calculate the number average, weight average and viscosity average molecular weight of a polymer having 15 molecules of molecular weight is 1200, 20 molecules of molecular weight is 2300 and 25 molecules of molecular weight is 3600. (Given a=0.69)	6
	d)	Write any three principles of green chemistry.	3

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