Paper code - U119-2011 (T1)

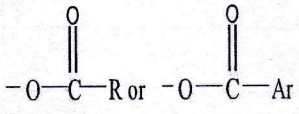
Marking scheme for T1 examination

Engineering Chemistry Sem I (2019-20)

Question number	Sub question number	Marking Scheme	Bloom's level	CO
Q.1	a)	Definition – 1 mark, figure – 1mark, principle – 1 mark, applications – 1mark	2	1
	b)	Identification of type – 1 mark OH^- alkalinity = (1 ½ marks) CO_3^{-2} alkalinity = (1 ½ marks)	3	1
	c)	4 points = 4 marks	2	1
Q.2	a)	2 marks each along with explanation of calculation	3	2
	b)	(i) 2 marks (1 mark each) (ii) Calculation of number of fundamental vibrations –2 marks (1 mark each)	3 2	2
	c)	2 marks each – 1 mark for low resolution signals and 1 mark for high resolution	3	2
Q.3	a)	Definition – 1mark, Hydrogen evolution mechanism – 3 marks (figure – 1mark, reactions at anode and cathode – 1 mark, explanation of example – 1 mark)	2	6
	b)	Figure – 1 mark, Process – 3marks (3 steps)	2	6

Paper code - U119-1011 (T1)

Data for UV – Visible Spectroscopy:
Woodward – Fieser rule for calculation of λ_{max} in dienes, trienes and polyenes:

1	Basic λ_{max} for an unsubstituted, conjugated acylic (open chain) or heteroannular diene	214 nm
2	Basic λ_{max} for an unsubstituted, conjugated homoannular diene	253 nm
3	Increments for	
	Each double bond extending conjugation(DEC)	30 nm
	Each alkyl substituent or ring residue	5 nm
	Each exocyclic double bond	5 nm
4	Increments for substitutions	
	(a) H	0 nm
	(b) Alkyl group (R)	5 nm
	(c) Halogen Cl, Br	5 nm
	(d) –OH or –OR	5nm
	(e) Acyl group 	0 nm
	(f) – S – Alkyl (-SR)	30 nm
	(g) N- Alkyl ($-NR_2$)	60 nm

Woodward – Fieser rule for calculation of λ_{max} of enone derivatives α, β unsaturated compounds or ketones

1	Base value:	
	a) Acyclic α, β unsaturated ketones	215 nm
	b) 6 membered cyclic α, β unsaturated ketones	215 nm
	c) 5 membered cyclic α, β unsaturated ketones	202 nm
	d) α, β unsaturated aldehydes	210 nm
	e) α, β unsaturated carboxylic acids & esters	195 nm
2	H substitution	0 nm
3	Alkyl substituent or Ring residue in α position	10 nm
4	Alkyl substituent or Ring residue in β position	12 nm
5	Alkyl substituent or Ring residue in γ and higher positions	18 nm
6	Double bond extending conjugation	30 nm
7	Exocyclic double bonds	5 nm
8	Homodiene compound	39 nm
9	Polar groups	
	a) –OH in α position	35 nm
	–OH in β position	30 nm
	–OH in δ position	50 nm
	b) –OAc in α, β, γ, δ positions	6 nm
	c) –OMe in α position	35 nm
	–OMe in β position	30 nm
	–OMe in γ position	17 nm
	–OMe in δ position	31 nm
	d) –Cl in α position	15 nm
	–Cl in β position	12 nm
	e) –Br in α position	25 nm
	–Br in β position	30 nm
	f) $-NR_2$ in β position	95 nm

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Important Infrared Absorption Frequencies (Engineering Chemistry)

Sr.No.	Frequency Region cm^{-1}	Type of vibration	Functional group
1	3640-3610	O-H stretch, free hydroxyl	Alcohols, phenols
2	3500-3200	O-H stretch, H-bonded	Alcohols, phenols
3	3400-3250	N-H stretch	Primary, secondary amines, amides
4	3300-2500	O-H stretch	Carboxylic acids
5	3330-3270	-C ≡ C-H,C-H stretch	Alkynes (terminal)
6	3100-3000	C-H stretch	Aromatics
7	3100-3000	=C-H stretch	Alkenes
8	3000-2850	C-H stretch	Alkanes
9	2830-2695	H-C=O, C-H stretch	Aldehydes
10	2260-2210	C ≡ N stretch	Cyanides/nitriles
11	2260-2100	-C ≡ C- stretch	Alkynes
12	1760-1665	C=O stretch	Carbonyls (general)
13	1760-1690	C=O stretch	Carboxylic acid
14	1750-1735	C=O stretch	Esters, saturated aliphatic
15	1740-1720	C=O stretch	Aldehydes, saturated, aliphatic
16	1730-1715	C=O stretch	α,β-unsaturated esters
17	1715	C=O stretch	Ketones, saturated aliphatic
18	1710-1665	C=O stretch	α,β-unsaturated aldehydes, ketones
19	1680-1640	-C=C- stretch	Alkenes
20	1650-1580	N-H bend	Primary amines
21	1600-1585	C-C stretch (in ring)	aromatic
22	1550-1475	N-O asymmetric stretch	Nitro compounds
23	1500-1400	C-C stretch (in ring)	Aromatic
24	1470-1450	C-H bend	Alkanes
25	1370-1350	C-H rock	Alkanes
26	1360-1290	N-O symmetric stretch	Nitro compound
27	1335-1250	C-N stretch	Aromatic amines
28	1320-1000	C-O stretch	Alcohols, carboxylic acids, esters,ethers
29	1300-1150	C-H wag($-CH_2X$)	Alkyl halides
30	1250-1020	C-N stretch	Aliphatic amines
31	1000-650	=C-H bend	Alkenes
32	950-910	O-H bend	Carboxylic acids
33	910-665	N-H wag	Primary, secondary amines
34	900-675	C-H (out of plane)	Aromatic
35	850-550	C-Cl stretch	Alkyl halides
36	725-720	C-H rock	Alkanes
37	700-610	-C ≡ C-H:C-H bend	Alkynes
38	690-515	C-Br stretch	Alkyl halides

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