Q. P. Code: 21423

(Time: Three Hours)

Please check whether you have got the right question paper

- N.B. (1) All questions are compulsory
 - (2) **Figures** to the **right** indicate full marks
 - (3) Answer all the sub-questions together and in order
 - (4) Spectral correlation tables provided with question paper are allowed

Q.1. (a) Answer any four questions (1 mark each)

- i. Predict m/z of molecular ion of ethyl chloride
- ii. Predict the base peak for n-propanol
- iii. Give the number of signals in ¹³C NMR of 1,4-dimethyl benzene
- iv. State an example of a molecule containing D₂O exchangeable protons
- v. Calculate index of hydrogen deficiency for C₇H₄Cl₂O
- vi. Predict the number of signals in ¹H NMR of CH₃-CH₂-C=C-CH₂-CH₃
- (b) Answer any eight questions (2 marks each)
- i. Predict UV λ_{max} of:



ii. Predict UV λ_{max} of:



iii. How will you distinguish between the following by ¹H NMR spectroscopy?



iv. How you will distinguish between the following by IR spectroscopy? Give distinguishing spectral data.



(Marks: 80)

16

4

v. How will you distinguish between the following by mass spectrometry?



vi. How will you distinguish between by ¹³C NMR spectroscopy



vi. Depict one fragmentation pathway for:



viii. Predict ¹H NMR spectrum of the following giving δ value, splitting pattern and ratio of proton intensity. Do not give ranges



ix. Predict the IR spectrum of:



x. A compound with molecular formula C_3H_6O gives bands at 2944 and 1710 cm⁻¹ in IR spectrum Predict its structure and justify your answer.

Q.2. Answer any five questions (8 marks each)

40

a. Predict IR spectrum, ¹³C NMR and ¹H NMR spectrum of :



b. How will you distinguish between following compounds using any one spectral technique. Give distinguishing spectral characteristics. If mass spectrometry is used one fragmentation pathway has to be depicted



c. An organic compound with molecular weight 120 has the following spectral characteristics:

IR: 3062-2907, 1608, 1473 cm⁻¹

¹H NMR: δ7.2 (s, 10.4sq), 2.26(s, 3.1sq)

- Deduce the structure and justify your answer. Predict the ¹³C NMR of the compound.
- d. A compound with molecular formula $C_9H_{12}O_3S$ has the following spectral characteristics: IR: 3050, 1600, 1315, 1175 cm⁻¹

¹HNMR: $\delta 1.3(t, 3H)$, 2.4(s, 3H), 4.1(q, 2H), 7.1-7.8(dd, 4H) Deduce the structure and justify your answer. Depict one fragmentation pathway for this compound

e. A hydrocarbon with molecular formula $C_8H_{18}O$ shows the following spectral characteristics: ¹H NMR: δ 1.0 (t, 3H), 1.5 (m, 4H), 3.5 (t, 2H) ¹³C NMR: 14.2 (q), 20.9 (t), 29.5 (t), 54.2 (t)

Deduce the structure of the compound and justify your answer. Depict one fragmentation pathway for this compound

- f. A compound with MW 119 has following spectral characteristics: IR: 3500, 3350 and 1608cm⁻¹
 ¹H NMR: δ1.1 (d, 18.1 sq), 1.5(bs, 12.5sq., D₂O exchangeable), 3.6(m, 5.9 sq.), 7.29 (m, 29.7sq.). Deduce the structure and predict ¹³C NMR for the same
- g. Predict IR and ¹H NMR of the following compound. Depict two fragmentation pathways for this compound one involving fission and the other rearrangement.



Q.3. Answer any five questions (4 marks each)

a. Distinguish between the following using a suitable spectral technique



- A compound with molecular formula C4H₇BrO₂ has the following spectral characteristics:
 ¹H NMR: δ1.1 (t, 3H), 2.1 (m, 2H), 4.3(t, 1H), 11.2(s, 1H) Predict its structure and justify your answer
- c. A compound with molecular weight 140 shows following spectral characteristics: IR bands at 2960, 2200, 1720 cm⁻¹
 ¹³C NMR: 13.5(q), 18.2 (t), 21.9 (t), 29.3 (t), 52.8 (q), 72.9 (s), 89.8 (s), 150.4 (s)
 Predict its structure and justify your answer
 - Predict its structure and justify your answer.
- d. A compound with molecular formula C₅H₆O₃ has following spectral characteristics:
 ¹H NMR: δ2.2 (d, 2H), 2.5 (m, 1H), 1.2 (d, 3H) IR:2931, 1820, 1790 and 1100 cm⁻¹ Deduce its structure and justify your answer.
- e. Predict the IR and ¹H NMR of the structure given below and justify your answer



f. Predict the IR and ¹³C NMR spectra for:



g. Depict two fragmentation pathways for:



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SPECTRAL CORRELATION TABLES Chemical Shifts for Methylene Groups Attached to Two Functional Groups (Y---OH₂---Z)

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b. Aryl chlorider c. Aryl bromider c. Aryl bromider c. Aryl bromider c. Aryl bromider c. Aryl bromider c. Aryl bromider 	2. Acvi Buorides and the second	-5.41 (5)		Secondary amides, dilute solution	6.45-6.62	9	1550-15
cLow -5.31 (s) -1.810 $\cdot 1. ALCOHOLS XND PHENOLS$ da. 6. Librardurated artistry is $5.61-577.5$ (s) $1720-1730$ (s) $1230-1730$ (r) $1100-1700$ $\cdot 1. ALCOHOLS XND PHENOLS$ cCOF2 $5.61-577.5$ (s) $1720-1730$ (r) $1720-1730$ (r) $1230-1730$ (r) $1520-1730$ (r) $1520-1730$ (r) $1100-1700$ $2.74-279$ (r, r) $1500-1730$ fCODry 5.47 (s) $1720-1730$ (r) $1720-1730$ (r) 1233 $1100-100-100-100-100-100-100-100-100-10$	N And children's differences of the second of the second secon	~ 2.57 (4)	~1795	C. Miscellançous chromophoric groups		. ·	
d. a. f. Unanturzed articulary by dragen and articles 3.0 -H. Streething vibrations 2.14-2.79 (v. ih) 36.0-3 e. COFs 5.19 (s) 1923 1923 Internaliceutary by dragen bonded 2.14-2.79 (v. ih) 36.0-3 7. ANTIDES 5.19 (s) 1923 1923 Internaliceutary by dragen bonded 2.33-2.80 (v. ih) 35.0-35.0-35.0 7. ANTIDES 5.41 (s) 1823 5.41 (s) 1823 5.41 (s) 1823 7. ANTIDES 5.41 (s) 1823 5.41 (s) 1823 5.41 (s) 1353 7. ANTIDES 5.41 (s) 1823 5.61 (s) 1823 5.94-3.13 (s) 1359-3.0 7. ANTIDES 5.41 (s) 1823 5.61 (s) 1823 5.61 2.34-3.13 (s) 1359-3.0 7. ANTIDES 5.41 (s) 1823 5.61 (s) 1823 5.61 2.91-3.13 (s) 1350-3.0 7. ANTIDES 5.61 6.66 (s) 1823 5.61 (s, sh) 350-3.0 2.94-3.13 (s, b) 350-3.0 7. ANTIDES 5.61 6.61 16.62 6.62 1.123-6.0 (s, sh) 350-3.0 7. ANTIDES 5.61 6	· Ard hromides - 5, 20 at 182 at 182	-5.53 (1)	-1810	-1. ALCOHOLS AND PHENOLS			•
and S.TJ-3581 [and S.TJ-3581	d - C. Harring Shibbert	5.61-5.772 (G)	1720-(750	a. O-H. Stretching vibrations			
c COFs 5.19 (s) 1928 Internedecularly hydrogen koaded f. COCY 5.47 (s) 1828 (charige on dilution) 2.83-2.90 (v. sh) 1530- 7. ANIIDES 5.47 (s) 1828 (charige on dilution) 2.83-2.90 (v. sh) 1530- 7. ANIIDES 5.47 (s) 1828 ingle bridge compounds 2.34-1.13 (f. b) 3400- 7. ANIIDES 5.47 (s) 1828 ingle bridge compounds 2.34-1.13 (f. b) 3400- 7. ANIIDES 5.47 (s) 1828 ingle bridge compounds 2.34-1.13 (f. b) 3400- 7. ANIIDES 5.60 5.47 (s) 1828 ingle bridge compounds 2.34-1.13 (f. b) 3400- 7. ANIIDES 5.60 6.60 (s) 1828 ingle bridge compounds 2.34-1.13 (f. b) 3400- 7. ANIIDES 5.60 6.10 6.60 (s) 1650- (s) 1500- 8 5 5 5 5 5 5 5 5 5 7. ANIIDES 5 6 1650- (s) 1650- 5 5 5 7 6		and 5.72-5.82 [in]	1750-1720	Free Of-H.	214-279	1 (v: sh	56-0276
7. Aktriptics 5.47 (s) 1823 (charify on dianton) 2.33-2.80 (v. sh) 350-2.80 9. Aktriptics 5.47 (s) 1825 single hridge composition 2.33-2.80 (v. sh) 350-2.80 9. Aktriptics 5.47 (s) 1825 single hridge composition 2.33-2.80 (v. sh) 350-2.80 9. Aktriptics 5.47 (s) 1825 single hridge composition 2.34-3.1.3 (f. b) 3400- 1. Carbonyl stretching vibrations -6.06 (s) -6.06 (s) -6.06 (s) 2.39-2.10 (v. sh) 350-2.80 9. Primary, solid and concintratid -6.06 (s) -6.06 (s) -6.06 (s) 360-2.80 (s) 360-2.80 (s) 360-2.80 (s) 350-2.80 (s)<		(3) (3)	1,11	Intermelicularly hydrosen boaded		. •	
c. Concert C. Concert		5.01 (5)	1828	(chańść ön dilation)			•
7. XIIIBES 294-3113 (± b) 3400- 1012molecularly Närögen Existention 7. ANIBES 1. Cabonyl stretching vibration 294-3113 (± b) 3400- 1012molecularly Närögen Existention 8. Cabonyl stretching vibration 2. Cabonyl stretching vibration 2.04-3.13 (± b) 350- 1000 7. Anonyl stretching vibration -6.06 (±) -1650 single bridge comparies 2.84-2.50 (± sh) 3570- 1570- 1570 8. Spution -5.52 (s) -1650 (s) -1650 (s) 3.11-6.0 (w, b) 3200- 1570-1650 8. Scondary, state solution 5.95-5.14 (s) 1630-1630 -1680 (wible solution) 2.84-2.50 (wible solution) 8. Scondary, state solution 5.85-5.54 (s) 1630-1630 -1680 -1680 7. Scondary, state solution 5.95-5.14 (s) 1630-1630 -1680 7. Scondary, state solution 5.95-5.14 (s) 1630-1630 -1680 7. Scondary, state solution 5.95-5.14 (s) 1630-1630 -5.16 7. Scondary, state solution 5.95-5.14 (s) 1630-1630 -5.16 7. Scondary, state solution 5.95-5.14 (s) 1630-1630 -5.16 7. Scondary, state solution		· 5.47 (s)	1825	sinele hridee compounds	2.52-2.%	45.2	1550-34
 Antuezary solid and concentrated Larboryl stretching, vibrations Larboryl stretching, vibration Larbor	COURT ALL ALL ALL ALL ALL ALL ALL ALL ALL AL	;	•	polymeric association	. 2.94-3.13	(q. ;) [1400-11
A. Labory) externation 1. Labory) externation 2.80-2.90 (*, sh) 1570- single bridge compounds Primary, solid and concentrated -6.06 (s) -1650 single bridge compounds 2.80-2.90 (*, sh) 1570- (*, b) 1200- strainty, solid and concentrated 2.80-2.90 (*, sh) 1570- (*, b) 1200- strainty, solid and concentrated 2.80-2.90 (*, sh) 1570- (*, b) 1200- (*, b) 1200-	1. AMIRES			Intramoleculariy Avdropen Bonded	•		•
Trinary, sens and universe and unitexes and universe and universe and universe and universe	aCarbonyi sugammerum and and anneantailed	ې پې		(no change on dilution)			
Primary dilute solution -5.92 (s) -1680 chclate compounds J.1-(0 (w. b) 3500- Secondary, dilute solution 5.95-5,14 (s) 1680-1630 1 Abbrohuloust = kuong m = medium, w = weak, w = word, h = thap, solution 5.95-5,14 (s) 1700-1670 = sprtowinately 5.00-1670 = sprtowinately 5.95-5,14 (s) 1700-1670 = sprtowinately 5.95-5,14 (s) 1700-1670 = sprtowinately 5.95-5,14 (s) 1700-1670 = sprtowinately 5.95-5,14 (s) 1670-1630 Cyclic, glate solution -5.95 (s) -1650 Cyclic, glate solution -5.85 (s) -1650 Cyclic, glate solution -5.85 (s) -1700		-6.06	1650	single bridge compounds	2,80-2.90	۲۲. ×	1270-24
Seconduryr, golid and concentrated 59-5,14 (s) 1630-1630 f Abbrenations = 4000g m = medium. * = ven. b* b = broad at = shap, solution 555-59* (s) 1700-1670 ÷ = spriosimately Terinary, solid and solution 555-59* (s) 1700-1670 ÷ = spriosimately Cyclig, e lactanar, dilute solution -5,55 (s) -1680 Cyclig, e lactanar, dilute solution -5,55 (s) -1700	Primary: dilute solution	~5.92 (s)	~1690	chelate compounds	3.1-6.0	(*: Þ	1200-2:
solution 535-5,14 (s) 1630-1630 F concentrations a server a monthly a solution 535-5,57 (s) 1700-1670 - = approximately Secondary, dilute solution 535-5,57 (s) 1650-1630 - = approximately Cyclic, r-lastrans, dilute solution -5,58 (s) -11500 - 520 Cyclic, r-lastrans, dilute solution -5,58 (s) -1700 Cyclic, r-1500 Cyclic, r-last	Secondary, solid and concentrated				· - ventile b = bro	the state of the s	e
Secondary, ddute solution 5.83-5.99 (s) 1700-1670 Tertiary, solid and all solutions 5.99-6.14 (s)1670-1630 Cyclic, 2-lactams, ddiute solution -5.55 (s)1680 Cyclic, 1-lactams, ddiute solution5.55 (s)1700	solution	(s) +1,5-202	1630-1630	f Abbroaudus: 5 = Mone. II = mousing. = =			<u>.</u>
Teritary, solid and all solutions	Secondary, dilute solution	5.83-5.99- (s)	1700-1670				
Cyclic #Jactang, dilute solution ~5,95 (5)7 ~1680 · Cyclic T-lactang dilute solution ~5,58 (s) ~1700	Tertiary, solid and all solutions	(3) +(3-645	1670-1630				
Cyclic r-lactang dilute solution -5.5 (s) -1700	Cyclic, 8-lactams, dilute solution	-2,95 (3)	- 1680				
	Cyclic, r-lactams, dilute solution	-5.8K (s)	1001				

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 b. OH Bending and CO streed whensloris Primary alcoholis Secondary alcoholis Tertiary alcoholis Tertiary alcoholis Phenolis Phenolis AMIN'ES Amine zalts Amine zalts AMINE zalts 	Buig								
 Aminary alcohols Primary alcohols Secondary alcohols Tertiary alcohols Pheriols AMINES AMINES AMINES N-HI Stretching vibrajions Primary, free; one bands Secondary, free; one bands Innines (=>N-H); oper bands Amine salts B. N-H Bending vibrations 	F	•							
Primary alcoholt Secondary alcoholt Tertiary alcoholt Phetelt Phetelt AMINES a. N		•				•			
 Secondary alcohols Tertiary alcohols Phecols Phecols AMINES AMINES AMINES NH Stretching vibrations Primary, free: one band tonine calts b. NH Bending vibrations 			2.6-	3	-1050	CHARACTERISTIC INFRARED ABJOR THONS OF PUNCTION	STUD ANY		
 Secondary alcohols Tertiary alcohols Pheredis AMINES AMINES AMINES AMINES AMINES NH Steekhing vibrations Primary, free; two band Kmary B. NH Bending vibrations 		pue	£.1-3.7	Ξ;	0921-0001				
Tertlary alcohols Phereels AMINES a. NH Stretching vibragions Primary, free; two bands Secondary, free; one band tenines (==NH); one band Amine zalts Amine zalts b. NH Bending vibrations Primary		-	1.4-	ĒĒ	04C1-05U	Group	Range	Intensity	Range cm
Fricialy alconois Phericals AMINES a. N		2		:3	~1150				
Phecols AMINES a. N		hus	21-76	53	0161-0111	L. C-NO2 Nitro compounds:			
Phecols AMINES a. N	•			23	, international sector	aromatic	6.37-4.67	Ð	1570-150
AMI/VES a. N				13			01.1-01.1 bms	Ξ	1370-LX
AMINES a. N			0.1-1.1	2		aliphatic	Sr.3-628	Ξ	1570-151
 a. N			• •	•	.:- •		and, 7.25-7.30	E	11-0801
Primary, free; two bands Secondary, free; one band Imines (==N11); one, band Amine saits b. NH Bending vibrations Primary						5. O-NO ₃ , Nitrates	6.06 6.15	: E	1630-16
Secondary, free: one band l'unines (=N-11); one band Amine zalts b. N-H Bending vibrations Primary		•	-7-80 -7-80				Md 7.70-5.0	3	1300-12
Secondary, freet one band Imines (=N-11): one band Amine saits b. N-H Bending vibrations Primary		puz	3	Ē	Bri	h. C-NO, Nitroso compounds	6.25-6.67	(3)	1600-15(
laines (=N-H); sae,band Amine zeits b. N-H Bending vibrations Peimury	•		1,86-3.02.	Ē	0100-0050	i. O-NO. Nitrites	XU Y- 3 9 5 - 4 0X	3	1680-16
Amine salts b. NH Bending vibrations Primary		Ч.	294-3.03	(E)	34(0-3300		ILY I Y PUT	3	71-2-27
b. N-H Bending vibrations Primary		•	52-22	(E)	3130-3030	A HALOGEN COMPOLINDS CAN			
Primary			•		•		•	•	
Lunary			606-6.29	(m-s)	1650-1590			•	
			2 × × ×				7.1-10.0	છ	101-00+1
Secondary							12.5-16.6	E	89-83 83
Amine salts			2.0.9-62.0	3			16.6-20.0	T	8
	•	and.	-0.67	(3)	Bail	4. C-I	91	9	81
c. C-N Vibrations			•			S. SULFUR COMPOUNDS	.•.		•
Aromatic primary			7,46-6.00	Ξ.	1340-1250	a. S-H Stretching vibrations	115-112	(*)	2600-25
Aromatic secondary		••	7,41-7.81	Ξ	1350-1280	b. C-S Suerchine vibrations	x 33-9 52)3	1200-10
Anmatic tertiary	*	• •	7.36-7.64	E	1360-1310	c. San Stretching vibrations:			
. Gabair			\$.2-9.5	E	120-1020	entfortidae	0 12 0 11	141	10,00,10
summer		and		()	-1410.			23	
				•		Childrine	7. e-70. e	23	
. UNSATURATED NITROUEN		•					PAG 7.41-1.69	E)	1-0(1
SONDONDO			·			sunter	02.3-21.3	Ξ	
a. CEAN Succeling vibrations				•		•	12.00.1 bits	Ē	CI-001
Alkyl nitriles		•	9.T.Q	<u>e</u> .	2260-2240	sulfonyf.chlorides	1.44-6.59	(3)	1185-11
a A-Unsaturated alkyl nivikes		•••	4,47-451	Ē	sizz-strz		34.1-01.7 bas	3	1370-13
- And nitriles			05794.7	Ē	224042220		1.41-1.77	3	
	•		8 T 9 T	Ē	227552240	•	141-15, bas	Э	1350-13X
Transaldar		•	130-4.51	(E)	1110-1010	· sulfonie acide.	8.27.4.70	3	11-0121
							0.41.471	ЭЭ	1050-10
			•		•		indiana pari	23	
		••	01 97 65	(A)	1690-1640				
		•	6.02-6.14	E	1660-1630	f Abbreviations: s m strong, m m medium, w in west, v m	e řichtk, b = braid	ah = then	
		•				= approximately	••••		
CN-K-N- SUCCEPTUE AUMENT		•	AL A. 14 2.	(n).	572140681				
aza compounds		.: :							
d NHCHN- Sircician Vion	"STUDIN	•		. ie.	1111-1111				
dimides.				33			t		
e Na Stielching wibrations, and	: •		4.01-10.4	2	N717-0017		·		

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Proton Chemical Sh officially approved d	ilts (Values are given scale; T = 10.00 - 8	on the	ęł				
N	ethyl	Methylene	Methine	Substituent Group	-Methyl Protons	Metaylche Protons	Proton
Substituent Group	otons	Protons	Preton -	HC-F	4.25	4.50	4.80
HC-C-CH,	.95	1.20	1.55	HC-NO2	054	122 No. 1 122	4,60
HC-C-NR,	20.	1.45	1.70	Curlimmane	••	0.20	070
HC-C-C=C	8	1.35	1.70	Cyclobutane		2.45	
HC-C-C=0	05	1.55	1.95	Celorentere			
HC-C-NRAr	10	1.50	1.80	Cyclohexane		1.50	.1.80
HC-C-NH(C=O)R	.10	1.50	. 16,1:	Cyclohentane		1.25	
HC-C-(C=O)NR ₂	10	1.50	1.80				
HC-C-(C=0)Ar		1.55	06.1	Substituent Group	Proton Shift	Substituent Group	Proton Shift
HC-C-(C=0)OR	.15	1.70	061				
HC-C-Ar	-15	1.55	1.80	HUEUH	326	HO-C-O	<u>-</u>
HC-C-OII (and OR)	.20	1.50	1.75			HO-CO-	
HC-C-C=CR	20	1.50	1,80				y y
HC-C-CHN	1.25	1.65	2.00		22		
HC-C-SR	F	1.60	1.90		07"/		
HG-C-OAr	30	55.1	00 6	HCU-O	8 .1		0.0-0.1
HC-C-O(C=O)R	30	V.		HCO-R	9.4-10.0	HS-K	1
HC-C-SH	U.C.	1 20.		HCO-Ar	2.01-1.9	N-NH"	ļ
HC-C-CS=OIF and -SO.B.				HQ-N=C(oxime)	9-12	HN-R	22.0
		c/ 1	. co.z	•			
						 , *	
		1.80	1.95	•	•		
HC-C-O(C=O)AL	.65	1.75	1.85	•			÷
HC-C-Br	-80·	1.85	06.1	1040	and the first of the factor	معتاداته الماسية المسالم المسالم المسالم	t TUC)
BC-CH,	.90	1.30	1.50		tuncin' sum o' i sunc	BILEN DI ITE O SERIE TENTINE	. ('041 01
HC-C=C	.60	2,05	•				
HC-CEC	(.70	2.20	2.80	Soft of the second s	Armites	Secondary Jetjus	
HC-(C=0)OR (and NR3)	2,00	2.25	2.50	substitution of the second	Carbon	Carbon	
HC-SR	2.05	2.55	3.00				
HC-0-0	2.10	. 2.30.	2.55	Alkener			
HC-(C=0)R	2,10	2,35	2.65				0/ 01 00
HC-CHN	2.15	2.45	2 90	2:	40 to 00	40 10 /0 10	1010 63
OHD TO THE	2.20	2.40			20 to 45	40 to to 60 50 to 70	65 to 75
HC-Ar (and NR.).	220	27 6	200	<u>ې</u>	10 to 30	25 to 45 40 to 55	55 to 70
HC-SSR	2			C-Halide	-37 to 35	-10 to 45 30 to 65	35 to 75
HC-(C=0)Ar	40	2.20	02.5	•	6) 5)	(j) (c) (c) (j) (c)	<u>ලි</u> දි
HC-SAI	.04					والمراجعة والمراجع والم	
HC-NRAL	2.60			Alkynes .	70 to 100	Isocyanides	130 to 150
HC-SO-R and -(SO)R				Alkenes	110 to 150	Carbonates.	150 to 160
HC-H				Aromatics	110 to 135	. Oximes	155 to 165
		04.0	4.10	C-substituted	125 to 145	Ureas	150 to 170
		2.10	3.60	Heteroaromatics	115 to 140	Thiourese	165 to 185
		. 3.35	3.85		115 40 155	Feters A shudrides	150 40 175
	50°	.3 . 45	4:05			a milder	
HC-OH and -OR	1.20	3,40	3.60	cy anales	071 01 COT	Vinides	
HC-NH2	50	-3.75	4.05	Bocyanates	112 (0 135	Acids, Acyl chlorides	160 10 185
HC-0(C=0)R	1,65	4.10	201	I mocyanates	110 to 120	Aldehydes	175 to 205
HC-OAr	.80	4 00	A KN	Isothiocyanates .	120 to 140	. Ketones	175 to 225
HC-O(C=0)Ar	. 80	06.7		.Cyanides	110 to 130		•

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Туре	J. cjis	Турс	J. cps
Hat	280)c-cii-cii-c	9-13
CH.t	12.4	HC=CH+	9.1
, n	12-15	CII-C≡C-II	2-3-
์ ัพ		Н	••• • •
CH-CI	2 9	CH-C	1-3
-C-(-C-)C-	0	N. II	
i i i		· ⊂=C	6-8
$CH_{T}-CH_{2}-X$	6.5-7.5	Č	
CH.			a- 6-9
	2.2-1.0	\bigcirc	m- 1-3
	C_{i} :		p= 0-1
	a.a 5-10		
[-C-C-11	a.c 2-4		«B1.6-2.0
2 Å : 3	e.e 2-4		4/5 U.U~1,U
11		. 0.	<i>KR</i> 3.2-3.8
C=.C	0,5-3	х	
41 -			\$82.0-2.6
	712	$\langle Q \rangle$	AF 1.5-2.2
and the second sec			aa 1.8-2.3
	· • • • • •		<u> f 2:8-4.0</u>
	13-18		
и Н			aft-1.6-5.8
Cel C	4.10		a/F 1.0-1,8
		S S	-HA-10.43
i i i			
2-11	a tath (af 4.9-5.7
('='C'	0.5-2.5		ay 1.6-2.6
Hand a state a second	a nate in the second in an		·/ 0.7 1.1
	24		nn 0.2-0.5
CmiC	-0	17.	By 7.2-8.5
			BB 1.4-1.9

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Conjugated dienes & Trienes, Solve	ent: Ethanol
Parent value for Butadiene system	217 nm
or acyclic conjugated diene	
Acyclic triene	245 nm
Homoannular conjugated diene	253 nm
Hetroannular conjugated diene	215 nm
Increment for	each substituents
Alkyl substituents or ring residue	5 nm
Exocyclic double bond	5 nm
Double bond extending conjugation	30 nm
Auxochrome	
-OR	+6 nm
-SR	+30 nm
-Cl, -Br	+5 nm .
NR ₂	+60 nm
-OCOCH3	0
Woodward Fieser rules for a B-uns	saturated carbonyl compounds:-
a) Parent values	
αβ-unsaturated acyclic or six	215 nm
membered ketone	
αβ-unsaturated five membered ring	202 nm
ketone	
αβ-unsaturated aldehyde	207 nm
b)Increments	
i) Each alkyl substituents or ring 1	esidue
A A L LA LANADATATATATA	ETA min and a

a) Parent values		•	
αβ-unsaturated ac	yclic or six	215 nm	
membered ketone	÷ • •		
αβ-unsaturated fi	ve membered ring	202 nm	
ketone	·	••••	<u>.</u>
αβ-unsaturated a	ldehyde	207 nm	•
b)Increments		-1.	
i) Each alkyl sub	stituents or ring r	esidue	ي مي ماهر ما الإستار الم المالي المراجع المالي المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع الم
At a position		10 nm, 35.200	
At β position	2	12 nm	- •
At gamma and his	cher position	18 nm.	
ii) Each exocyclie	c double bond 🕐	5 nm:	• jæj
iii) Double bond	extending	30 nm	•
conjugation			
'iv) Homoannula	r conjugated	39 nm	•
diene		<u>.</u>	
Auxochromes	Positio	ons	· · · · · · · · · · · · · · · · · · ·
 A strain management of the second seco	α	β	gamma
-OH	35	30	50
-OR	35	30	17
-SR	·	85	
-0COCH,	6	6	6
-Cl	15	12	-
-Br	25 [.]	30 <u>.</u>	
-NR ₂	÷-	.95	

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