

LAMPIRAN D3



PENYEMAKAN KERTAS SOALAN PEPERIKSAAN
Proof-reading of Examination Question Paper

Untuk Kegunaan Seksyen Peperiksaan dan Pengijazahan	
Nombor Sampul	
Tarikh Peperiksaan	
Sesi Peperiksaan	PAGI / PETANG

Gunakan satu proforma untuk satu kertas soalan peperiksaan.
Use separate proforma for each Question Paper

Kepada : Ketua Penolong Pendaftar
Seksyen Peperiksaan dan Pengijazahan

SAYA/KAMI TELAH MENYEMAK SALINAN-SALINAN KERTAS SOALAN PEPERIKSAAN BERTAIP YANG DISEBUTKAN DI BAWAH INI :

I/We have checked the typed copies of the Examination Paper stated below :

Kod Kursus : EBP 103 / 3 Tajuk Kursus : Kimia Organik Polimer
Course Code Course Title Polymer Organic Chemistry

Jangka Masa Peperiksaan : 3 Jam Bilangan Muka Surat Bertaip : 9+1 Muka Surat Bilangan Soalan Yang Perlu Dijawab : 5 Soalan
Duration of Examination Hours Number of typed pages Pages Number of questions required to be answered Questions

Soalan-soalan dijawab atas : Questions to be answered in : Sila (✓) Please (✓)	BUKU JAWAPAN Answer Book	OMR OMR Form	JAWAB DALAM KERTAS SOALAN Answer In Question Paper
	✓		

DENGAN INI DISAHKAN BAHAWA KERTAS SOALAN PEPERIKSAAN INI ADALAH TERATUR, BETUL DAN SEDIA UNTUK DICETAK.

Certified that this question paper is in order, correct and ready for printing.

Nama Pemeriksa : Razaim Mat Taib Tandatangan : [Signature] Tarikh : 20/10/2016
Name of Examiner(s) Signature Date
Huruf Besar CHOW WEN SHYANG
In Block Capitals

Tandatangan dan Cop Rasmi : [Signature] Tarikh : 4/11/16
DEKAN/PENGARAH : PROFESOR DR. ZUHAILAWATI HUSSAIN Date
Signature and Official Stamp P. Peng. Kej. Bahan & Sumber Mineral
Dean/Director Kampus Kejuruteraan
Universiti Sains Malaysia

NOTA : Pemeriksa-pemeriksa yang menyediakan kertas soalan peperiksaan adalah bertanggungjawab atas ketepatan isi kandungan kertas soalan peperiksaan berkenaan.
NOTE : Accuracy of the contents of the question paper is the responsibility of the Examiner(s) who set the question paper.

PART A / BAHAGIAN A

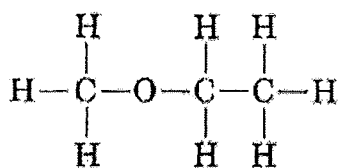
1. [a] What is the difference between chain-growth polymerization and step-growth polymerization?

Apakah perbezaan antara pempolimeran rantai dan pempolimeran langkah?

(50 marks/markah)

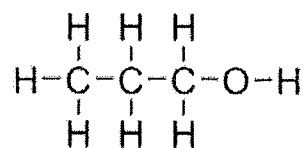
- [b] Ethyl methyl ether has a boiling point of 11°C, and n-propyl alcohol has a boiling point of 97°C. Explain this large difference (86°C) in boiling points for these two isomers.

Etil metil eter mempunyai takat didih 11°C dan n-propil alkohol mempunyai takat didih 97°C. Terangkan perbezaan besar (86 °C) bagi takat didih dua isomer ini.



ethyl methyl ether

Etil metil eter



n-propyl alcohol

n-propil alkohol

(50 marks/markah)

- [b] "Dry isobutylene is unaffected by dry boron trifluoride but polymerization occurs immediately when trace amounts of water are added". Explain.

"Isobutilena kering adalah tidak dipengaruhi oleh boron trifluorida kering tetapi pempolimeran berlaku dengan serta merta apabila sedikit air ditambahkan". Jelaskan.

(40 marks/markah)

4. [a] Discuss on ring opening polymerization of lactone.

Bincangkan pempolimeran pembukaan-gelang bagi lakton.

(40 marks/markah)

- [b] Write and explain the chemical reaction for the synthesis of melamine-formaldehyde resins.

Tulis dan jelaskan tindakbalas kimia untuk sintesis bagi resin melamina-formaldehid.

(60 marks/markah)

6. [a] Explain why free-radical chlorination of 2,2-dimethylbutane gives 3 isomeric products (Figure 1). Calculate the proportion (in percentage) for each product. The rate of abstraction of hydrogen atoms follows the sequence $3^\circ > 2^\circ > 1^\circ$. At room temperature, the relative rates (abstraction) per hydrogen atom are 5.0 : 3.8 : 1.0.

Terangkan mengapakah pengklorinan radikal bebas 2,2-dimetilbutana menghasilkan 3 produk isomer (Rajah 1). Kirakan pembahagian (dalam peratusan) bagi setiap produk. Kadar penyingkiran atom hidrogen mengikut turutan $3^\circ > 2^\circ > 1^\circ$. Pada suhu bilik kadar relatif (penyingkiran) setiap satu atom hidrogen adalah 5.0 : 3.8 : 1.0.

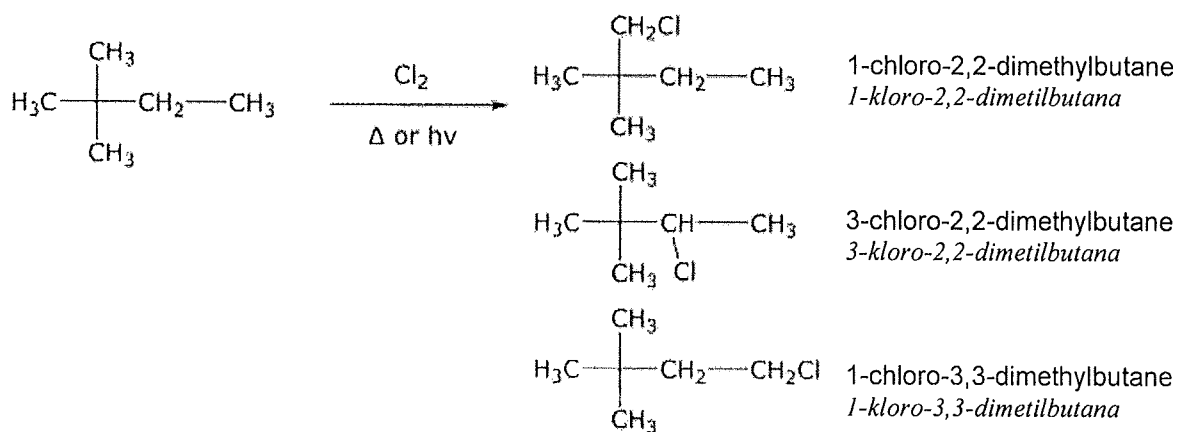


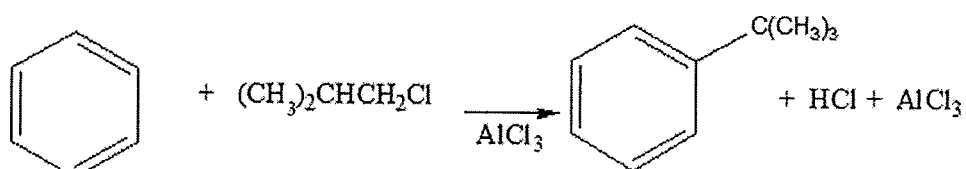
Figure 1. Chlorination of 2,2-dimethylbutane.

Rajah 1. Pengklorinan 2,2-dimetilbutana

(50 marks/markah)

7. [a] Draw and briefly describe the mechanism for the following reaction.

Lukis dan jelaskan secara ringkas mekanisme tindak-balas berikut.



(50 marks/markah)

APPENDIX 1

LAMPIRAN 1

CHARACTERISTIC INFRARED ABSORPTION BANDS OF FUNCTIONAL GROUPS

Class of Compounds	Absorption, cm ⁻¹	Intensity	Assignment	Class of Compounds	Absorption, cm ⁻¹	Intensity	Assignment		
Alkanes and Alkyls	2850-3000	s	C-H stretch	Carboxylic Acids	2500-3500	s, broad	O-H stretch		
	1450-1470	s	C-H bend		R-C(O)-OH	1710-1715	s, broad	C=O stretch	
	1370-1390	m	CH ₃ C-H bend		C=C-C(O)-OH or Ar-C(O)-OH	1680-1710	s	C=O stretch	
	1365 + 1395 (two bands)	m	-CH(CH ₃) ₂ or -(CH ₃) ₃ bend	Esters	aliphatic 1160-1210 acetates ~1240	s-vs	O=C-O-C stretch		
	715-725	w	-(CH ₂) _n bend		aromatic 1250-1310				
Alkenes	3020-3140	w-m	=C-H stretch	R-C(O)-O-R	1735-1750	s	C=O stretch		
	1640-1670	vw-m	C=C stretch	C=C-C(O)-O-R or Ar-C(O)-O-R	1715-1730	s	C=O stretch		
	RCH=CH ₂	m + s	=C-H bend	R-C(O)-O-Ar	1760-1790	s	C=O stretch		
	(two bands)			Acyl Chlorides					
	RR'C=CH ₂	s	=C-H bend		R-C(O)-Cl	1785-1815	s	C=O stretch	
<i>cis</i> -RCH=CHR'	665-730	m-s, broad	=C-H bend	Ar-C(O)-Cl	1770-1800	s	C=O stretch		
<i>trans</i> -RCH=CHR'	960-980	s	=C-H bend	Anhydrides					
RCH=CR'R''	790-840	s	=C-H bend		R-C(O)-O-C(O)-R	~1750 + ~1815	s,s	C=O symmetric	
					Ar-C(O)-O-C(O)-Ar	~1720 + ~1775 (both two bands)	s,s	& asym. stretch	
Alkynes				Nitriles					
	R-C≡C-H	3265-3335	s, sharp		≡C-H stretch	R-C≡N	2240-2260	m-s	C≡N stretch
		2100-2140	m		C≡C stretch	C=C-C≡N or Ar-C≡N	2220-2240	s	C≡N stretch
	610-700	s, broad	≡C-H bend	Amines					
R-C≡C-R'	2190-2260	vw-w	C≡C stretch		R-NH ₂	~3400 + ~3500 (two bands)	w	N-H symmetric & asym. stretch	
						1580-1650	w-m	N-H bend	
Alkyl halides				RR'N-H	3310-33350	w	N-H stretch		
	R-F	1000-1350	vs	C-F stretch	Amides				
	R-Cl	750-850	s	C-Cl stretch		R-C(O)-NH ₂	3200-3400 and 3400-3500 (two bands)	w-m	N-H symmetric & asym. stretch
	R-Br	500-680	s	C-Br stretch			1650-1690	s, broad	C=O stretch
	R-I	200-500	s	C-I stretch		1590-1655	m-s	N-H bend	
				R-C(O)-NH-R	3400-3500	w-m	N-H stretch		
Alcohols					1640-1690	s, broad	C=O stretch		
	C=C-CH ₂ -OH	3300-3400	s, broad	O-H stretch		1510-1560	m-s	N-H bend	
	R-CH ₂ -OH (1°) or C=C-CH(R)-OH	1035-1050	m-s	C-O stretch	R-C(O)-NR'R''	1630-1680	m-s	C=O stretch	
	RR'CH-OH (2°) or C=C-CRR'-OH	1050-1085	m-s	C-O stretch	Nitro Compounds				
	RR'R''C-OH (3°)	1085-1125	m-s	C-O stretch		R-NO ₂	~1550 and ~1370	s	N-O symmetric & asym. stretch
Ar-O-H	1125-1205	m-s	C-O stretch	C=C-NO ₂ or Ar-NO ₂		~1525 and ~1335 (both two bands)	s	N-O symmetric & asym. stretch	
	1180-1260	m-s	C-O stretch	Aromatic Compounds					
Ethers					3010-3100	m	Ar C-H stretch		
	R-O-R'	1085-1150	s		C-O-C stretch	1450-1600	m-s	ring C=C stretch	
Ar-O-R	1020-1075 and 1200-1275 (two band)	m-s	=C-O-C sym. & asym. stretch	(two to four bands)	sharp				
Aldehydes				monosubstituted	730-770 and 690-710 (two bands)	s	C-H bend		
	R-CH=O	2700-2725	m	H-C=O stretch					
	C=C-CH=O or Ar-CH=O	1720-1740	s	C=O stretch	<i>o</i> -disubstituted	735-770	s	C-H bend	
	1685-1710	s	C=O stretch	<i>m</i> -disubstituted	750-810 and 690-710	s	C-H bend		
Ketones				<i>p</i> -disubstituted	810-840	s	C-H bend		
	RR'C=O	1710-1720	s	C=O stretch					
	C=C-C(O)-R	1665-1685	s	C=O stretch					
	Ar-C(O)-R	1675-1695	s	C=O stretch					
	four member cyclic	1770-1780	s	C=O stretch					
	five member cyclic	1740-1755	s	C=O stretch					
six member cyclic	1710-1720	s	C=O stretch						

Intensity abbreviations: vw = very weak, w = weak, m = medium, s = strong, vs = very strong