

recrystallized from benzene. The colorless crystals (16.7 g., 89% yield) melted at 139.0–140.0° (uncorr.).

Anal. Calcd. for $C_{18}H_{30}ClNO_5$: C, 57.52; H, 8.04; Cl, 9.42; N, 3.73. Found: C, 57.39; H, 8.15; Cl, 9.45; N, 3.83.

4-(*N,N*-Diethylamino)butyronitrile (V). Condensation of 4-bromobutyronitrile with diethylamine yielded 89% V; it distilled at 100–102°/22 mm., n_D^{20} 1.4334, in accordance with the literature.⁹

4-(*N,N*-Diethylamino)butylamine (VI). Lithium aluminum hydride reduction of V yielded 86% VI; it distilled at 86–87°/22 mm., n_D^{20} 1.4425, in accordance with the literature.¹⁰

N-[4-(*N',N'*-Diethylamino)butyl]-3,4,5-trimethoxybenzamide (VII). The acid chloride (*loc. cit.*) of 3,4,5-trimethoxybenzoic acid (10.6 g., 0.050 mole) was dissolved in 300 ml. of dry benzene, and a solution of 7.2 g. (0.050 mole) of VI in 100 ml. of dry benzene was added dropwise with continuous stirring; the temperature of the reaction mixture was maintained at 29–34°. Subsequently, the reaction mixture was refluxed for 3 hr. The benzene was removed under reduced pressure. The semisolid residue was treated with saturated aqueous sodium carbonate, and the base was extracted with ethyl ether. The ethereal solution was dried over anhydrous sodium sulfate, filtered; upon removal of the solvent 11.4 g. (68% yield) of the crude base remained behind. The pure compound distilled at 223.0–224.0°/0.20–0.25 mm. and melted at 68.0–69.0° (uncorr.).

Anal. Calcd. for $C_{18}H_{30}N_2O_4$: C, 63.88; H, 8.94; N, 8.28. Found: C, 63.78; H, 8.97; N, 8.33.

Attempts to prepare the crystalline hydrochloride of this compound proved unsuccessful.

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4-Pyridylhydantoins¹

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Three hydantoins carrying 4-pyridyl substituents have been prepared for testing as possible anti-convulsants. This completes a series of pyridylhydantoins, the first members of which were reported previously.^{2,3} The corresponding alkyl pyridyl ketones were prepared as intermediates. Methyl-4-pyridyl ketone was prepared by a Claisen condensation of ethyl isonicotinate and ethyl acetate according to the procedure of Kolloff and Hunter.⁴ Ethyl 4-pyridyl ketone and *n*-hexyl 4-pyridyl ketone could only be obtained in small yield and in

impure state by the action of alkyl halides on the sodium derivative of ethyl isonicotinoyl acetate, the Claisen condensation product. This agrees with the observation of Burrus and Powell.⁵

All three ketones were prepared in satisfactory yield by the action of the proper Grignard reagent on 4-cyanopyridine. The hydantoins were prepared by the method used in the previous reports.

EXPERIMENTAL⁶

4-Cyanopyridine. This was prepared from isonicotinic acid, ammonium acetate and acetic acid by the method used by Adkins⁷ for the preparation of the 3-isomer, b.p. 185–190°, m.p. 76–79°.

Methyl 4-pyridyl ketone. Claisen condensation of methyl or ethyl isonicotinate with ethyl acetate gave a product which was contaminated with unreacted ester, as shown by its infrared spectrum. It was necessary to reflux the ketone for several hours with 10% HCl to obtain a pure product. The addition of an ether solution of 4-cyanopyridine to a cold solution of methyl magnesium iodide gave the ketone in 50% yield, b.p. 105–107° at 20 mm., n_D^{20} 1.5254; phenylhydrazone, m.p. 148–149° (reported⁸ 150°); picrate, m.p. 129.5–130° (reported⁸ 129–130°).

Ethyl 4-pyridyl ketone. No record of the preparation of this compound in a pure state could be found in the literature. It was prepared from 4-cyanopyridine and ethyl magnesium bromide. In the case of both the methyl and the ethyl ketones careful fractionation was required to remove unreacted 4-cyanopyridine. The yield of the ethyl ketone was 51%, b.p. 104–106° at 10 mm., n_D^{20} 1.5199; phenylhydrazone, m.p. 140–142; picrate, m.p. 125.5–126.5°.

Anal. Ketone, calcd. for C_8H_9ON : N, 10.37. Found: N, 10.58.

Hexyl 4-pyridyl ketone. This ketone was prepared by the same procedure, using *n*-hexylmagnesium chloride, in a yield of 44%, b.p. 124–125° at 3 mm., n_D^{20} 1.4996; phenylhydrazone, m.p. 154.0–155.5°; picrate, m.p. 106.5–107.5°.

Anal. Ketone, calcd. for $C_{12}H_{17}ON$: C, 75.35; H, 8.96. Found: C, 75.17; H, 8.82.

Hydantoins. The hydantoins were prepared by the reaction of the ketones with KCN and $(NH_4)_2CO_3$ following the procedure used previously.²

TABLE I
5-ALKYL-5-PYRIDYLHYDANTOINS

Alkyl Group	M.P.	%C		%H		Yield, %
		Calcd.	Found	Calcd.	Found	
Methyl	234.5–235.5	56.53	56.54	4.75	4.89	88
Ethyl	181.5–183.0	58.52	58.30	5.40	5.45	82.5
<i>n</i> -Hexyl	146.0–147.0	64.34	64.40	7.33	7.57	86

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