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# 3-Acetyl-6-chloro-1-ethyl-4-phenylquinolin-2(1*H*)-one

**R. Subashini,[a] Venkatesha R. Hathwar,[b] T. Maiyalagan,[a] G. Ganesh Kumar Reddy[a] and F. Nawaz Khan[a]***

[a]Chemistry Division, School of Science and Humanities, VIT University, Vellore 632 014, Tamil Nadu, India, and [b]Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore 560 012, Karnataka, India
Correspondence e-mail: nawaz_f@yahoo.co.in

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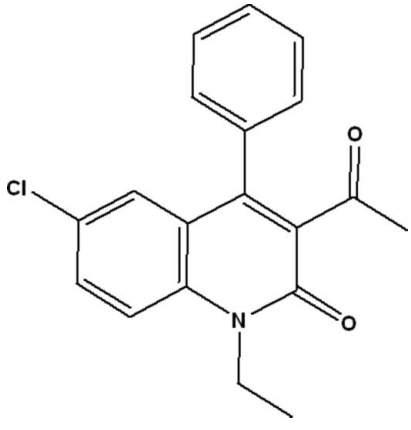
Key indicators: single-crystal X-ray study; $T$ = 290 K; mean $\sigma$(C–C) = 0.003 Å; $R$ factor = 0.040; $wR$ factor = 0.106; data-to-parameter ratio = 14.6.

In the title compound, $C_{19}H_{16}ClNO_2$, the dihedral angle between the plane of the phenyl substituent and 3-acetylquinoline unit is 75.44 (5)°. The crystal structure is stabilized by intermolecular C—H···O hydrogen bonds

## Related literature

For general background to isoquinolines, see: Broadhurst *et al.* (2001); Behrens (1999); Broadhurst (1991); Chao *et al.* (1999); Cobet & Luckner (1971); Kametani (1968); Lamberton & Price (1953); Majumdar & Mukhopadhyay (2003); Nayar et al. (1971); Storer et al. (1973); Yong et al. (2001). For related crystal structures, see: Yang et al. (2008); Choudhury & Guru Row (2006); Choudhury et al. (2002); Hathwar et al. (2008); Cho et al. (2002); Manivel et al. (2009).




## Experimental

### Crystal data

$C_{19}H_{16}ClNO_2$
$M_r$ = 325.78
Monoclinic, $P2_1/c$
$a$ = 9.6480 (8) Å
$b$ = 17.5756 (11) Å
$c$ = 9.9694 (7) Å
$\beta$ = 103.245 (8)°
$V$ = 1645.5 (2) Å$^3$
$Z$ = 4
Mo $K\alpha$ radiation
$\mu$ = 0.24 mm$^{-1}$
$T$ = 290 K
0.21 × 0.16 × 0.15 mm

### Data collection

Oxford Xcalibur Eos(Nova) CCD detector diffractometer
Absorption correction: multi-scan (*CrysAlisPro RED*; Oxford Diffraction, 2009)
$T_{min}$ = 0.925, $T_{max}$ = 0.965
21440 measured reflections
3061 independent reflections
1928 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.052

### Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.040
$wR(F^2)$ = 0.106
$S$ = 0.95
3061 reflections
210 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.16 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.27 e Å$^{-3}$

**Table 1**
Hydrogen-bond geometry (Å, °).

| $D$—H···$A$ | $D$—H | H···$A$ | $D$···$A$ | $D$—H···$A$ |
|---|---|---|---|---|
| C15—H15···O1$^{i}$ | 0.93 | 2.58 | 3.341 (2) | 139 |
| C7—H7···O2$^{ii}$ | 0.93 | 2.70 | 3.340 (2) | 126 |

Symmetry codes: (i) $x, -y+\frac{3}{2}, z-\frac{1}{2}$; (ii) $x+1, y, z$.

Data collection: *CrysAlisPro CCD* (Oxford Diffraction, 2009); cell refinement: *CrysAlisPro CCD*; data reduction: *CrysAlisPro RED* (Oxford Diffraction, 2009); program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *CAMERON* (Watkin *et al.*, 1993); software used to prepare material for publication: *WinGX* (Farrugia, 1999).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: BT2983).

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# supporting information

*Acta Cryst.* (2009). E**65**, o1800–o1801 [doi:10.1107/S1600536809024830]

## 3-Acetyl-6-chloro-1-ethyl-4-phenylquinolin-2(1*H*)-one

**R. Subashini, Venkatesha R. Hathwar, T. Maiyalagan, G. Ganesh Kumar Reddy and F. Nawaz Khan**

### S1. Comment

2-quinolinone is an important biosynthetic (Cobet *et al.*, 1971) and synthetic (Majumdar *et al.*, 2003; Yong *et al.*, 2001) precursor of quinoline alkaloids. Methylated compounds like 4-methoxy-1-methyl-2-quinolinone, folimine, 4,6-dimethoxy-1-methyl-2-quinolinone and 4,7,8-trimethoxy-1-methyl-2-quinolinone are widely distributed in nature (Nayar *et al.*, 1971; Lamberton *et al.*, 1953; Storer *et al.*, 1973). Due to the importance of these derivatives (Broadhurst *et al.*; 2001; Behrens, 1999; Broadhurst, 1991; Chao *et al.*, 1999; Kametani *et al.*, 1968) and in continuous of our interest in quinolines and isoquinolines (Choudhury & Guru Row 2006; Choudhury *et al.*, 2002; Hathwar *et al.*, 2008; Cho *et al.*, 2002; Manivel *et al.*, 2009) we report here crystal structure of the title compound.

All the bond lengths are within normal ranges in the title compound. The two carbonyl O atoms participate in intermolecular C—H···O hydrogen bonding resulting the close packing of the crystal structure in the unit cell (Figure 2).

### S2. Experimental

The solution of 3-acetyl-6-chloro-4-phenylquinolin-2(1*H*)-one in DMF was treated with ethylbromide and K2CO3 taken in DMF and stirred at RT for 4hr. The reaction contents were poured in crushed ice and solid otanined was filtered, dried. Single-crystals were obtained by recrystallization from petrol ether and ethylacetate solvent mixture.

### S3. Refinement

All H atoms were positioned geometrically and refined using a riding model with bond lengths C—H are 0.93 Å (for aromatic), 0.97 Å (for methylene) and 0.96 Å (for methyl). The $U_{iso}$(H) = 1.5$U_{eq}$(C) for methyl and $U_{iso}$(H) = 1.2$U_{eq}$(C) for all other carbon bound H atoms.

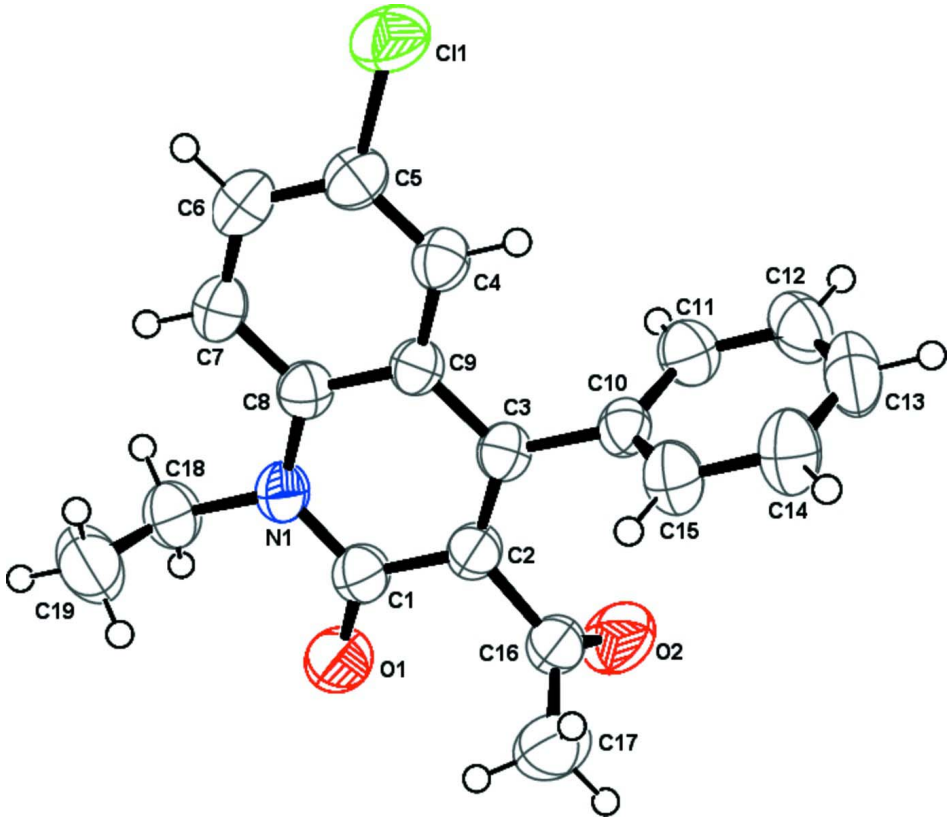


**Figure 1**

*ORTEP* diagram of molecule (I) with 50% probability displacement ellipsoids with atom labelling.

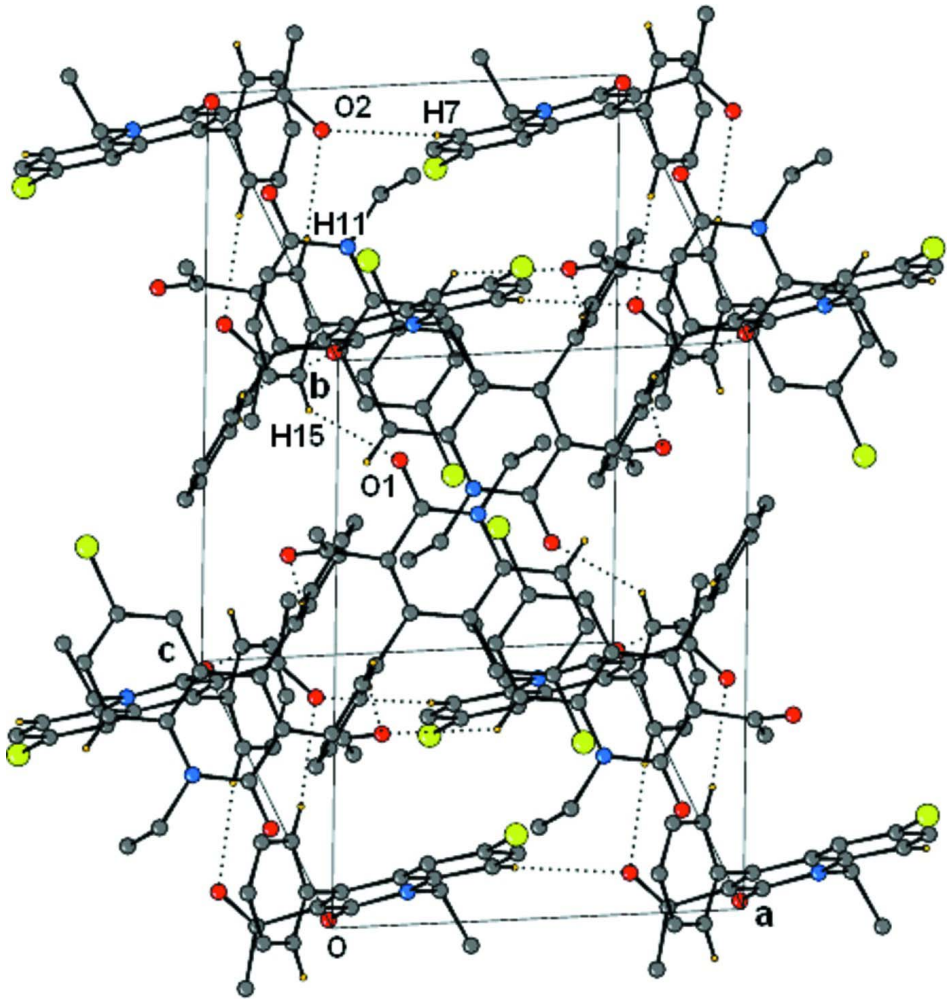


**Figure 2**

The crystal packing diagram of (I).The dotted lines indicate intermolecular C—H···O hydrogen bonds. All H atoms have been omitted for clarity.

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*Crystal data*

$C_{19}H_{16}ClNO_2$
$M_r = 325.78$
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$c = 9.9694\ (7)$ Å
$\beta = 103.245\ (8)°$
$V = 1645.5\ (2)$ Å$^3$
$Z = 4$

$F(000) = 680$
$D_x = 1.315$ Mg m$^{-3}$
Mo $K\alpha$ radiation, $\lambda = 0.71073$ Å
Cell parameters from 1023 reflections
$\theta = 1.7–20.6°$
$\mu = 0.24$ mm$^{-1}$
$T = 290$ K
Block, colorless
0.21 × 0.16 × 0.15 mm

*Data collection*

Oxford Xcalibur Eos(Nova) CCD detector diffractometer
Radiation source: Enhance (Mo) X-ray Source
Graphite monochromator
$\omega$ scans
Absorption correction: multi-scan (*CrysAlis RED*; Oxford Diffraction, 2009)
$T_{min}$ = 0.925, $T_{max}$ = 0.965
21440 measured reflections
3061 independent reflections
1928 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.052
$\theta_{max}$ = 25.5°, $\theta_{min}$ = 3.1°
$h$ = −11→11
$k$ = −21→21
$l$ = −12→12

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.040
$wR(F^2)$ = 0.106
$S$ = 0.95
3061 reflections
210 parameters
0 restraints
Primary atom site location: structure-invariant direct methods
Secondary atom site location: difference Fourier map
Hydrogen site location: inferred from neighbouring sites
H-atom parameters constrained
$w = 1/[\sigma^2(F_o^2) + (0.0592P)^2]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.001
$\Delta\rho_{max}$ = 0.16 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.27 e Å$^{-3}$

*Special details*

**Geometry**. All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

**Refinement**. Refinement of $F^2$ against ALL reflections. The weighted $R$-factor $wR$ and goodness of fit $S$ are based on $F^2$, conventional $R$-factors $R$ are based on $F$, with $F$ set to zero for negative $F^2$. The threshold expression of $F^2 > \sigma(F^2)$ is used only for calculating $R$-factors(gt) *etc*. and is not relevant to the choice of reflections for refinement. $R$-factors based on $F^2$ are statistically about twice as large as those based on $F$, and $R$- factors based on ALL data will be even larger.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²)*

| | $x$ | $y$ | $z$ | $U_{iso}$*/$U_{eq}$ |
|---|---|---|---|---|
| Cl1 | 0.51092 (6) | 1.05067 (3) | 0.20536 (6) | 0.0782 (2) |
| N1 | 0.35571 (15) | 0.79959 (8) | 0.53674 (14) | 0.0523 (4) |
| O1 | 0.18412 (15) | 0.72734 (8) | 0.59753 (16) | 0.0844 (5) |
| O2 | −0.11779 (16) | 0.83560 (9) | 0.49385 (18) | 0.0873 (5) |
| C1 | 0.2157 (2) | 0.78011 (11) | 0.52883 (19) | 0.0562 (5) |
| C2 | 0.10651 (18) | 0.82606 (9) | 0.43889 (18) | 0.0488 (4) |
| C3 | 0.13896 (17) | 0.88600 (9) | 0.36740 (17) | 0.0448 (4) |
| C4 | 0.32709 (19) | 0.96195 (10) | 0.29747 (17) | 0.0502 (4) |
| H4 | 0.2572 | 0.9916 | 0.2416 | 0.060* |
| C5 | 0.46684 (19) | 0.97641 (10) | 0.30238 (18) | 0.0527 (5) |
| C6 | 0.5726 (2) | 0.93221 (11) | 0.38284 (19) | 0.0585 (5) |
| H6 | 0.6677 | 0.9419 | 0.3845 | 0.070* |
| C7 | 0.53689 (19) | 0.87387 (10) | 0.46042 (18) | 0.0554 (5) |
| H7 | 0.6083 | 0.8443 | 0.5145 | 0.066* |
| C8 | 0.39405 (18) | 0.85855 (9) | 0.45869 (17) | 0.0467 (4) |
| C9 | 0.28714 (17) | 0.90307 (9) | 0.37541 (16) | 0.0434 (4) |

| | | | | |
|---|---|---|---|---|
| C10 | 0.02678 (17) | 0.93280 (9) | 0.27678 (17) | 0.0460 (4) |
| C11 | −0.0010 (2) | 1.00621 (10) | 0.3121 (2) | 0.0602 (5) |
| H11 | 0.0483 | 1.0266 | 0.3956 | 0.072* |
| C12 | −0.1019 (2) | 1.04958 (11) | 0.2237 (2) | 0.0705 (6) |
| H12 | −0.1209 | 1.0988 | 0.2485 | 0.085* |
| C13 | −0.1740 (2) | 1.02063 (13) | 0.1000 (2) | 0.0743 (6) |
| H13 | −0.2407 | 1.0503 | 0.0402 | 0.089* |
| C14 | −0.1473 (2) | 0.94779 (13) | 0.0647 (2) | 0.0736 (6) |
| H14 | −0.1972 | 0.9276 | −0.0186 | 0.088* |
| C15 | −0.0470 (2) | 0.90426 (11) | 0.15166 (19) | 0.0607 (5) |
| H15 | −0.0287 | 0.8551 | 0.1260 | 0.073* |
| C16 | −0.0442 (2) | 0.80120 (11) | 0.4330 (2) | 0.0571 (5) |
| C17 | −0.0962 (2) | 0.73258 (12) | 0.3491 (2) | 0.0816 (7) |
| H17A | −0.1914 | 0.7210 | 0.3567 | 0.122* |
| H17B | −0.0350 | 0.6903 | 0.3820 | 0.122* |
| H17C | −0.0960 | 0.7422 | 0.2543 | 0.122* |
| C18 | 0.4651 (2) | 0.75412 (11) | 0.6307 (2) | 0.0636 (5) |
| H18A | 0.4254 | 0.7340 | 0.7044 | 0.076* |
| H18B | 0.5445 | 0.7868 | 0.6718 | 0.076* |
| C19 | 0.5185 (3) | 0.68935 (11) | 0.5580 (3) | 0.0872 (7) |
| H19A | 0.4404 | 0.6567 | 0.5174 | 0.131* |
| H19B | 0.5880 | 0.6609 | 0.6231 | 0.131* |
| H19C | 0.5613 | 0.7091 | 0.4873 | 0.131* |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Cl1 | 0.0683 (4) | 0.0909 (4) | 0.0817 (4) | −0.0115 (3) | 0.0305 (3) | 0.0206 (3) |
| N1 | 0.0456 (9) | 0.0560 (9) | 0.0506 (9) | 0.0030 (7) | 0.0012 (7) | 0.0075 (7) |
| O1 | 0.0660 (10) | 0.0864 (10) | 0.0946 (11) | −0.0072 (8) | 0.0056 (8) | 0.0460 (9) |
| O2 | 0.0636 (10) | 0.0908 (11) | 0.1172 (13) | −0.0045 (8) | 0.0406 (10) | −0.0133 (9) |
| C1 | 0.0508 (12) | 0.0585 (12) | 0.0568 (11) | −0.0002 (9) | 0.0069 (9) | 0.0104 (10) |
| C2 | 0.0433 (10) | 0.0521 (10) | 0.0504 (10) | −0.0007 (8) | 0.0093 (8) | 0.0018 (9) |
| C3 | 0.0434 (10) | 0.0505 (10) | 0.0398 (9) | 0.0019 (8) | 0.0081 (8) | 0.0000 (8) |
| C4 | 0.0457 (11) | 0.0591 (11) | 0.0457 (10) | 0.0028 (9) | 0.0105 (8) | 0.0031 (9) |
| C5 | 0.0511 (12) | 0.0613 (11) | 0.0480 (10) | −0.0042 (9) | 0.0158 (9) | −0.0025 (9) |
| C6 | 0.0423 (11) | 0.0728 (13) | 0.0604 (12) | −0.0048 (10) | 0.0115 (9) | −0.0070 (10) |
| C7 | 0.0426 (11) | 0.0650 (12) | 0.0545 (11) | 0.0032 (9) | 0.0030 (9) | −0.0006 (10) |
| C8 | 0.0463 (11) | 0.0486 (10) | 0.0435 (10) | −0.0001 (8) | 0.0070 (8) | −0.0025 (8) |
| C9 | 0.0419 (10) | 0.0467 (10) | 0.0407 (9) | 0.0003 (8) | 0.0076 (8) | −0.0009 (8) |
| C10 | 0.0394 (10) | 0.0529 (11) | 0.0475 (10) | 0.0041 (8) | 0.0138 (8) | 0.0063 (8) |
| C11 | 0.0623 (13) | 0.0567 (12) | 0.0617 (12) | 0.0062 (10) | 0.0146 (10) | −0.0015 (10) |
| C12 | 0.0735 (15) | 0.0572 (12) | 0.0872 (16) | 0.0202 (11) | 0.0316 (13) | 0.0094 (12) |
| C13 | 0.0627 (14) | 0.0896 (16) | 0.0722 (15) | 0.0289 (12) | 0.0186 (12) | 0.0254 (13) |
| C14 | 0.0675 (14) | 0.0857 (15) | 0.0602 (13) | 0.0178 (12) | −0.0003 (11) | 0.0037 (12) |
| C15 | 0.0607 (13) | 0.0625 (12) | 0.0547 (12) | 0.0122 (10) | 0.0045 (10) | 0.0005 (10) |
| C16 | 0.0507 (12) | 0.0596 (12) | 0.0593 (12) | −0.0019 (10) | 0.0093 (10) | 0.0124 (10) |
| C17 | 0.0712 (15) | 0.0829 (15) | 0.0854 (16) | −0.0190 (12) | 0.0067 (12) | −0.0039 (13) |

| | | | | | | |
|---|---|---|---|---|---|---|
| C18 | 0.0598 (13) | 0.0666 (13) | 0.0579 (12) | 0.0084 (10) | 0.0002 (10) | 0.0159 (10) |
| C19 | 0.0915 (17) | 0.0672 (14) | 0.1005 (18) | 0.0208 (12) | 0.0172 (14) | 0.0104 (13) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Cl1—C5 | 1.7344 (18) | C10—C15 | 1.381 (2) |
| N1—C1 | 1.378 (2) | C11—C12 | 1.383 (3) |
| N1—C8 | 1.396 (2) | C11—H11 | 0.9300 |
| N1—C18 | 1.476 (2) | C12—C13 | 1.368 (3) |
| O1—C1 | 1.232 (2) | C12—H12 | 0.9300 |
| O2—C16 | 1.198 (2) | C13—C14 | 1.368 (3) |
| C1—C2 | 1.460 (2) | C13—H13 | 0.9300 |
| C2—C3 | 1.348 (2) | C14—C15 | 1.374 (3) |
| C2—C16 | 1.507 (2) | C14—H14 | 0.9300 |
| C3—C9 | 1.445 (2) | C15—H15 | 0.9300 |
| C3—C10 | 1.489 (2) | C16—C17 | 1.488 (3) |
| C4—C5 | 1.362 (2) | C17—H17A | 0.9600 |
| C4—C9 | 1.400 (2) | C17—H17B | 0.9600 |
| C4—H4 | 0.9300 | C17—H17C | 0.9600 |
| C5—C6 | 1.383 (3) | C18—C19 | 1.502 (3) |
| C6—C7 | 1.375 (2) | C18—H18A | 0.9700 |
| C6—H6 | 0.9300 | C18—H18B | 0.9700 |
| C7—C8 | 1.400 (2) | C19—H19A | 0.9600 |
| C7—H7 | 0.9300 | C19—H19B | 0.9600 |
| C8—C9 | 1.405 (2) | C19—H19C | 0.9600 |
| C10—C11 | 1.380 (2) | | |
| | | | |
| C1—N1—C8 | 122.28 (14) | C12—C11—H11 | 119.9 |
| C1—N1—C18 | 116.83 (15) | C13—C12—C11 | 120.54 (19) |
| C8—N1—C18 | 120.89 (15) | C13—C12—H12 | 119.7 |
| O1—C1—N1 | 121.27 (17) | C11—C12—H12 | 119.7 |
| O1—C1—C2 | 121.48 (17) | C12—C13—C14 | 119.54 (19) |
| N1—C1—C2 | 117.22 (16) | C12—C13—H13 | 120.2 |
| C3—C2—C1 | 122.30 (16) | C14—C13—H13 | 120.2 |
| C3—C2—C16 | 123.02 (16) | C13—C14—C15 | 120.4 (2) |
| C1—C2—C16 | 114.68 (15) | C13—C14—H14 | 119.8 |
| C2—C3—C9 | 118.67 (15) | C15—C14—H14 | 119.8 |
| C2—C3—C10 | 121.86 (15) | C14—C15—C10 | 120.67 (18) |
| C9—C3—C10 | 119.42 (14) | C14—C15—H15 | 119.7 |
| C5—C4—C9 | 120.94 (17) | C10—C15—H15 | 119.7 |
| C5—C4—H4 | 119.5 | O2—C16—C17 | 122.09 (19) |
| C9—C4—H4 | 119.5 | O2—C16—C2 | 120.83 (18) |
| C4—C5—C6 | 120.58 (17) | C17—C16—C2 | 117.08 (18) |
| C4—C5—Cl1 | 119.19 (15) | C16—C17—H17A | 109.5 |
| C6—C5—Cl1 | 120.23 (14) | C16—C17—H17B | 109.5 |
| C7—C6—C5 | 119.91 (17) | H17A—C17—H17B | 109.5 |
| C7—C6—H6 | 120.0 | C16—C17—H17C | 109.5 |
| C5—C6—H6 | 120.0 | H17A—C17—H17C | 109.5 |

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|---|---|---|---|
| C6—C7—C8 | 120.60 (17) | H17B—C17—H17C | 109.5 |
| C6—C7—H7 | 119.7 | N1—C18—C19 | 112.27 (16) |
| C8—C7—H7 | 119.7 | N1—C18—H18A | 109.2 |
| N1—C8—C7 | 121.44 (16) | C19—C18—H18A | 109.2 |
| N1—C8—C9 | 119.38 (15) | N1—C18—H18B | 109.2 |
| C7—C8—C9 | 119.17 (16) | C19—C18—H18B | 109.2 |
| C4—C9—C8 | 118.78 (16) | H18A—C18—H18B | 107.9 |
| C4—C9—C3 | 121.17 (15) | C18—C19—H19A | 109.5 |
| C8—C9—C3 | 120.01 (15) | C18—C19—H19B | 109.5 |
| C11—C10—C15 | 118.71 (16) | H19A—C19—H19B | 109.5 |
| C11—C10—C3 | 121.22 (16) | C18—C19—H19C | 109.5 |
| C15—C10—C3 | 120.00 (15) | H19A—C19—H19C | 109.5 |
| C10—C11—C12 | 120.13 (18) | H19B—C19—H19C | 109.5 |
| C10—C11—H11 | 119.9 | | |

| | | | |
|---|---|---|---|
| C8—N1—C1—O1 | 179.22 (17) | C7—C8—C9—C4 | −0.6 (2) |
| C18—N1—C1—O1 | 0.2 (3) | N1—C8—C9—C3 | −2.1 (2) |
| C8—N1—C1—C2 | −2.6 (2) | C7—C8—C9—C3 | 177.21 (15) |
| C18—N1—C1—C2 | 178.42 (15) | C2—C3—C9—C4 | 176.41 (16) |
| O1—C1—C2—C3 | 177.17 (18) | C10—C3—C9—C4 | −1.2 (2) |
| N1—C1—C2—C3 | −1.0 (3) | C2—C3—C9—C8 | −1.3 (2) |
| O1—C1—C2—C16 | −2.7 (3) | C10—C3—C9—C8 | −178.92 (15) |
| N1—C1—C2—C16 | 179.10 (16) | C2—C3—C10—C11 | 109.3 (2) |
| C1—C2—C3—C9 | 2.9 (2) | C9—C3—C10—C11 | −73.2 (2) |
| C16—C2—C3—C9 | −177.26 (15) | C2—C3—C10—C15 | −73.9 (2) |
| C1—C2—C3—C10 | −179.55 (16) | C9—C3—C10—C15 | 103.69 (19) |
| C16—C2—C3—C10 | 0.3 (3) | C15—C10—C11—C12 | 0.6 (3) |
| C9—C4—C5—C6 | 1.2 (3) | C3—C10—C11—C12 | 177.48 (16) |
| C9—C4—C5—Cl1 | −179.29 (13) | C10—C11—C12—C13 | −0.7 (3) |
| C4—C5—C6—C7 | −1.0 (3) | C11—C12—C13—C14 | 1.0 (3) |
| Cl1—C5—C6—C7 | 179.43 (13) | C12—C13—C14—C15 | −1.1 (3) |
| C5—C6—C7—C8 | 0.1 (3) | C13—C14—C15—C10 | 1.0 (3) |
| C1—N1—C8—C7 | −175.20 (16) | C11—C10—C15—C14 | −0.7 (3) |
| C18—N1—C8—C7 | 3.8 (2) | C3—C10—C15—C14 | −177.66 (17) |
| C1—N1—C8—C9 | 4.1 (2) | C3—C2—C16—O2 | −76.4 (2) |
| C18—N1—C8—C9 | −176.91 (16) | C1—C2—C16—O2 | 103.5 (2) |
| C6—C7—C8—N1 | −179.99 (15) | C3—C2—C16—C17 | 103.7 (2) |
| C6—C7—C8—C9 | 0.7 (3) | C1—C2—C16—C17 | −76.4 (2) |
| C5—C4—C9—C8 | −0.4 (2) | C1—N1—C18—C19 | 93.7 (2) |
| C5—C4—C9—C3 | −178.10 (16) | C8—N1—C18—C19 | −85.3 (2) |
| N1—C8—C9—C4 | −179.89 (14) | | |

*Hydrogen-bond geometry (Å, º)*

| *D*—H···*A* | *D*—H | H···*A* | *D*···*A* | *D*—H···*A* |
|---|---|---|---|---|
| C15—H15···O1$^{i}$ | 0.93 | 2.58 | 3.341 (2) | 139 |

| | | | | |
|---|---|---|---|---|
| C7—H7···O2$^{ii}$ | 0.93 | 2.70 | 3.340 (2) | 126 |

Symmetry codes: (i) $x$, $-y+3/2$, $z-1/2$; (ii) $x+1$, $y$, $z$.