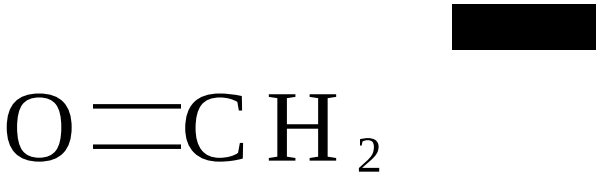

```
SMILES : O=C
CHEM   : Formaldehyde
CAS NUM: 000050-00-0
MOL FOR: C1 H2 O1
MOL WT : 30.03
------------------------------ EPI SUMMARY (v3.20) -------------------------
 Physical Property Inputs:
    Water Solubility (mg/L):   ------
    Vapor Pressure (mm Hg) :   ------
    Henry LC (atm-m3/mole) :   ------
    Log Kow (octanol-water):   ------
    Boiling Point (deg C)  :   ------
    Melting Point (deg C)  :   ------

KOWWIN Program (v1.67) Results:
===============================

                  Log Kow(version 1.67 estimate): 0.35

Experimental Database Structure Match:
  Name     :  Formaldehyde
  CAS Num  :  000050-00-0
  Exp Log P:  0.35
  Exp Ref  :  Hansch,C et al. (1995)

SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
-------+-----+---------------------------------------+---------+--------
 TYPE  | NUM |          LOGKOW FRAGMENT DESCRIPTION  |  COEFF  |  VALUE
-------+-----+---------------------------------------+---------+--------
 Frag  |  1  | Formaldehyde experimental value - constant| 0.1210  |  0.1210
 Const |     | Equation Constant                     |         |  0.2290
-------+-----+---------------------------------------+---------+--------
                                                    Log Kow   =   0.3500



MPBPWIN (v1.42) Program Results:
================================
Experimental Database Structure Match:
  Name     :  FORMALDEHYDE
  CAS Num  :  000050-00-0
  Exp MP (deg C):  -92
  Exp BP (deg C):  -19.1
  Exp VP (mm Hg):  3.89E+03  (extrapolated) = 518624.09 Pa
  Exp VP (deg C):  25
  Exp VP ref    :  BOUBLIK,T ET AL. (1984)

SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
----------------------- SUMMARY MPBPWIN v1.42 --------------------


Boiling Point:    9.50 deg C (Adapted Stein and Brown Method)
```

Melting Point: -113.76 deg C (Adapted Joback Method)
Melting Point: -108.11 deg C (Gold and Ogle Method)
Mean Melt Pt : -110.94 deg C (Joback; Gold,Ogle Methods)
  Selected MP: -110.94 deg C (Mean Value)

Vapor Pressure Estimations (25 deg C):
  (Using BP: -19.10 deg C (exp database))
  (MP not used for liquids)
    VP: 3.67E+003 mm Hg (Antoine Method)
    VP: 3.31E+003 mm Hg (Modified Grain Method)
    VP: 3E+003 mm Hg (Mackay Method)
  Selected VP: 3.49E+003 mm Hg (Mean of Antoine & Grain methods)

TYPE	NUM	BOIL DESCRIPTION	COEFF	VALUE
Group	1	-CHO (aldehyde)	83.38	83.38
*		Equation Constant		198.18
RESULT-uncorr		BOILING POINT in deg Kelvin		281.56
RESULT- corr		BOILING POINT in deg Kelvin		282.66
		BOILING POINT in deg C		9.50

TYPE	NUM	MELT DESCRIPTION	COEFF	VALUE
Group	1	-CHO (aldehyde)	36.90	36.90
*		Equation Constant		122.50
RESULT		MELTING POINT in deg Kelvin		159.40
		MELTING POINT in deg C		-113.76

Water Sol from Kow (WSKOW v1.41) Results:
==========

          Water Sol: 5.702e+004 mg/L

Experimental Water Solubility Database Match:
  Name   : FORMALDEHYDE
  CAS Num : 000050-00-0
  Exp WSol : 4E+005 mg/L (20 deg C)
  Exp Ref : PICKRELL,JA ET AL. (1983)

SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
---------- WSKOW v1.41 Results ----------
Log Kow (estimated) : 0.35
Log Kow (experimental): 0.35
    Cas No: 000050-00-0
    Name : Formaldehyde
    Refer : Hansch,C et al. (1995)
Log Kow used by Water solubility estimates: 0.35

Equation Used to Make Water Sol estimate:
   Log S (mol/L) = 0.796 - 0.854 log Kow - 0.00728 MW + Correction
       (used when Melting Point NOT available)

      Correction(s):   Value
      -------------------   -----
       No Applicable Correction Factors

   Log Water Solubility (in moles/L) : 0.279
   Water Solubility at 25 deg C (mg/L): 5.702e+004

WATERNT Program (v1.01) Results:
==========

Water Sol (v1.01 est): 3.9694e+005 mg/L

Experimental Water Solubility Database Match:
  Name   : FORMALDEHYDE
  CAS Num : 000050-00-0
  Exp WSol : 4E+005 mg/L (20 deg C)
  Exp Ref : PICKRELL,JA ET AL. (1983)

SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03

TYPE	NUM	WATER SOLUBILITY FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Formaldehyde experimental value - constant	0.8720	0.8720
Const		Equation Constant		0.2492

Log Water Sol (moles/L) at 25 dec C =   1.1212
Water Solubility (mg/L) at 25 dec C =3.9694e+005

ECOSAR Program (v0.99h) Results:
==========
SMILES : O=C
CHEM   : Formaldehyde
CAS Num:
ChemID1:
ChemID2:
ChemID3:
MOL FOR: C1 H2 O1
MOL WT : 30.03
Log Kow: 0.35 (KowWin estimate)
Melt Pt:
Wat Sol: 6434 mg/L (calculated)

ECOSAR v0.99h Class(es) Found

Aldehydes

ECOSAR Class	Organism	Duration	End Pt	Predicted mg/L (ppm)
Neutral Organic SAR (Baseline Toxicity)	: Fish	14-day	LC50	1103.201
Aldehydes	: Fish	96-hr	LC50	8.297
Aldehydes	: Daphnid	48-hr	LC50	16.071
Aldehydes	: Green Algae	96-hr	EC50	430.284
Aldehydes	: Fish	32-day	ChV	2.688
Aldehydes	: Green Algae		ChV	16.581

 Note: * = asterisk designates: Chemical may not be soluble
        enough to measure this predicted effect.
        Fish and daphnid acute toxicity log Kow cutoff: 6.0
        Green algal EC50 toxicity log Kow cutoff: 6.4
        Chronic toxicity log Kow cutoff: 7.0
        MW cutoff: 1000

HENRY (v3.10) Program Results:
==========

       Bond Est : 9.29E-005 atm-m3/mole
       Group Est: 6.14E-005 atm-m3/mole

SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03

```
------------------------- HENRYWIN v3.10 Results -------------------------

Experimental Database Structure Match:
  Name     :  FORMALDEHYDE
  CAS Num  :  000050-00-0
  Exp HLC  :  3.37E-07 atm-m3/mole
  Temper   :  25 deg C
  Exp Ref  :  BETTERTON,EA & HOFFMAN,MR (1988)

----------+-----------------------------------------------+---------+----------
   CLASS  |     BOND CONTRIBUTION DESCRIPTION             | COMMENT |  VALUE
----------+-----------------------------------------------+---------+----------
 HYDROGEN |   2  Hydrogen to Carbonyl (C=O) Bonds         |         |  2.4206
----------+-----------------------------------------------+---------+----------
 RESULT   |    BOND ESTIMATION METHOD for LWAPC VALUE     |  TOTAL  |  2.421
----------+-----------------------------------------------+---------+----------
HENRYs LAW CONSTANT at 25 deg C = 9.29E-005 atm-m3/mole = 9.4130925 Pa*m³/mole
                                = 3.80E-003 unitless

--------+-----------------------------------------------+------------+--------
        |        GROUP CONTRIBUTION DESCRIPTION         |   COMMENT  |  VALUE
--------+-----------------------------------------------+------------+--------
        |           1  H2CO                             |EXPERIMENTAL|  2.60
--------+-----------------------------------------------+------------+--------
 RESULT |  GROUP ESTIMATION METHOD for LOG GAMMA VALUE  |   TOTAL    |  2.60
--------+-----------------------------------------------+------------+--------
HENRYs LAW CONSTANT at 25 deg C = 6.14E-005 atm-m3/mole
                                = 2.51E-003 unitless


Henrys LC [VP/WSol estimate using EPI values]:
    HLC:  5.267E-004 atm-m3/mole
    VP:   3.49E+003 mm Hg
    WS:   5.7E+004 mg/L



Log Octanol-Air (KOAWIN v1.10) Results:
=======================================

          Log Koa: 5.211

SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
------------------------- KOAWIN v1.10 Results -------------------------

Log Koa (octanol/air) estimate:  5.211
    Koa (octanol/air) estimate:  1.625e+005
 Using:
   Log Kow:  0.35  (exp database)
   HenryLC:  3.37e-007  atm-m3/mole (exp database)
   Log Kaw:  -4.861  (air/water part.coef.)

 LogKow  : 0.35 (exp database)
 LogKow  : 0.35 (KowWin estimate)
 Henry LC: 3.37e-007 atm-m3/mole (exp database)
 Henry LC: 9.29e-005 atm-m3/mole (HenryWin bond estimate)

 Log Koa (octanol/air) estimate:  2.770 (from KowWin/HenryWin)



BIOWIN (v4.10) Program Results:
===============================
SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
------------------------- BIOWIN v4.10 Results -------------------------

   Biowin1 (Linear Model Prediction)    :  Biodegrades Fast
   Biowin2 (Non-Linear Model Prediction):  Biodegrades Fast
   Biowin3 (Ultimate Biodegradation Timeframe):  Weeks
```

Biowin4 (Primary Biodegradation Timeframe): Days
Biowin5 (MITI Linear Model Prediction) : Biodegrades Fast
Biowin6 (MITI Non-Linear Model Prediction): Biodegrades Fast
Biowin7 (Anaerobic Model Prediction): Biodegrades Fast
Ready Biodegradability Prediction: YES

TYPE	NUM	Biowin1 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aldehyde [-CHO]	0.2846	0.2846
MolWt	*	Molecular Weight Parameter		-0.0143
Const	*	Equation Constant		0.7475
RESULT		Biowin1 (Linear Biodeg Probability)		1.0179

TYPE	NUM	Biowin2 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aldehyde [-CHO]	7.1804	7.1804
MolWt	*	Molecular Weight Parameter		-0.4264
RESULT		Biowin2 (Non-Linear Biodeg Probability)		0.9999

A Probability Greater Than or Equal to 0.5 indicates --> Biodegrades Fast
A Probability Less Than 0.5 indicates --> Does NOT Biodegrade Fast

TYPE	NUM	Biowin3 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aldehyde [-CHO]	0.0223	0.0223
MolWt	*	Molecular Weight Parameter		-0.0664
Const	*	Equation Constant		3.1992
RESULT		Biowin3 (Survey Model - Ultimate Biodeg)		3.1551

TYPE	NUM	Biowin4 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aldehyde [-CHO]	0.1966	0.1966
MolWt	*	Molecular Weight Parameter		-0.0433
Const	*	Equation Constant		3.8477
RESULT		Biowin4 (Survey Model - Primary Biodeg)		4.0011

Result Classification: 5.00 -> hours 4.00 -> days 3.00 -> weeks
(Primary & Ultimate) 2.00 -> months 1.00 -> longer

TYPE	NUM	Biowin5 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aldehyde [-CHO]	0.4114	0.4114
MolWt	*	Molecular Weight Parameter		-0.0893
Const	*	Equation Constant		0.7121
RESULT		Biowin5 (MITI Linear Biodeg Probability)		1.0342

TYPE	NUM	Biowin6 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aldehyde [-CHO]	2.7436	2.7436
MolWt	*	Molecular Weight Parameter		-0.8668
RESULT		Biowin6 (MITI Non-Linear Biodeg Probability)		0.9879

A Probability Greater Than or Equal to 0.5 indicates --> Readily Degradable
A Probability Less Than 0.5 indicates --> NOT Readily Degradable

TYPE	NUM	Biowin7 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aldehyde [-CHO]	0.1226	0.1226
Const	*	Equation Constant		0.8361
RESULT		Biowin7 (Anaerobic Linear Biodeg Prob)		0.9587

A Probability Greater Than or Equal to 0.5 indicates --> Biodegrades Fast
A Probability Less Than 0.5 indicates --> Does NOT Biodegrade Fast

BioHCwin (v1.01) Program Results:
==========
SMILES : O=C
CHEM : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
---------- BioHCwin v1.01 Results ----------

NO Estimate Possible ... Structure NOT a Hydrocarbon
(Contains atoms other than C, H or S (-S-))

Sorption to aerosols (25 Dec C)[AEROWIN v1.00]:
Vapor pressure (liquid/subcooled): 5.19E+005 Pa (3.89E+003 mm Hg)
Log Koa (Koawin est): 5.211
Kp (particle/gas partition coef. (m3/ug)):
Mackay model : 5.78E-012
Octanol/air (Koa) model: 3.99E-008
Fraction sorbed to airborne particulates (phi):
Junge-Pankow model : 2.09E-010
Mackay model : 4.63E-010
Octanol/air (Koa) model: 3.19E-006

AOP Program (v1.92) Results:
==========
SMILES : O=C
CHEM : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
---------- SUMMARY (AOP v1.92): HYDROXYL RADICALS ----------
Hydrogen Abstraction = 8.1300 E-12 cm3/molecule-sec
Reaction with N, S and -OH = 0.0000 E-12 cm3/molecule-sec
Addition to Triple Bonds = 0.0000 E-12 cm3/molecule-sec
Addition to Olefinic Bonds = 0.0000 E-12 cm3/molecule-sec
Addition to Aromatic Rings = 0.0000 E-12 cm3/molecule-sec
Addition to Fused Rings = 0.0000 E-12 cm3/molecule-sec

OVERALL OH Rate Constant = 8.1300 E-12 cm3/molecule-sec
HALF-LIFE = 1.316 Days (12-hr day; 1.5E6 OH/cm3)
HALF-LIFE = 15.787 Hrs
---------- SUMMARY (AOP v1.91): OZONE REACTION ----------

****** NO OZONE REACTION ESTIMATION ******
(ONLY Olefins and Acetylenes are Estimated)

Experimental Database Structure Match:
Chem Name : Formaldehyde
CAS Number: 000050-00-0
Exper OH rate constant : 9.37 E-12 cm3/molecule-sec
Exper OH Reference: KWOK,ESC & ATKINSON,R (1994)
Exper Ozone rate constant: 2.1 E-24 cm3/molecule-sec
Exper NO3 rate constant : 5.8 E-16 cm3/molecule-sec
Fraction sorbed to airborne particulates (phi): 3.36E-010 (Junge,Mackay)
Note: the sorbed fraction may be resistant to atmospheric oxidation

PCKOC Program (v1.66) Results:

```
============================

                  Koc (estimated): 1


SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
-------------------------- PCKOCWIN v1.66 Results -------------------------

         First Order Molecular Connectivity Index  ..... :  1.000
         Non-Corrected Log Koc  ........................ :  1.1553
         Fragment Correction(s):
                  1   Misc (C=O) Group (aliphatic attach)....  : -1.2000
         Corrected Log Koc  ............................... : -0.0447
         Over Correction Adjustment to Lower Limit Log Koc ... :  0.0000

                        Estimated Koc:  1



HYDROWIN Program (v1.67) Results:
================================
SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
-------------------------- HYDROWIN v1.67 Results -------------------------

 Currently, this program can NOT estimate a hydrolysis rate constant for
                the type of chemical structure entered!!

 ONLY Esters, Carbamates, Epoxides, Halomethanes (containing 1-3 halogens)
   and Specific Alkyl Halides can be estimated!!  For more information,
    (Click OVERVIEW in Help  or  see the User's Guide)

              *****   CALCULATION NOT PERFORMED   *****



BCF Program (v2.17) Results:
===========================
SMILES : O=C
CHEM   : Formaldehyde
MOL FOR: C1 H2 O1
MOL WT : 30.03
------------------------------ Bcfwin v2.17 ------------------------------
Log Kow  (estimated)  :  0.35
Log Kow (experimental):  0.35
Log Kow used by BCF estimates:  0.35

Equation Used to Make BCF estimate:
   Log BCF = 0.50

     Correction(s):                    Value
     Correction Factors Not Used for Log Kow < 1

  Estimated Log BCF =  0.500  (BCF = 3.162)



                          Volatilization From Water
                          =========================

Chemical Name: Formaldehyde

Molecular Weight    :  30.03 g/mole
Water Solubility    :  -----
Vapor Pressure      :  -----
Henry's Law Constant:  3.37E-007 atm-m3/mole  (Henry experimental database)
```

	RIVER	LAKE
Water Depth (meters):	1	1
Wind Velocity (m/sec):	5	0.5
Current Velocity (m/sec):	1	0.05
HALF-LIFE (hours) :	952.6	1.044E+004
HALF-LIFE (days) :	39.69	434.9
HALF-LIFE (years) :	0.1087	1.191

STP Fugacity Model: Predicted Fate in a Wastewater Treatment Facility
==========

(using 10000 hr Bio P,A,S)

PROPERTIES OF: Formaldehyde

Molecular weight (g/mol)	30.03
Aqueous solubility (mg/l)	0
Vapour pressure (Pa)	0
(atm)	0
(mm Hg)	0
Henry 's law constant (Atm-m3/mol)	3.37E-007
Air-water partition coefficient	1.37823E-005
Octanol-water partition coefficient (Kow)	2.23872
Log Kow	0.35
Biomass to water partition coefficient	1.24774
Temperature [deg C]	25

Biodeg rate constants (h^-1),half life in biomass (h) and in 2000 mg/L MLSS (h):

-Primary tank	0.03	24.89	10000.00
-Aeration tank	0.03	24.89	10000.00
-Settling tank	0.03	24.89	10000.00

STP Overall Chemical Mass Balance:

	g/h	mol/h	percent
Influent	1.00E+001	3.3E-001	100.00
Primary sludge	2.55E-002	8.5E-004	0.25
Waste sludge	1.51E-001	5.0E-003	1.51
Primary volatilization	1.83E-004	6.1E-006	0.00
Settling volatilization	5.00E-004	1.7E-005	0.00
Aeration off gas	1.23E-003	4.1E-005	0.01
Primary biodegradation	1.76E-003	5.9E-005	0.02
Settling biodegradation	5.27E-004	1.8E-005	0.01
Aeration biodegradation	6.94E-003	2.3E-004	0.07
Final water effluent	9.81E+000	3.3E-001	98.13
Total removal	1.87E-001	6.2E-003	1.87
Total biodegradation	9.22E-003	3.1E-004	0.09

Level III Fugacity Model (Full-Output):
==========

Chem Name : Formaldehyde
Molecular Wt: 30.03
Henry's LC : 3.37e-007 atm-m3/mole (Henry database)
Vapor Press : 3.49e+003 mm Hg (Mpbpwin program)
Log Kow : 0.35 (Kowwin program)
Soil Koc : 0.918 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	2.13	27.4	1000
Water	44.2	360	1000
Soil	53.5	720	1000
Sediment	0.0826	3.24e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	2.03e-010	631	250	21	8.32
Water	2.91e-011	997	518	33.2	17.3
Soil	1.21e-009	604	0	20.1	0

Sediment 2.66e-011 0.207 0.0194 0.0069 0.000645

Persistence Time: 390 hr
Reaction Time: 525 hr
Advection Time: 1.53e+003 hr
Percent Reacted: 74.4
Percent Advected: 25.6

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):
Air: 27.41
Water: 360
Soil: 720
Sediment: 3240
Biowin estimate: 3.155 (weeks)

Advection Times (hr):
Air: 100
Water: 1000
Sediment: 5e+004