# Methyl propyl ketone

| CAS number: | 107-87-9 |
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| Synonyms: | 2-Pentanone, ethyl acetone, MPK |
| Chemical formula: | C5H10O5 |

Workplace exposure standard (amended)

| TWA: | **—** |
| --- | --- |
| STEL: | **150 ppm (529 mg/m3)** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **1,500 ppm (10% LEL)** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

There are insufficient data available to recommend a TWA and a TWA is recommended to be withdrawn.

A STEL of 150 ppm (529 mg/m3) is recommended to protect for acute respiratory impairment and irritation of the eyes and upper respiratory tract in exposed workers.

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

## Discussion and conclusions

Methyl propyl ketone (MPK) is used as a solvent, reagent and flavouring agent.

Critical effects of exposure are respiratory impairment and irritation of the eyes and upper respiratory tract. The toxicological database for MPK is limited. Non-atopic volunteers showed no signs of irritation at 200 ppm over brief exposures. Whereas, this concentration caused bronchoconstriction in an atopic volunteer and a NOAEC was not established (ACGIH, 2018). Human exposure data are consistent with NOAEC of 178 and 564 ppm for decreased tidal volume and respiratory rate, respectively, in acutely exposed mice (ACGIH, 2018).

Based on the weight of evidence, the TWA of 200 ppm is considered insufficiently protective of these effects and is recommended to be withdrawn consistent with DFG (2000), ACGIH (2018) and HCOTN (2004). A detailed examination of the available subchronic and chronic exposure data should be prioritised during subsequent reviews of the WES.

Based on the acute and transient nature of irritation reported near 200 ppm in atopic individuals and animals, the STEL of 150 ppm assigned by ACGIH (2018) is expected to be protective of these critical effects and is recommended to be adopted.

## Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 200 ppm (705 mg/m3); STEL: 250 ppm (881 mg/m3) | |
|  |
| ACGIH 2007 TLV-STEL: 150 ppm (529 mg/m3) |
| TLV-STEL intended to protect for bronchoconstriction, decreased respiratory rate and irritation to the eyes.  Summary of data:  TLV-STEL of 150 ppm based on weight of evidence from limited human and animal data including respective NOAEC of 178 ppm and 564 ppm for reversible decreases in tidal volume and respiratory rate, and bronchoconstriction, respectively, in an atopic volunteer at 200 ppm.  Critical effects observed in the atopic volunteer are considered in the TLV-STEL recommendation as 25–30% of the population are atopic.  Human data:   * Odour threshold: 11 ppm * Upper respiratory tract and eye irritation at 1,500 ppm (no further details provided) * Eye irritation at 400 ppm, no irritation at 200 ppm in volunteer inhalation study (n=2, 15 sec) * Uptake rate of inhaled dose at 100 ppm reported as 53% in inhalational study with healthy volunteers (n=4, 10 min) * Bronchoconstriction measured by airway resistance reported in small volunteer study;   + 200 ppm produced 29.4% airway resistance, and 57.4% resistance at 400 ppm in one volunteer (durations not specified, but cited as short-term)   + one other volunteer had a slight increase in resistance (1.6%) at 400 ppm; 2 others showed none   + one non-atopic volunteer had a 37.2% resistance at 600 ppm; both atopic and non-atopic volunteers (n=2) exhibited bronchoconstriction at 800 ppm.   Animal data:   * Lethal pulmonary oedema at 50,000 ppm (50 min) and 13,000 ppm (300 min); lachrymation, coughing and nasal discharge at 10,000 ppm (10 min), necropsy showed pulmonary and adrenal congestion, haemosiderosis, splenic haemorrhaging and fatty liver   + non-lethal at 5,000 ppm (810 min) with narcotic effects after 460–710 min resulting in coma, eye irritation after 3 min (guinea pigs)   + slight or no signs of gross pathology at 5,000 ppm (1 h) or 2,000 ppm (8 h) * LC50 >2,000 ppm (rats, 4 h); narcosis, cardiac/respiratory rate depression reported * Median respiratory depression (RD50): 12,832 ppm (mice, 10 min); NOAEC 970 ppm (2 min); concentration dependent decrease in tidal volume within 30 min with NOAECs: 340 ppm (10 min), 178 ppm (30 min); effects reversible (recovery period not specified) * Potentiation of kidney and liver toxicity from IP injected chloroform in single dose study, and is consistent with such potentiation seen for other ketones * Negative genotoxicity in standardised *in vitro* assays in bacteria.   Insufficient data to recommend notations for carcinogenicity, skin absorption and sensitisation. |
| DFG 2000 not established |
| Summary of additional data:  Previous 1958 MAK of 200 ppm withdrawn due to lack of suitable human and animal data.  Critical effects are eye and upper respiratory and CNS depression; a threshold for these effects cannot be determined from the available data.  Toxic effects likely caused by non-covalent interactions of the substance with mucosal and neuronal membranes; systemically available substance is mostly eliminated *via* the lungs.  Human data:   * Acute exposure causes irritation to the mucous membranes of the eyes and upper respiratory tract.   Animal data:   * Concentration-dependent decrease in rest periods during swimming test in acute inhalational study with treatment range: 976–1965 ppm (mice, 4 h); 50% decrease at 1,346 ppm * Co-administration with methyl butyl ketone in a subchronic repeat subcutaneous injection study increased susceptibility to neurotoxic effects of MPK (rats, 5 d/wk, 20 wk) * Non-mutagenic *in vitro* in *Salmonella*, increased aneuploidy reported in *S. cerevisiae* at excessive concentrations in the test medium (1.48%).   Insufficient data to assign notations for carcinogenicity, skin absorption, and sensitisation. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2004 TWA: 200 ppm (700 mg/m3) |
| Summary of additional data:  Current administrative OEL is set at 200 ppm; available toxicological database is however too limited to recommend a health-based value or comment on the suitability of the current administrative OEL.  Human data:   * Very irritating at 2,000–4,000 ppm; strong odour, and eye and nose irritation at 1,500 ppm (no further details provided, also cited in ACGIH, 2018) * Separate study reported eye irritation threshold at 10,000 ppm (n=6 males, 4 females, age 19–30, duration not specified).   Animal data:   * LD50: 6,472 mg/kg (rabbits, dermal). |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| ECHA |  | 2019 | * DNEL for acute exposures derived from LOAEC of 7,235 ppm for increased respiration rate and ataxia in an acute inhalation study (rats, 4 h, nose only)   + overall UF of 9 applied to account for inter- and intraspecies differences and absence of an experimentally determined NOAEC to afford acute DNEL of 1,357 ppm. * DNEL for long-term exposures derived from NOAEC of 750 ppm for systemic effects including organ weight changes in a subchronic inhalation study (rats, 6 h/d, 5 d/wk, 13 wk)   + overall UF of 6 applied to account for inter- and intraspecies differences and differences in exposure duration to afford the chronic DNEL of 60 ppm. |
| US NIOSH |  | 1994 | IDLH based on acute inhalation toxicity data in humans and on 10% of the lower explosive limit of 1.5%. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | No |
| --- | --- |
| **The chemical is not a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | — |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | — |
| ACGIH | — |
| DFG | — |
| SCOEL | NA |
| HCOTN | — |
| IARC | NA |
| US NIOSH | NA |

NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations

### Skin notation assessment

| Calculation |
| --- |
| Insufficient data to assign a skin notation. |

### IDLH

| Is there a suitable IDLH value available? | Yes, based on LEL |
| --- | --- |

## Additional information

| Molecular weight: | 86.17 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 3.52 mg/m3; 1 mg/m3 = 0.284 ppm |
| This chemical is used as a pesticide: |  |
| This chemical is a biological product: |  |
| This chemical is a by-product of a process: |  |
| A biological exposure index has been recommended by these agencies: | ACGIH  DFG  SCOEL |

## Workplace exposure standard history

| Year | Standard |
| --- | --- |
| Click here to enter year |  |

## References

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the [*TLVs® and BEIs® Guidelines section*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2000) Pentan-2-on – MAK value documentation, German language edition.

European Chemicals Agency (ECHA) (2019) Pentan-2-one – REACH assessment.

Health Council of the Netherlands (HCOTN) (2004) Pentan-2-one. Health-based recommendation on occupational exposure limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/136.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – 2-Pentanone.