Sub-Chapter VI

KETONE-FUNCTION COMPOUNDS AND QUINONE-FUNCTION COMPOUNDS

29.14 - Ketones and quinones, whether or not with other oxygen function, and their halogenated, sulphonated, nitrated or nitrosated derivatives.

- Acyclic ketones without other oxygen function :

2914.11 - - Acetone

2914.12 - - Butanone (methyl ethyl ketone)

2914.13 - - 4-Methylpentan-2-one (methyl isobutyl ketone)

2914.19 - - Other

- Cyclanic, cyclenic or cycloterpenic ketones without other oxygen function :

2914.22 - - Cyclohexanone and methylcyclohexanones

2914.23 - - Ionones and methylionones

2914.29 - - Other

- Aromatic ketones without other oxygen function :

2914.31 - - Phenylacetone (phenylpropan-2-one)

2914.39 - - Other

2914.40 - Ketone-alcohols and ketone-aldehydes

2914.50 - Ketone-phenols and ketones with other oxygen function

- Quinones :

2914.61 - - Anthraquinone

2914.62 - - Coenzyme Q10 (ubidecarenone (INN))

2914.69 - - Other

- Halogenated, sulphonated, nitrated or nitrosated derivatives :

2914.71 - - Chlordecone (ISO)

2914.79 - - Other

The term "ketones and quinones with other oxygen function" means ketones and quinones which contain also one or more of the oxygen functions referred to in previous sub-Chapters (alcohol, ether, phenol, aldehyde, etc., functions).

(A) KETONES*

These are compounds containing the group (>C=O), so-called "carbonyl" group, and can be represented by the general formula ($R\text{-}CO\text{-}R^1$), in which R and R^1 stand for alkyl or aryl radicals (methyl, ethyl, propyl, phenyl, etc.).

Ketones may have two tautomeric forms, the true ketonic form (-CO-) and the enolic form (=C(OH)-), both of which fall in this heading.

(I) **Acyclic ketones**.

(1) **Acetone** (propanone) (CH_3COCH_3). Found in the products of the dry distillation of wood (methyl alcohol and crude pyroligneous acid), but is mainly obtained by synthesis. Colourless liquid with an agreeable ether-like odour. Used in numerous organic syntheses, for the manufacture of plastics, as a solvent for acetylene, acetylcellulose and resins, etc.

(2) **Butanone** (methyl ethyl ketone) ($CH_3COC_2H_5$). Colourless liquid found in the by-products of the distillation of alcohol from beet molasses. Also obtained by the oxidation of secondary butyl alcohol.

(3) **4-Methylpentan-2-one** (methyl isobutyl ketone) ($(CH_3)_2CHCH_2COCH_3$). Liquid with an agreeable odour; used as a solvent for cellulose nitrate, gums and resins.

(4) **Mesityl oxide**. Colourless liquid formed by the condensation of two acetone molecules.

(5) **Phorones**. Compounds formed by the condensation of three acetone molecules.

(6) **Pseudoionones**. Complex ketones, liquid, yellowish in colour, smelling of violets; used for the preparation of ionone (artificial violet oil).

(7) **Pseudomethylionones**. Liquids with the same properties as pseudoionones, with a violet-like odour. Used in perfumery.

(8) **Diacetyl** ($CH_3COCOCH_3$)*. Greenish-yellow liquid, with a penetrating quinone-like odour. Used for flavouring butter and margarine.

(9) **Acetylacetone** ($CH_3COCH_2COCH_3$)*. Colourless liquid, with an agreeable odour; used in organic synthesis.

(10) **Acetonylacetone** ($CH3COCH_2CH_2COCH_3$)*. Colourless liquid with an agreeable odour; used in organic synthesis.

(II) **Cyclanic, cyclenic or cycloterpenic ketones**.

(1) **Camphor** ($C_{10}H_{16}O$)*. The heading covers **both** natural and synthetic camphor. The former is obtained from the *Laurus camphora* tree, indigenous to China and Japan. Synthetic camphor is derived from pinene (obtained from spirits of turpentine). Both are colourless crystalline masses, translucent, soft to the touch, and with a characteristic odour. Natural and synthetic camphor are used in medicine as an antiseptic, for the manufacture of celluloid and in moth balls.

So-called "Borneo camphor" or "borneol" is not a ketone but an alcohol, and is formed by reducing camphor; it is **excluded (heading 29.06)**.

(2) **Cyclohexanone** ($C_6H_{10}O$). Obtained by synthesis; a liquid with an odour similar to that of acetone. Strong solvent for acetylcellulose and natural or artificial resins.

(3) **Methylcyclohexanones**. Liquids insoluble in water.

(4) **Ionones** ($C_{13}H_{20}O$), formed by the condensation of citral with acetone. They include :

(a) α-**Ionone**. Colourless liquid with a strong violet-like odour.

(b) β-**Ionone**. Colourless liquid with a violet-like odour less delicate than that of α-ionone.

Both are used in perfumery.

(5) **Methylionones**. Colourless to amber-yellow liquids.

(6) **Fenchone** ($C_{10}H_{16}O$). Occurs in fennel and thuja oils. A clear, colourless liquid, with a camphor-like odour; used as a camphor substitute.

(7) **Irone**. Occurs in the essential oil obtained from the roots of some varieties of iris. An oily liquid, colourless, with an iris-like odour; strongly diluted, it has a delicate, violet-like odour. Used in perfumery.

(8) **Jasmone** ($C_{11}H_{16}O$). Derived from jasmine-blossom. A light yellow oil with a strong jasmine odour, used in perfumery.

(9) **Carvone** ($C_{10}H_{14}O$). Occurs in caraway, aniseed and mint oils. A colourless liquid, with a strong aromatic odour.

(10) **Cyclopentanone** (adipoketone) (C_4H_8CO). Occurs in the distillation products of wood. A liquid with a mint-like odour.

(11) **Menthone** ($C_{10}H_{18}O$). Found in peppermint and other essential oils. Obtained synthetically by oxidation of menthol. An unstable, colourless, refractive liquid, with an odour of mint.

(III) **Aromatic ketones**.

(1) **Methyl naphthyl ketone**.

(2) **Benzylideneacetone** ($C_6H_5CH{=}CHCOCH_3$). Colourless crystals, smelling of sweet peas.

(3) **Acetophenone** ($CH_3COC_6H_5$). Oily, colourless or yellow liquid, with an agreeable aromatic odour; used in perfumery and for organic synthesis.

(4) **Propiophenone**.

(5) **Methylacetophenone** ($CH_3C_6H_4COCH_3$). Colourless or yellowish liquid, with an agreeable odour.

(6) **Butyldimethylacetophenone**.

(7) **Benzophenone** ($C_6H_5COC_6H_5$). Colourless or slightly yellow crystals with an agreeable ether-like odour. Used in the manufacture of synthetic perfumes and for organic synthesis.

(8) **Benzanthrone**. Yellowish needles.

(9) **Phenylacetone** (phenylpropan-2-one). Colourless to light yellow liquid. Used principally in organic synthesis and as a precursor in the production of amphetamines (see the list of precursors at the end of Chapter 29).

(B) KETONE-ALCOHOLS

Compounds whose molecules contain both the alcohol and ketone functions.

(1) **4-Hydroxy-4-methylpentan-2-one** (diacetone alcohol). Colourless liquid.

(2) **Acetol** (acetylcarbinol) (CH_3COCH_2OH). Colourless liquid with a penetrating odour; used as a solvent for cellulose varnishes and resins.

(C) KETONE-ALDEHYDES

Compounds whose molecules contain both the ketone and aldehyde functions.

(D) KETONE-PHENOLS

Compounds whose molecules contain both the ketone and phenol functions.

(E) QUINONES

These are diketones derived from aromatic compounds by conversion of two $\gg$CH groups into $>$C=O groups with any necessary rearrangement of double bonds.

(1) **Anthraquinone** ($C_6H_4(CO)_2C_6H_4$)*. Yellow needles which, when ground, give a white powder. Used in the manufacture of dyes.

(2) *p*-**Benzoquinone** (quinone) ($C_6H_4O_2$). Yellow crystals with a penetrating odour.

(3) **1,4-Naphthoquinone** ($C_{10}H_6O_2$). Yellow needles.

(4) **2-Methylanthraquinone**. White needles.

(5) **Acenaphthenequinone**. Yellow needles.

(6) **Phenanthraquinone**. Yellow needles.

(F) QUINONE-ALCOHOLS, QUINONE-PHENOLS, QUINONE-ALDEHYDES AND OTHER OXYGEN FUNCTION QUINONES

Quinone-alcohols, quinone-phenols and quinone-aldehydes are compounds which, independently of their quinone function, also contain, in their molecules, alcohol, phenol and aldehyde functions, respectively.

(1) **α-Hydroxyanthraquinone**.

(2) **Quinizarin**.

(3) **Chrysazin**.

(4) **Coenzyme Q10*** (ubidecarenone (INN)).

(G) HALOGENATED, SULPHONATED, NITRATED OR NITROSATED DERIVATIVES OF KETONES, QUINONES, KETONE-ALCOHOLS, ETC., QUINONE-ALCOHOLS, ETC.

(1) **Bromocamphor** ($C_{10}H_{15}OBr$). Needles with a strong camphor-like odour. Used as a sedative.

(2) **4'-Tert-butyl-2',6'-dimethyl-3',5'-dinitroacetophenone** (ketone musk).

(3) **Camphorsulphonic acid**.

(4) **Chlordecone** (ISO).

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This heading also covers combinations of halogenated, sulphonated, nitrated or nitrosated derivatives (e.g., sulphohalogenated, nitrohalogenated, nitrosulphonated and nitrosulpho-halogenated derivatives).

Organic colouring matter is **excluded** from this heading (**Chapter 32**). The heading also **excludes** ketone-bisulphite compounds which are classified as sulphonated derivatives of alcohols (**headings 29.05 to 29.11**).