

# Isopropyl Alcohol

## 1 Nonproprietary Names

BP: Isopropyl Alcohol

JP: Isopropanol

PhEur: Isopropyl Alcohol

USP-NF: Isopropyl Alcohol

## 2 Synonyms

Alcohol isopropylicus; dimethyl carbinol; IPA; isopropanol; petrohol; 2-propanol; *sec*-propyl alcohol; rubbing alcohol.

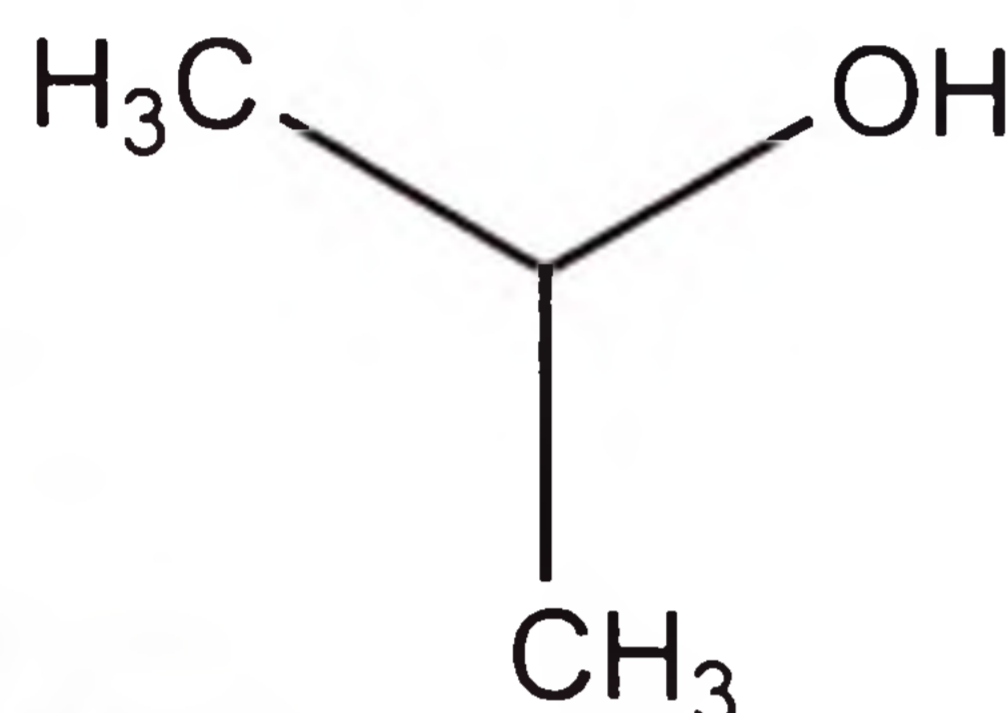
## 3 Chemical Name and CAS Registry Number

Propan-2-ol [67-63-0]

## 4 Empirical Formula and Molecular Weight

C<sub>3</sub>H<sub>8</sub>O 60.1

## 5 Structural Formula



## 6 Functional Category

Antimicrobial preservative; solvent.

## 7 Applications in Pharmaceutical Formulation or Technology

Isopropyl alcohol (propan-2-ol) is used in cosmetics and pharmaceutical formulations, primarily as a solvent in topical formulations.<sup>(1)</sup> It is not recommended for oral use owing to its toxicity; see Section 14.

Although it is used in lotions, the marked degreasing properties of isopropyl alcohol may limit its usefulness in preparations used repeatedly. Isopropyl alcohol is also used as a solvent both for tablet film-coating and for tablet granulation,<sup>(2)</sup> where the isopropyl alcohol is subsequently removed by evaporation. It has also been shown to significantly increase the skin permeability of nimesulide from carbomer 934.<sup>(3)</sup>

## 8 Description

Isopropyl alcohol occurs as a clear, colorless, mobile, volatile, flammable liquid with a characteristic, spirituous odor resembling that of a mixture of ethanol and acetone; it has a slightly bitter taste.

## 9 Pharmacopeial Specifications

See Table I.

## 10 Typical Properties

**Antimicrobial activity** Isopropyl alcohol is bactericidal; at concentrations greater than 70% v/v it is a more effective antibacterial preservative than ethanol (95%). The bactericidal effect of aqueous solutions increases steadily as the concentration approaches 100% v/v. Isopropyl alcohol is ineffective against bacterial spores.

**Table I:** Pharmacopeial specifications for isopropyl alcohol.

Test	JP XVII	PhEur 9.2	USP 40- NF 35 S1
Identification	+	+	+
Appearance of solution	+	+	—
Absorbance	—	+	—
Characters	—	+	—
Specific gravity	0.785–0.788	0.785–0.789	0.783–0.787
Refractive index	—	1.376–1.379	1.376–1.378
Acidity or alkalinity	+	+	+
Water	≤0.75%	≤0.5%	≤0.5%
Volatile impurities	—	—	+
Nonvolatile residue	≤1.0 mg	≤20 ppm	≤0.005%
Distillation range	81–83°C	—	—
Benzene	—	+	—
Peroxides	—	+	—
Assay	—	—	≥99.0%

**Autoignition temperature** 425°C

**Boiling point** 82.4°C

**Dielectric constant**  $D^{20} = 18.62$

**Explosive limits** 2.5–12.0% v/v in air

**Flammability** Flammable.

**Flash point** 11.7°C (closed cup); 13°C (open cup). The water azeotrope has a flash point of 16°C.

**Freezing point** –89.5°C

**Melting point** –88.5°C

**Moisture content** 0.1–13% w/w for commercial grades (13% w/w corresponds to the water azeotrope).

**Refractive index**

$n_D^{20} = 1.3776$ ;

$n_D^{25} = 1.3749$ .

**Solubility** Miscible with benzene, chloroform, ethanol (95%), ether, glycerin, and water. Soluble in acetone; insoluble in salt solutions. Forms an azeotrope with water, containing 87.4% w/w isopropyl alcohol (boiling point 80.37°C).

**Specific gravity** 0.786

**Spectroscopy**

IR spectrum see Figure 1.

Raman spectrum see Figure 2.

**Vapor density (relative)** 2.07 (air = 1)

**Vapor pressure**

133.3 Pa (1 mmHg) at –26.1°C;

4.32 kPa (32.4 mmHg) at 20°C;

5.33 kPa (40 mmHg) at 23.8°C;

13.33 kPa (100 mmHg) at 39.5°C.

**Viscosity (dynamic)** 2.43 mPa s (2.43 cP) at 20°C

## 11 Stability and Storage Conditions

Isopropyl alcohol should be stored in an airtight container in a cool, dry place.

## 12 Incompatibilities

Incompatible with oxidizing agents such as hydrogen peroxide and nitric acid, which cause decomposition. Isopropyl alcohol may be salted out from aqueous mixtures by the addition of sodium