CentriVap® Centrifugal Concentrators and Cold Traps

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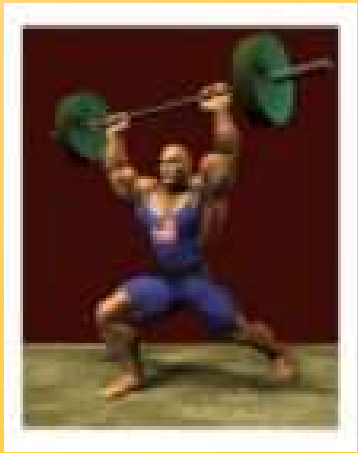
Overview

- What is a Concentrator?
  - Evaporator that uses centrifuge motion, vacuum and optional heat to concentrate a liquid sample to dryness or a wet pellet.
- Applications that relate to current events
  - Paternity testing – Anna Nicole Smith trial
  - Drugs of abuse testing – Steroid use in athletes
  - Drug development – New drug discovery, diabetes, cancer, etc.



Definition: Centrifugal Concentrator

A device that uses centrifugal force and vacuum (and optionally heat), to concentrate a selected solute from solution. Also called a vacuum concentrator.

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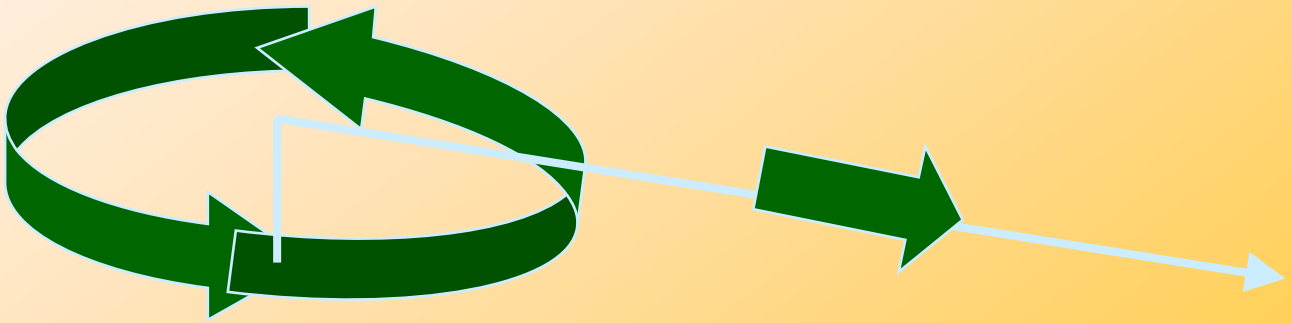
Definition: Centrifugal Force

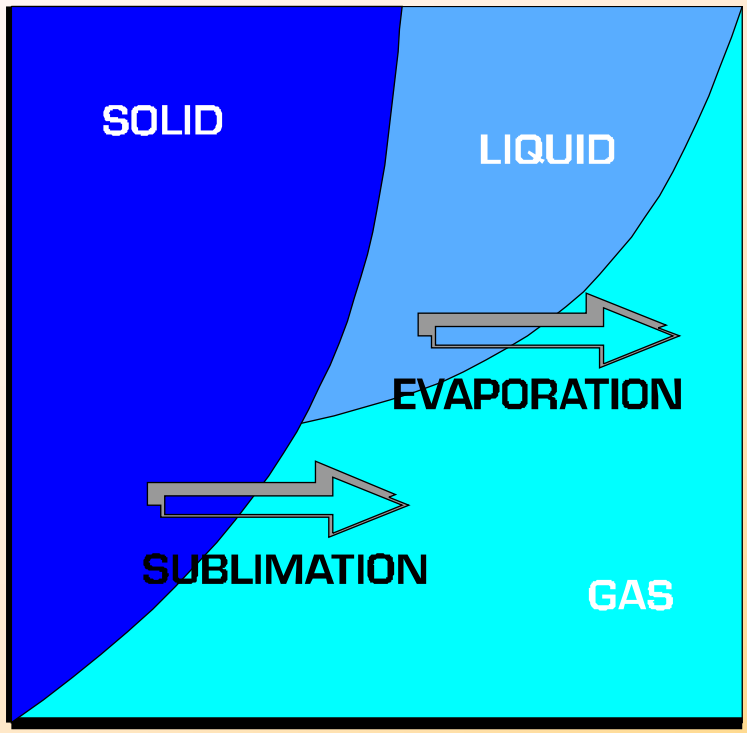
- The component of apparent force on a body in curvilinear motion, as observed from that body, that is directed away from the center of curvature or axis of rotation.



Definition: Low Vacuum Pressures

- Low vacuum pressures help vaporize solvents. The rate of evaporation of the solvent increases because there is a decrease in vapor pressure, which encourages the solvent molecules to pass from the liquid phase to the gaseous phase.

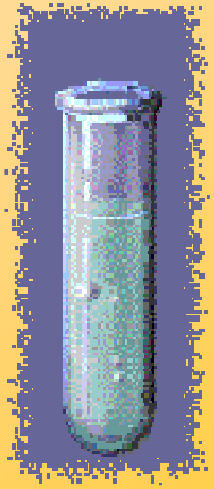
Evaporation and Sublimation



- Evaporation occurs when a liquid transforms into a vapor
- Occasionally, at low pressure and temperature, a sample will freeze and undergo sublimation
- Sublimation occurs when a solid transforms directly to a vapor without going through the liquid phase

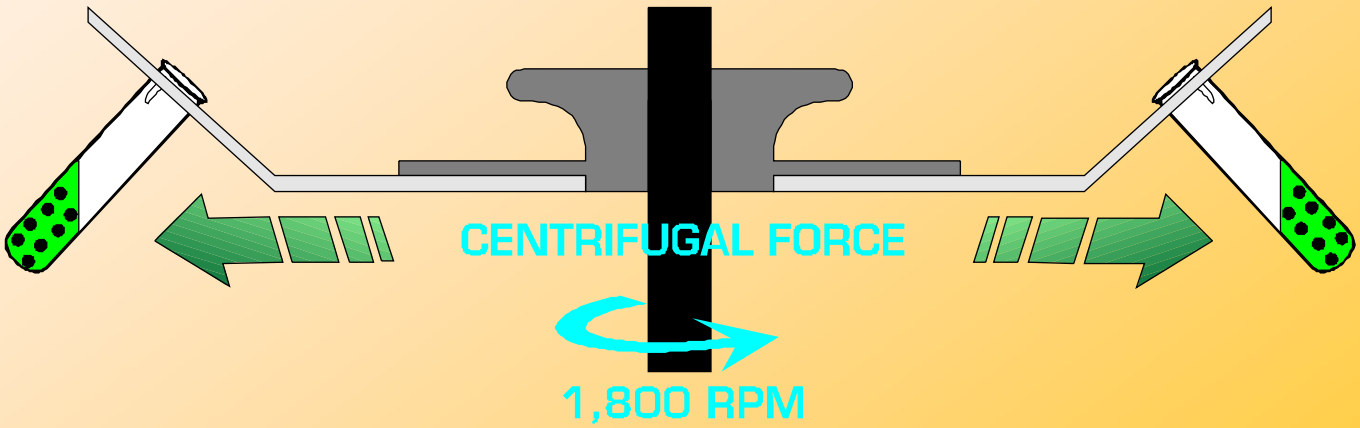
Evaporation

- The rate of evaporation can be increased by reducing the system pressure and by heating the solvent.
- Low system pressure decreases the vapor pressure, and that encourages the solvent to go from liquid to gaseous phase.
- Increasing the temperature will increase the movement of the molecules, which also encourages the solvent molecules to enter the gaseous phase.
- By increasing the surface area, the rate of evaporation increases.



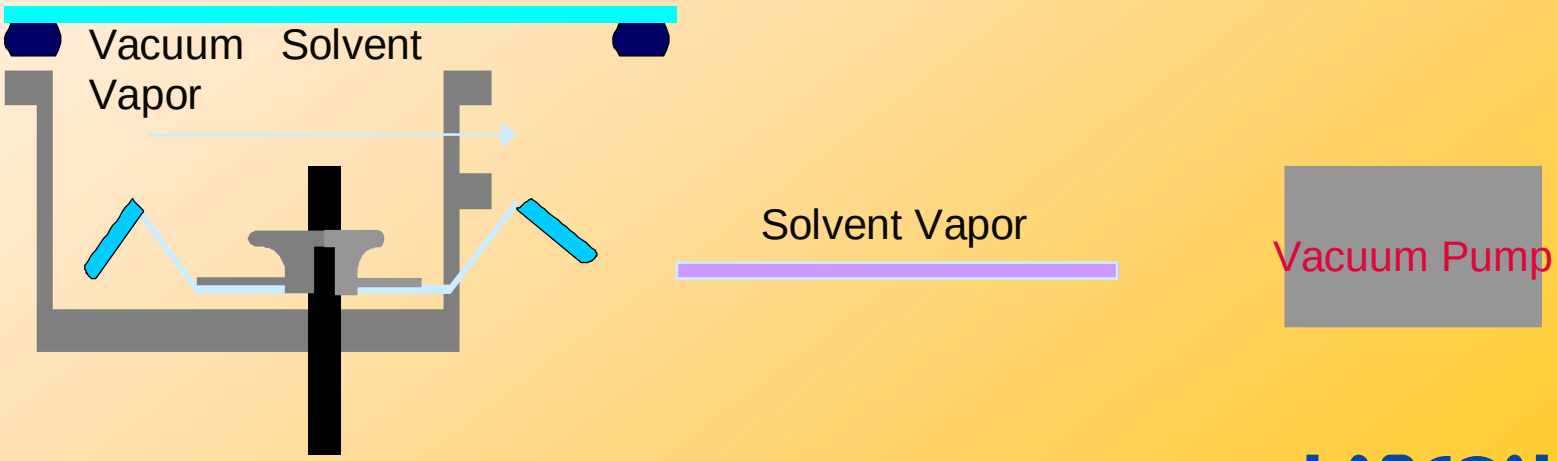
Theory of Operation

- As the rotor turns, centrifugal force moves the solvent and solute to the bottom of the tube. This prevents foaming and/or bumping during the concentration process

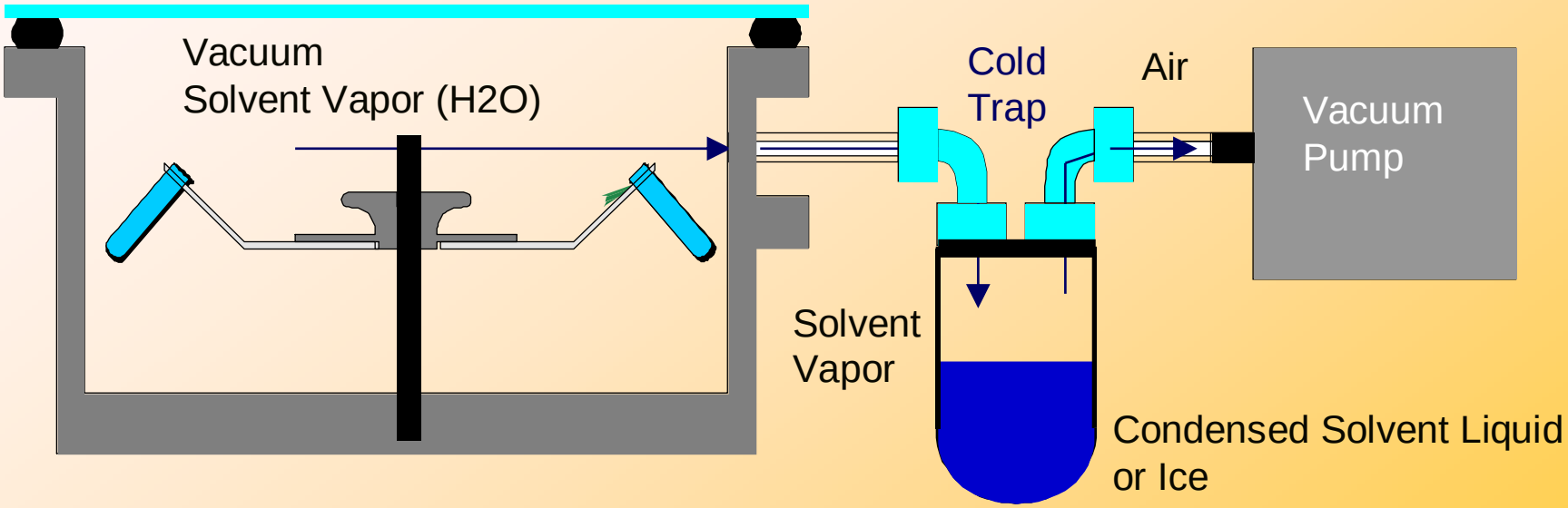


Theory of Operation

- By connecting a vacuum pump to the centrifugation chamber, the vapor pressure is reduced, increasing the speed of concentration.
- If the solvent is liquid, then it evaporates; if it is solid, sublimation occurs.



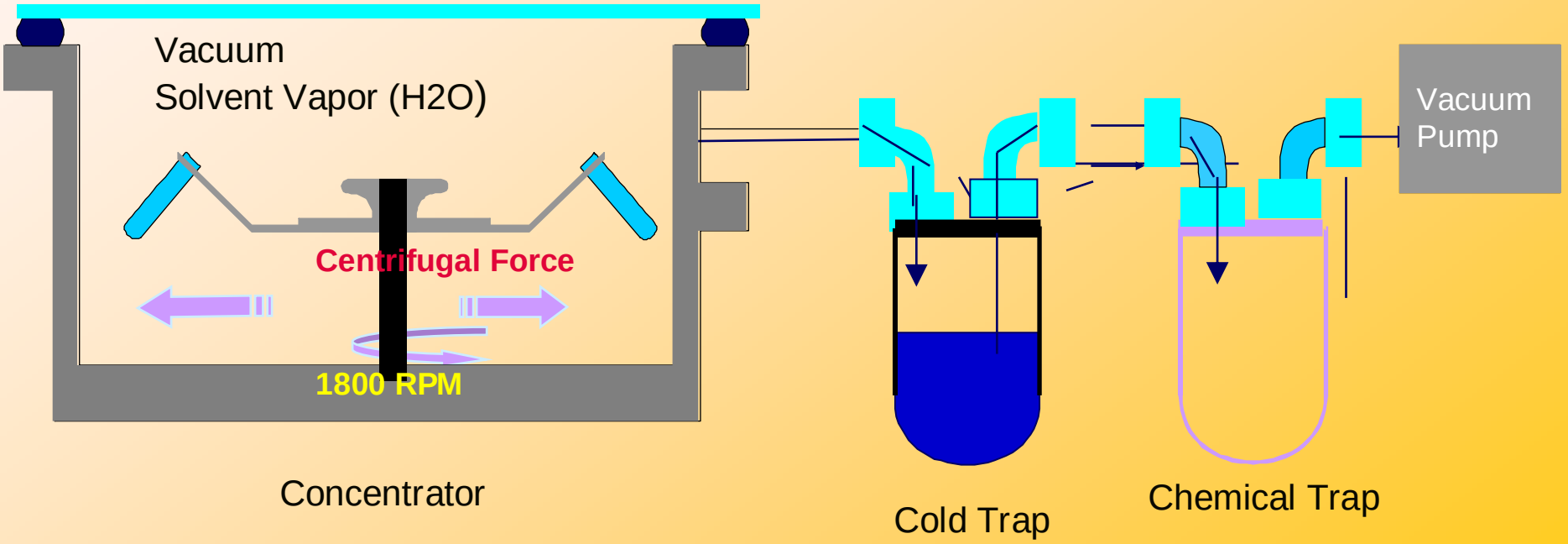
Theory of Operation



Placing a cold trap in the vacuum line allows the user to collect the solvent.

Theory of Operation

- A secondary chemical trap placed after the cold trap, physically traps acids, moisture, radioisotopes, or solvents to protect the vacuum pump.



Solute Recovery

- The solvent is removed from the solute by evaporation and/or sublimation. Solvent recovery is 99%. The remaining sample pellet is nearly pure solute.

History

- First manufactured in 1991
- Most recent redesign 2005
- New Products Refrigerated CentriVap and Acid Resistant CentriVap introduced 2006

Overview of Products

Features Common to All Concentrators

CentriVap® Control Panel

Program - shows program from 1-9, R for run or S for stop.

Heater Time - shows time selected for heat from 1-999 minutes.

Quick-Start™ Buttons initiate user-set Program 1, 2 or 3 with single push of button.

Increase/Decrease Buttons - increase or decrease last selected set point parameter.

Temperature - shows heat (and Heat Boost, if activated) from OFF to 99º C or HI (100º C).

Run Time - shows time from 1-999 minutes. During run, time remaining also displays. Selecting “ON” allows CentriVap to run continuously.

Preheat Button - turns on heater to preheat chamber prior to loading samples.

CentriVap® Centrifugal Concentrator

Control Panel

Lightbulb feature!

- Heat and run times are each set separately from 1 to 999 minutes so heat can be programmed to shut down, protecting samples from excessive heat exposure as they dry
- LCD display prompts user to set program parameters and displays current program

CentriVap® Centrifugal Concentrator

Control Panel

- Quick-Start™ One Button Start Up activates the rotor, heater, timers and vacuum pump with one button*
- Preheat button activates the heater to begin elevating to set point temp
- Memory stores 9 user-set programs*
- Audible alarm signals completion of set point run time

*Exclusive feature

CentriVap® Centrifugal Concentrator Common Features

- Lid latch with safety sensor
- Built-in vacuum delay prevents bumping
- Variety of rotors available
- Automatic vacuum release valve
- Epoxy-coated aluminum chamber, Teflon coated as an option

CentriVap® Centrifugal Concentrator
Common Features

- Heat Boost™ for extra heat controllable in 1º C increments through sidewalls of chamber*
- Larger chamber
- Quick-Stop System
- Rear vacuum port

CentriVap® Centrifugal Concentrator

Lightbulb feature!

CentriZap™

- Optional accessory allows viewing samples while rotor is turning. Samples appear to be standing still
- Plugs into outlet on back of CentriVap and holster attaches with two fasteners to side of cabinet

*Exclusive feature

CentriVap® Centrifugal Concentrator

Accessories

- Glass lid provides additional protection from solvents and corrosives that attack acrylic
- Secondary Chemical Traps remove vapors and liquid that may be exhausted from the vacuum pump and into the laboratory
- Digital Electronic Vacuum Gauge

CentriVap® DNA Centrifugal Concentrator

Incorporates a built-in diaphragm vacuum pump

- DNA rotor included for 0.5 – 2ml tubes
- Two 177 ml glass traps protect vacuum pump and environment*
- Rotor accommodates up to 60 each 1.5 ml and 72 each 0.5 ml microcentrifuge tubes
- Accessory Microtiter Plate Rotor holds four standard 96-well plates or two deep well plates

Lightbulb feature!

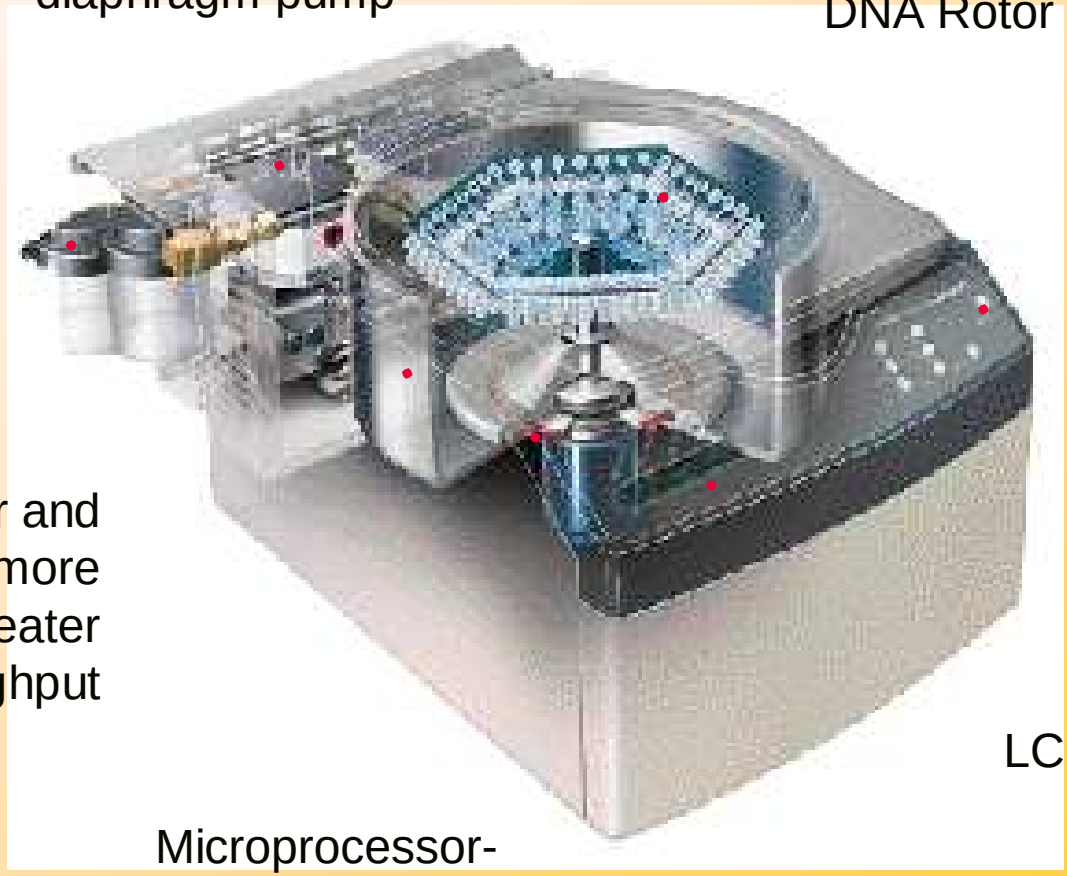
*Exclusive feature

CentriVap® DNA Centrifugal Concentrator

Integrated diaphragm pump

DNA Rotor included

177 ml glass traps



Control Panel

Larger chamber and rotors hold more samples for greater throughput

LCD Display

Microprocessor-controlled 300-watt heater

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CentriVap® Centrifugal Concentration Systems

Designed to rapidly concentrate multiple biological samples

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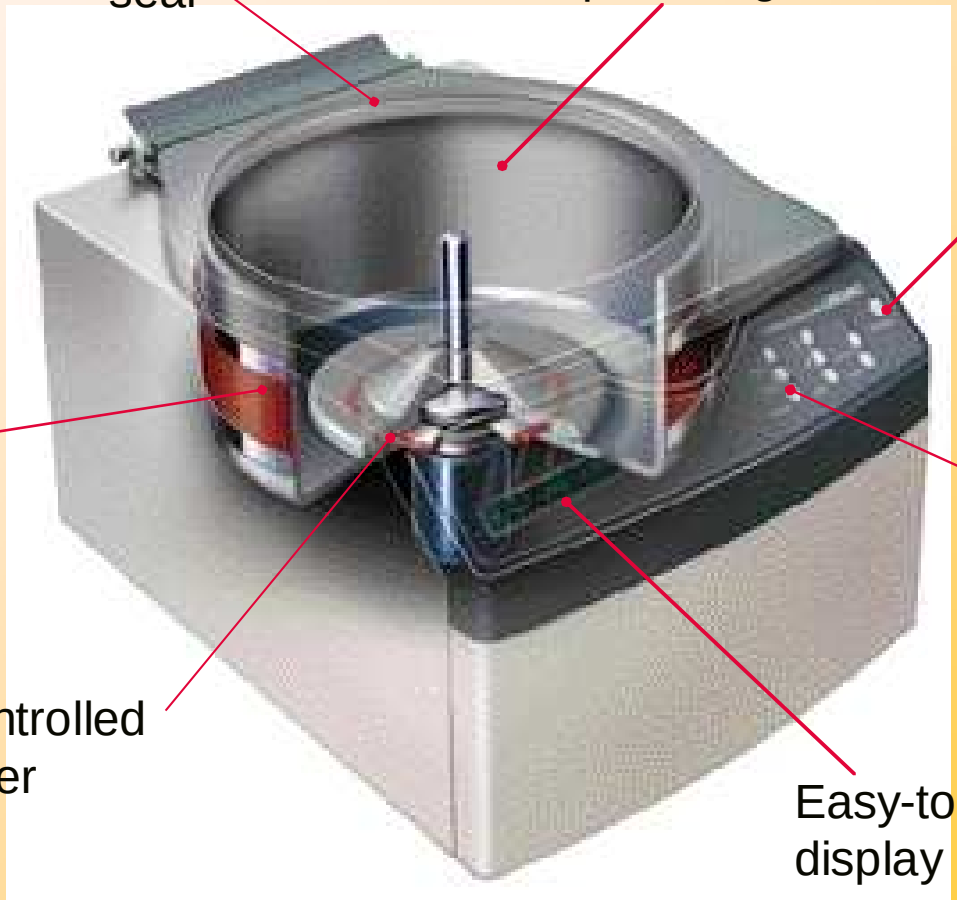
CentriVap® Centrifugal Concentrators

Large, phenol-free lid seal

Larger chamber holds more samples for greater throughput



Quick-Stop™ System

Optional microprocessor-controlled 300-watt Heat Boost™

Quick-Start™ One Button Start Up

Microprocessor-controlled 300-watt heater

Easy-to-read LCD display

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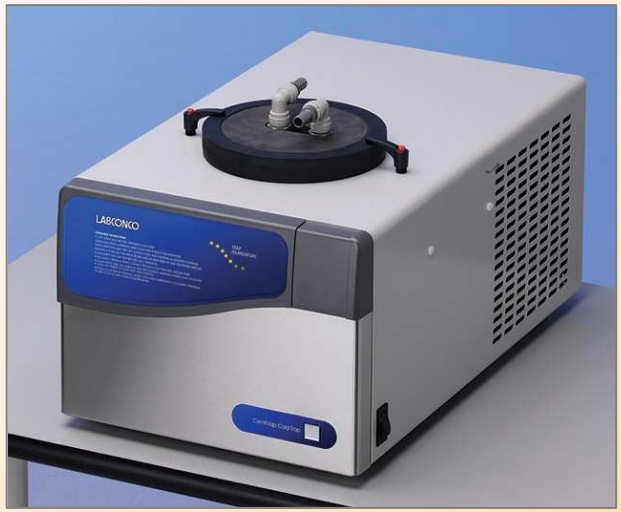
CentriVap® Required Accessories (not included)



Cold Trap

Rotor

Vacuum Pump

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CentriVap® Mobile Systems

CentriVap Mobile Console

- Only true mobile system available
- Accessory vacuum pump fits inside cabinet
- Accommodates a variety of rotors

*Exclusive feature

CentriVap® Mobile Systems

CentriVap Mobile Console includes:

- Concentrator
- -55° C Cold Trap
- 12 - 13 mm Rotor
- Clear Canister with Solvent Insert
- New Vacuum Port
- Glass lid

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CentriVap® Centrifugal Concentrator Systems

Complete CentriVap Concentrator Systems are available for the following applications:

- Aqueous
- Solvent
- Acid
- Gel Dryer

*All components necessary to begin operation are included except for the vacuum pump, which is sold separately.

Gel Dryer Systems

CentriVap Gel Dryer Systems include the CentriVap Benchtop Concentrator, Cold Trap, Gel Dryer and connecting tubing.

The diaphragm pump shown above is sold separately.

CentriVap® Centrifugal Concentrator Systems

CentriVap Benchtop System includes:

- -55º Cold Trap
- 12 - 13 mm Rotor
- Clear Canister
- Chemical Insert*—Moisture, Solvent or Acid

* With Acid System, a glass insert will be included to protect Cold Trap

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CentriVap® Centrifugal Concentrator Systems

Ultra-Low Cold Trap

Three-way Valve

Gel Dryer

Options & Accessories

- Ultra-Low Cold Trap (-85ºC)
- Three-Way Valve allows connection of other laboratory equipment to CentriVap System
- Gel Dryer

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CentriVap® Cold Traps

Cold Trap

- Epoxy-coated steel housing
- CFC-free refrigeration system with 1/4 hp compressor lowers cold trap to -55º C in less than 15 minutes
- Stainless steel collector
- Ready indicator illuminates when collector coil reaches operating temperature of -40º C

Lightbulb feature!

CentriVap® Cold Traps

Ultra-Low Cold Trap

Specs are same as the -50º Cold Trap with following exceptions:

- Epoxy-coated steel housing and control panel
- CFC-free refrigeration system with one 1/4 hp and one 1/3 hp compressor lowers cold trap to -85º C in less than 30 minutes

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Acid Resistant CentriVap®

- Uses robust component materials to create corrosion resistant concentrator
- Resists exposure to TFA, HCl, Acetic Acids
- Includes Teflon-coated chamber, and selection of rotors, Hastelloy shaft, ceramic ball bearings and glass lid

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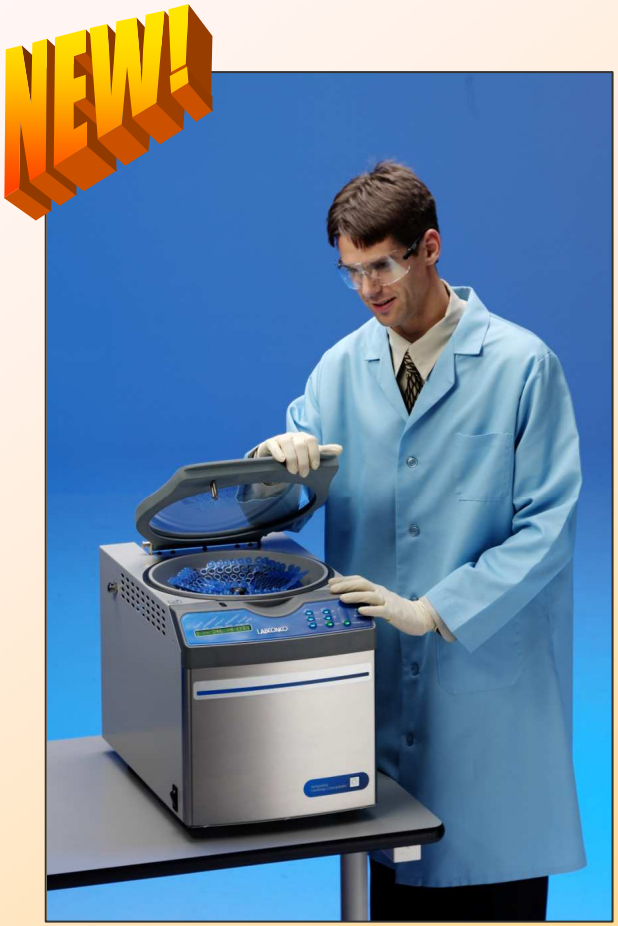
Refrigerated CentriVap® Centrifugal Concentrator



Exclusive!

- For molecular biology applications with DNA, RNA and proteins
- Only concentrator of its kind!
- Heats to 100°C, cools to –4°C for heat sensitive samples
- Two-step time and temperature programming
- Pre-cooling option

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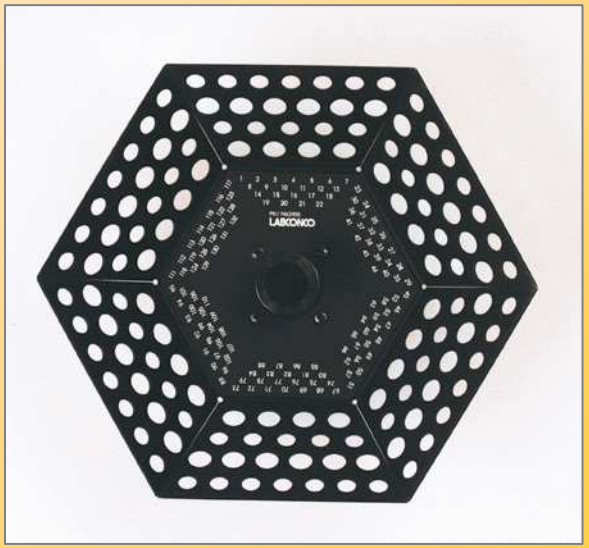
CentriVap® Rotors

Anodized aluminum rotors hold tubes at an angle to maximize surface area. Custom rotors can be ordered.

Acid resistant rotors available

Hexagonal Rotor



DNA Rotor

CentriVap® Rotors

Rotors are interchangeable. The 12-13 mm Rotor is included with each CentriVap Aqueous, Acid, Solvent, Mobile and Gel Dryer System.

28 mm Rotor

12-17 mm Rotor

12-13 mm Rotor

CentriVap® Rotors

Microtiter Plate Rotor hold four standard 96-well plates or two deep well plates

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CentriVap® Accessories

2-Port Manifold allows freeze drying of small volume samples in freeze dry glassware

Glass Trap Protects Cold Trap reservoir and lid from corrosives

Clear Polypropylene Canister holds chemical traps to provide additional protection to the vacuum pump

Vacuum Controller provides manual control and monitoring of vacuum levels

Vacuum Pumps

Diaphragm Vacuum Pumps are Teflon-coated for corrosion resistance. Select pump with explosion-proof motor if using flammable solvents.

Rotary Vane Direct Drive Vacuum Pumps are two-stage, oil sealed and sliding-vane. A one liter bottle of pump oil and two inlet adapters are provided.

Applications

Type of Account	Possible Application	Chemicals Used
Molecular Biology	Purification of Oligonucleotides	Ammonium hydroxide Aqueous
Genetics	Purification and concentrator of DNA and RNA	Methanol Ethanol Aqueous
Pharmaceutical	Drug discovery High throughput screening	TFA DMSO DMF

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