

This document provides guidance on how to use high-speed centrifuges (which can, if not operated correctly, cause serious injury and damage) safely in a laboratory environment.

Centrifuges rotate at very high speeds to separate materials on the basis of their density. There are a number of different types at the University from bench mounted to larger floor mounted centrifuges. This Information Sheet refers to high speed, floor-standing centrifuges **only**.

High Speed Centrifuge Hazards

If high-speed centrifuges are not handled correctly the following hazards may arise:



- Major injuries to the hands and fingers from the rotor.
- An unbalanced rotor can move violently, leading to damage to both the centrifuge, items near it and even damage to the building infrastructure.
- Biological and chemical hazards from the samples being centrifuged.
- Samples ejected if the centrifuge is not loaded and balanced correctly.
- If rotors are not attached properly they can shift, causing the whole centrifuge to move violently, causing severe damage to the centrifuge and the building.

Before Starting

Only trained, authorised personnel may operate such centrifuges. A list of trained persons must be displayed by the centrifuge. Records of training must be kept.

General

- **ALWAYS** check the COSHH Assessments to make sure you understand any chemical or biological hazards associated with the sample before centrifuging it.
- **A SPECIFIC RISK ASSESSMENT** required if centrifuging flammable or toxic materials.
- **ALWAYS** wear suitable PPE eg gloves and goggles with gloves replaced regularly.
- Remember, different thicknesses of gloves are needed dependent on what you are doing eg thicker gloves if handling concentrated acids or bases.



Result of wrong rotor used



Rotor failure

GLOVE MATERIAL

CHEMICAL GROUP	GLOVE MATERIAL					
	Natural Rubber	Nitrile Rubber	Neoprene™	PVC	Butyl	Viton™
Water miscible substances, weak acids / alkalis	✓	✓	✓	✓		
Oils		✓				
Chlorinated hydrocarbons						✓
Aromatic solvents						✓
Aliphatic solvents		✓				✓
Strong acids					✓	
Strong alkalis			✓			
PCBs						✓

Selecting Tubes

There is a wide range of tubes. These vary in make, shape, size and material. **ALWAYS CHECK:**

- Each tube is clean and in good order ie no cracks, crazing.
- Tubes are suitable for the rotor they are to be used in.
- The tubes are suitable for the RPM and RCF they are to be spun at.
- The tubes are suitable for the material and the volume of material to be processed.
- There is a sufficient number of the same type of tube and associated caps, 'o' rings etc.

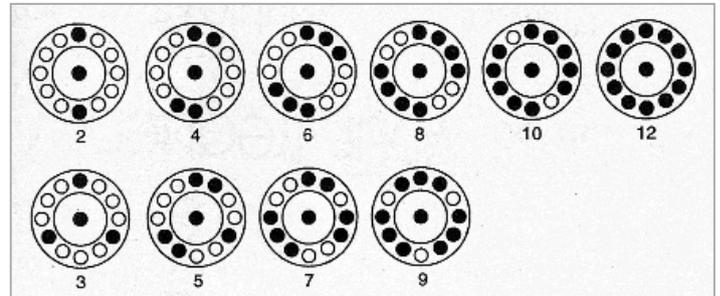
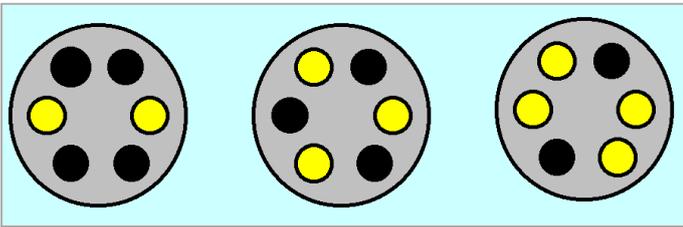
Balancing Tubes

It is **ESSENTIAL** tubes are balanced correctly as their contents weight will increase significantly when spun. *For example, 1ml at 20,000g (force of gravity) = 20kgs.*

NEVER judge by eye. Use digital or manual balances which are set to '0' before weighing and if you are unsure how to do this ask for help:



- **NEVER** overfill tubes and check they are tightly sealed.
- Place the tubes in the rotor and **CHECK** the rotor is balanced properly.
- This will depend on the number of tubes the rotor holds. Below shows examples for a 6 and 12-tube rotor.



Opening the Centrifuge Before and After Use

- Never open the centrifuge until it has come to a complete stop.

Loading and Installing the Rotor

- Always use the correct rotor for the type of centrifuge.
- **NEVER** exceed the maximum rotor speed - usually displayed on the rotor lid.
- **ALWAYS** check the rotor for signs of damage or corrosion before use.



Maximum rotor speed of 9000 RPM



Maximum rotor speed of 20,000 RPM

- **ALWAYS** seat the rotor correctly on the drive.



Ensure rotor pins line up with spindle pins



Spin rotor to check pins are located and rotor moves freely

- Fit the rotor lid and check it is screwed down properly into the spindle, with no gaps between the rotor lid and the rotor. Gently pull the rotor upwards to check it is secure.



- Secure the centrifuge lid and start the machine.
- Stay with the centrifuge until full operating speed is reached and the machine appears to be running without vibration.
- **If there appears to be excessive noise or vibration:**
 - Stop the machine and wait for it to stop.
 - Check the rotor balancing.
 - If you can't see anything wrong, make sure no one else uses the machine and report the problem to your Supervisor.
- **If a tube breaks:**
 - Stop the machine and leave for 30 minutes to reduce aerosols risk.
 - Wear appropriate gloves for the sample handled.
 - Clean the centrifuge as per manufacturer's advice, or if unsure ask your Supervisor.

General Cleaning of Centrifuge and Rotors

- Centrifuge rotors can corrode unless properly cleaned (very important if using corrosive chemicals such as cesium chloride).
- After each use clean and dry rotors according to manufacturer's instructions.



Water left in the centrifuge has caused corrosion

- If operated below room temperature, condensation forms within the centrifuge chamber. To prevent corrosion mop up excess water and leave the lid open until dry.

Maintenance and Inspections

It is essential centrifuges are maintained as directed by the manufacturer's guidance.

In addition, the importance of regular, recorded inspections (every 3 months minimum) which includes checks of safety critical devices, such as power / lid interlocks cannot be emphasised enough to ensure centrifuges continue to operate safely.

Examples of what to include in an inspection are:

Check	Ok	Action Required
General cleanliness – spilt chemicals not cleaned can deteriorate the casing / rotor etc		
The correct rotor(s) are available and used correctly ie the correct rotor for the RPM		
The rotor is not past its 'use by / replacement' date		
The correct tubes are available and used		
'O' rings (if required) are available and in good condition		
The centrifuge, rotor and tubes are structurally sound eg no cracks, chips, crazing, dents		
The lid secures correctly when closed		
The lid cannot be opened until the rotor has stopped spinning (confirms interlock works)		
There are no unusual sounds or vibration patterns coming from the centrifuge		
The Log Book is completed correctly		
The Authorised Users List is displayed		

Disposing of Waste

- Check the COSHH Assessment to ensure containers / gloves etc are disposed of correctly.

REMEMBER



- If you think there is something wrong with a centrifuge, **STOP** using it, place a sign on it to prevent others from using it and report the problem immediately to your Supervisor or Lab Technician.