College/Unit:	**Department of Mechanical and Biomedical Engineering**
Procedure Title:	**Standard Operating Procedure #TE0005** **Sorval RT6000B Centrifuge Safe Handling**

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Revision History

Revisions to this procedure are to be documented in Table 1, Revision History.

Table 1: Revision History

Document Section	Details of Amendments	Date	Author (Initials)

1 Introduction

This Standard Operating Procedure (SOP) provides guidelines for the safe use of a centrifuge. A centrifuge spins at high speeds to separate substances of different particle sizes or densities. Since centrifuges can reach high speeds they must be carefully balanced.

This SOP provides information for the following:

- General use of the centrifuge,
- Potential Hazards
- Personal Protective Equipment (PPE) requirements,

At the discretion of the Departmental Assistant, a researcher may be asked to repeat training on this SOP, if the researcher has failed to adhere to some of the policies outlined. All users will be required to repeat training on this SOP every three years from the date of the original training.

Persons who do not follow this and other required Mechanical and Biological Engineering SOPs will lose lab privileges (this may mean the inability to conclude research that is required for your degree)

2 Definitions

SOP:	Standard Operating Procedure
SDS:	Safety Data Sheet
WHMIS:	Workplace Hazardous Materials Information System 2015
PPE:	Personal Protective Equipment

3 Potential Hazards

- Physical Hazards
    - Mechanical failure of the centrifuge from:
        - Mechanical stress
        - Metal fatigue
        - Corrosion
    - Centrifuge explosion from
        - Unbalanced rotor
        - Mechanical failure

- Exposure Hazards

- Materials being centrifuged can become aerosolized and expose users to hazardous air.
- Leakage out of centrifuge containers not properly sealed can result in exposure to hazardous materials.

4 Personal Protective Equipment (PPE) Required

- Long pants.
- Lab coat.
- Eye protection.
- Closed-toe footwear.
- PPE for specific material being centrifuged, refer to SDS.

5 Procedure

5.1 Sample Preparation

- Ensure tubes and containers are appropriate for the rotor, sample type and rotor speed
  - Tube/container and rotor bottoms must match.
  - Sample must be compatible with tube/container material.
  - Tube/container must be rated for speed being used.
- Inspect tubes or containers for cracks or flaws before being used.
- Avoid over-filling or under-filling tubes or containers, follow manufacturer limits where given.
- Ensure lids or tops are properly tightened or sealed.
- Ensure the exterior of the tubes and/or containers are clean and dry prior to centrifugation.
- Balance the rotor with the tubes and/or containers inserted.

5.2 Balance of Rotor H-1000B Swinging Bucket

Because of the extreme speed of a centrifuge, it must be carefully balanced. The centrifuge is most easily balanced with containers in pairs placed directly opposite each other.

- The **maximum operating** speed is 3200 rpm.
- The **maximum compartment mass** is 820 grams. This includes the weight of the adapter, tube or bottle, and the tube contents.

5.3 Operation

- **To perform the run**
    - Set the POWER switch to "I", and turn the TIME dial off. (The fan will turn on and continue to operate whenever the POWER switch is in the on position). The FAULT light may come on when the power is turned on with the door closed. The light will go off when the door is opened.
    - When the OPEN light comes on, turn the door release knob to the OPEN position, and lift the chamber door up.
    - Install the rotor on the drive shaft and close the door. Turn the door release knob to the LOCKED position (the door latches will engage). Be sure the rotor is properly balanced and seated on the drive spindle.
    - Set the CHAMBER TEMP° C dial to the run temperature desired.
    - Set the BRAKE switch to "**.** " if braking is desired.
    - Set the TIME dial to the run time desired.
    - Set the REV/MIN x 1000 dial to the desired run speed.
    - At the end of the run remove the rotor.

- **To remove the rotor**
    - Leave the POWER switch set to "I".
    - If the TIME dial is set to "∞" turn it off.
    - When the OPEN light comes on, turn the door release knob to OPEN position and lift the chamber door up.
    - Remove the rotor, close the chamber door, and set the POWER switch to "0".

- **Emergency sample recovery**
    - If the main power shuts off because of a power failure or system malfunction while the rotoris spinning, the chamber door will not open. A mechanical override is provided to allowsample recovery in the case of an emergency.
    - The mechanical override loop is located under the right, front corner of the centrifuge. To operate the override, insert a screwdriver or similar object into the metal loop and pull down. Turn the door release knob to the OPEN position and lift the chamber door up.

- **Reducing speed for rotor compartment loads in excess of design mass**
    - There is a maximum allowable compartment mass established for each centrifuge rotor. See Appendix C34-C36 in the Operating Instructions of the Sorvall RT6000B for more details.
    - To prevent rotor failure, the total contents of any compartment, including specimen, tubes, cover, and adapters (if used), must not exceed the figure given on page 1-2 unless rotor speed is reduced proportionately.
    - If the compartment mass is more than that specified for therotor, the reduced speed can be determined by using the formula given below:
    - Reduced Motor Speed = Maximum Rotor Speed x sqrt (Maximum Compartment Mass / Actual Compartment Mass)
- **Logbook**
    - Please remember to fill out the log book for tracking centrifuge use.

For all other questions and information, please see the Sorbal RTB6000 manual.

6 Inspection and Cleaning

- **Inspection**
    - Inspect the centrifuge each week for signs of wear, encrusted biological deposits, and general cleanliness. Follow the cleaning procedures described below when necessary.
- **Cleaning**
    - The rotor chamber should be kept clean and wiped dry. Wash the rotor chamber with a mild, nonalkaline dishwashing liquid, then rinse and dry with a soft absorbent cloth.
    - For sterilization, use 70% ethanol to disinfect the rotor chamber or a 2% glutaraldehyde solution.
    - Before each run, wipe the spindle with a soft cloth before a rotor is installed to reduce the chance of the rotor sticking to the spindle.
    - Clean the chamber door with a soft, wet cloth and soapy water. Avoid using abrasive materials (for example, dry paper towels) and organic solvents (for example, acetone) on the dry surface.

7 Emergency Response Procedure (ERP)

- All personnel must be familiar with the Emergency Response Plan located at the entrance of the laboratory, as well as the location of the fire extinguisher and first aid kit. All personnel must be familiar with the Lockdown Procedure for their laboratory and/or office space.
- All personnel are responsible for alerting a Departmental Assistant to any unsafe equipment or situation that they notice in the laboratories.
- All chemical spills, injuries and near misses must be reported to the Departmental Assistant as soon as possible (**within 24 hours**). The appropriate paperwork must be completed. See the following for more information on filling out an incident report: http://safetyresources.usask.ca/incident-staff.php
- Any time that a first aid kit is used (even for Band-Aids) a record of the incident and what items were used from the first aid kit must be made in the log book inside the kit. This helps the Departmental Assistant keep track of what is used and restock items as necessary.

8 Bibliography

Canadian Biosafety Handbook, Second Edition, May 26, 2016
http://canadianbiosafetystandards.collaboration.gc.ca/cbh-gcb/index-eng

Operating Instructions Sorvall RT6000B & T6000B Tabletop Centrifuges

9 Persons authorized to perform this SOP:

By signing this form I acknowledge that I have read and understand this SOP, as well as the applicable SDS's and that I will conduct myself in accordance with this SOP and the general laboratory rules. I also acknowledge that I have received training by a qualified trainer, who has initialed this SOP acknowledging that training has been conducted.

List of Qualified Trainer(s)

1. Adam McInnes
2.
3.

NOTE: ALL SIGNATURES MUST BE PRESENT ON THE SOP LOCATED IN THE YELLOW BINDER IN ROOM 1A26. Digital copies of SOP's are made available for reference and convenience only. Printed SOP's are valid for 24 hours only, after that time their accuracy must be verified with the **OFFICIAL HARDCOPY VERSION**.

Name (Print)	Date	Dep’t	Signature	Trainer’s Initial
