

# Centrifuge Safety Manual

## General Information

The following program must be followed when using centrifuges to ensure that all centrifuges in campus laboratories are used, cared for and maintained in a safe manner.

### Training

1. It is the responsibility of the lab supervisor to ensure that all centrifuge users are properly trained in the selection, care and use of centrifuge, accessories and rotors. The lab supervisor may delegate training to the employee responsible for the centrifuge involved.
2. Use of centrifuges by new users must be closely supervised by the employee responsible for each centrifuge until he/she is satisfied that unsupervised usage of the instrument is safe.
3. All users must be familiar with the safety procedures for all of the centrifuges that they use, including proper load selection, balancing and maintenance of rotor where necessary.
4. It is the responsibility of the laboratory supervisor to ensure that each user has carefully read and understands the **Centrifuge Safety Instructions** specific for that centrifuge prior to instrument use. Users must sign a copy of these instructions to ensure that they have read and understand them.

### Use

1. All centrifuges that have manufacturers' rotor derating systems including ultracentrifuges, high speed centrifuges (Sorval and equivalent instruments) and high speed benchtop (Eppendorf, IEC, Jouan and equivalent instruments) must have an up-to-date record of the total hours of usage (refer to centrifuge use logs). Microcentrifuges and other low-speed centrifuges do not require use logs.
2. It is essential that a centrifuge use log be maintained for all ultracentrifuges, high speed centrifuges and super speed centrifuges. This is essential where manufacturers' rotor derating systems apply (reducing maximum speed) to prevent rotor fatigue and other mechanical hazards. Each user log entry must include the User's Name; Date of Use; Sample Description; Number of Runs; Run Time; Run Speed, Rotor Serial Number and Accumulated Revolutions (for those instruments equipped with revolution counters).
3. A copy of the **Centrifuge Safety Manual** must be kept available near each centrifuge for easy access by users.
4. If a centrifuge is experiencing problems or maintenance is required, the unit must be immediately taken out of service, disconnected from the power source and a clearly marked DO NOT USE until serviced. This notice will include the name of the person, the date, the reason and the signature of the lab supervisor or employee designate.

## **Maintenance**

1. All centrifuge maintenance must be clearly documented in the log book provided in the lab for each unit. This includes record of service history, warranties and warranty expiration dates as well as details of maintenance carried out by laboratory users.
2. If no reliable record of centrifuge history is found, or records are inadequate or not up to date, the unit concerned must be immediately taken out of service. A service representative from the centrifuge manufacturer must be contacted and the unit completely inspected and parts requiring replacement ordered and replaced by the service representative. Proper records must be kept thereafter.

## **Records and Responsibility**

### **University Safety:**

It is the responsibility of the Department of University Safety to keep an up-to-date list of departments who have centrifuges in use. The list is to be made available to the Ministry of Labour inspector on request.

**Departmental Safety Officer:** It is the responsibility of the Departmental Safety Officer (DSO) of a department that uses centrifuge(s) to:

- retain and keep up to date a list of all centrifuges in the department
- the list will include the name of the unit, manufacturer, serial #, building and room #, warranty and service information, name of the person responsible for the unit
- ensure that the laboratory supervisor of any laboratory where a new instrument is installed is made aware of his/her responsibilities as outlined in this document
- arrange for any assistance necessary to this supervisor regarding preparation of safety instructions, development of training package and preparation of centrifuge use log and maintenance log
- ensure that the list of centrifuges in use is made available to the Department of University Safety or Ministry of Labour inspector on request.

**Lab Supervisor:** It is the responsibility of the lab supervisor to:

- fill out and retain a record of all user names, dates of training and instruments for which training was received
- ensure that the person who is responsible for each centrifuge carries out all the described safety tasks (including regular maintenance, servicing and record keeping)
- ensure that any new centrifuge or any existing centrifuge that is moved to or from his/her laboratory is properly disconnected, moved and installed according to manufacturer specifications. A service representative should be contacted to assist in moving and installing the instrument if required.
- provide instructions involving the centrifugation of hazardous materials
- provide appropriate warning signs in rooms where potentially hazardous biological, radioactive materials, toxic or other hazardous chemicals are being centrifuged

**Lab Supervisor or Designated Employee:** It is the responsibility of the employee responsible for each centrifuge to:

- train new users in safe usage and maintenance of the centrifuge, and supervise their use where necessary
- ensure that the safety procedures and centrifuge use log are kept close to the instrument
- provide copies of the user instructions including specifics on balancing loads in the rotor, maximum G loads in RPM, filling and sealing samples
- ensure all users fill out the centrifuge use log
- provide derating information on rotor based on centrifuge use log
- ensure that all the regular and periodic maintenance required is carried out and recorded in the maintenance log
- contact a service representative when repair is necessary and record repair details in centrifuge maintenance log

**User:** It is the responsibility of the user to:

- attend a mandatory training session on centrifuge lab safety, use, care and maintenance before being allowed to operate a centrifuge,
- operate and maintain all centrifuges in accordance with NIEHS policy and good safe laboratory procedures,
- safety procedures as required),  
Read and follow all instructions for safe usage and maintenance of the centrifuge.
- Should users at any time be unsure of the safe operation of the instrument they must refer to the instruction manual for details and/or ask the employee responsible for the centrifuge or the laboratory supervisor for assistance?
- fill out the log each time the instrument is used,
- Report damage to centrifuge or rotor to the laboratory supervisor so action in terms of repair or derating may be performed.

### **Mechanical Breakdown**

In the event of a mechanical breakdown such as, rough running, a broken or chipped rotor, the rotor is off the spindle during use, a dropped rotor, or other types of mechanical problems, the user must notify the lab supervisor or employee designate immediately.

### **Emergency Procedure**

In the event that an incident or accident related to centrifugation occurs:

- turn off centrifuge and disconnect it from the power source,
- notify others in laboratory and evacuate
- notify the lab supervisor
- notify Department of University Safety
- refer to hazardous agent use protocol (if required)
- refer to radiation safety guide for radiochemical spills (if required)

## General Safety Measures

Centrifuges are instruments with strong potential for harming users due to the high speed at which they operate: mechanical failure of the rotor can result in injury, even death; and sample container breakage can generate aerosols that are harmful to inhale. Thus, it is very important to act safely when using and maintaining these instruments.

\*\*\*\* IF AT ANY TIME YOU ARE UNSURE HOW TO OPERATE THE INSTRUMENT SAFELY, PLEASE REFER TO THE INSTRUCTION MANUAL FOR DETAILS AND/OR ASK THE LABORATORY SUPERVISOR OR DESIGNATED EMPLOYEE FOR ASSISTANCE\*\*\*\*

1. The centrifuge should always be installed according to the manufacturer specifications.
  - Do not locate the instrument near areas containing flammable reagents or combustible fluids, or where vibration will cause items to fall off nearby shelves.
  - The centrifuge should be securely anchored by strong suction cups (benchtop models), wheel brakes (floor models) etc. Movement of the instrument can damage parts and injure users.
  - Request instructions from the manufacturer on safe transportation procedures if the centrifuge must be moved to another location and instructions are not in the operation manual.
2. Proper selection, use and maintenance of rotors is critical to safe operation. Lack of care can lead to severe personal injury.
  - Use only rotors designed for use in this instrument.
  - Inspect the rotor for signs of corrosion or cracking before using. If found, do not use the rotor, and inform the employee responsible for the centrifuge of the problem.
  - Inspect the inter-lock system to ensure the cover cannot be opened while the rotor is spinning.
  - Never operate the rotor unless it is symmetrically loaded and balanced. Care is required to achieve this.
  - Never operate the rotor without the lid or cover closed and locked in place, if the lid cannot be locked, the machine must be removed from service.
  - Never exceed the maximum recommended speed of the rotor.
  - Clean and disinfect rotors and sample cavities or cups after each use with non-corrosive solutions.
3. Sample management is also very important to safety. Lack of care can result in exposure of the user to harmful materials.
  - Always use sample tubes or bottles designed for the particular rotor being used
  - In general, samples should be capped to avoid generation of aerosols.
  - Nitrocellulose tubes should only be used when transparent and flexible. They must never be heated because of explosion possibility.

- Plastic centrifuge tubes should be discarded after one cycle of ultracentrifugation. The failure rate for used tubes is a hazard that justifies using new tubes for each high G run.
- When using radioactive, toxic, or pathogenic materials, be aware of potential hazards associated with them in case of leakage during centrifugation. If leakage does occur you may be exposed to particles dispersed in the air (aerosol). It is recommended that additional precautions be taken to prevent exposure to these materials such as the use of controlled ventilation or isolation areas.
- If exposure occurs to radioactive, toxic or pathogenic materials all necessary precautions and appropriate decontamination procedures should be used (see lab safety procedures for toxic/pathogenic and Radiation Safety Guide for radioactive).
- Dispose of all waste solutions according to appropriate health and safety guidelines.

#### 4. For safe use of the centrifuge

- Do not circumvent any of the safety features (such as lid closure override switches). They are there to protect you.
- Do not lean or place items on the instrument while it is operating.
- Do not leave the centrifuge until full operating speed is attained, and the instrument appears to be running normally without vibration.
- If vibration occurs, stop the run immediately; wait until the rotor stops, and check the load balances.
- In event of a power failure, do not try to open the lid to retrieve samples for at least one hour. After the rotor has stopped, follow the instructions in the manual for recovery of the samples.

**Instrument User Log**

**Rotor Use Log**

**Instrument Maintenance Log**

## Specific Safety Instructions

### Beckman Optima Le-80K Preparative Ultracentrifuge

#### Power

If the power to the instrument is off, flip the circuit breaker at the right side of the instrument on. Do not turn power off except during maintenance and in case of an emergency. The instrument will be in standby mode when not in use. Press any key and the instrument becomes fully operational. To end a run for any reason press **STOP**.

Power must be turned on and the vacuum system turned off to open chamber door.

#### Standard Operation

1. Use only the Beckman rotors and accessories designed for use in this instrument.
2. See manual for specific instructions for filling, sealing and capping tubes and bottles.
3. Inspect tubes and bottles for cracks or flaws prior to use. Do not use tubes and bottles if damaged.
4. Do not overfill tubes that require plugs, overfilling can cause overflow when plug is inserted, however, too much air can cause the tube to deform and disrupt gradients and sample bands, as well as increasing the force required to remove the tube from the cavity after centrifugation.
5. Unless otherwise specified the minimum recommended volume for bottles is half full, this will reduce rotor speed for optimum performance. Maximum and minimum fill levels and cap requirements are shown in table 3-6 of the manual.
6. Ensure samples are symmetrically placed in rotor.
7. With power on, open the chamber door, install the rotor, and close and lock the chamber door. Press VACUUM to evacuate the chamber.
8. Enter the required run conditions (Speed, Temp, and Time, Hold or  $\omega^2t$  as outlined in the manual).
9. Instrument should be set for standard or programmed operation (see manual).
10. Do not exceed rotors maximum run speed.
11. Press ENTER/RECALL and START (the vacuum system is automatically activated, unless you pressed VACUUM earlier).
12. Do not lean or place items on the instrument while it is operating.
13. Make sure run is proceeding normally before leaving the area.
14. Press stop to terminate a run in the HOLD mode (or to stop for any reason). Runs in timed and  $\omega^2t$  modes will terminate automatically and the instrument will sound a tone to indicate end of run.
15. At end of run, do not open chamber until the rotor comes to rest.
16. After rotor has stopped, press VACUUM to vent chamber.
17. When working with infectious materials wait 10 minutes after the rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures that apply to materials being centrifuged.
18. If a breakage has occurred, wait at least 10 minutes after the rotor has stopped for aerosols and droplets to settle before opening lid.

19. Open chamber door and remove the rotor. Ensure rotor chamber is clean and dry. Keep door closed between runs.
20. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest before removing the tubes from the rotor.
21. Do not try to remove tubes by pulling the plugs.
22. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug is removed if pressure is applied to the tube.

In case of a power failure, turn off the instrument and disconnect it from the main power source. In case of a power failure, lasting for several hours the samples must be retrieved from the rotor. The control head cover and the front panel must be removed to disengage the door lock. If possible, refer maintenance to qualified service personnel.

### **Care and Maintenance**

1. Always maintain the rotor in the recommended manner. The rotor and all accessories must be clean and inspected prior to each run: do not use if rotor shows signs of corrosion or cracking.
2. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals.
3. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
4. Wash only buckets of swinging rotors. If necessary, wipe off the rotor body with a damp cloth. Do not pour water directly into rotor chamber.
5. Rotors and sample buckets should be cleaned and disinfected after each use with a non-corrosive cleaning solution (mild detergent and distilled water are recommended). Metal test tube brushes must not be used for cleaning the inside of the buckets. All traces of detergent should be removed prior to air-drying.
6. Keep chamber door closed between runs to prevent moisture and dirt from collecting inside. Wipe off the chamber walls with a dry cloth before each run.
7. A regular inspection of the unit should be performed before every use and a detailed inspection every 100 hours to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting, white powder or deposits on aluminum rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.
8. Wipe clean O-ring or gaskets regularly (lubricate after cleaning). Replace every 600 hours of use or as required.
9. After 1000 runs or 2500 hours of centrifugation the maximum rated speed of all swinging bucket and aluminum fixed angle rotors should be permanently derated by 10%. The overspeed device should also be replaced.
10. Sample tubes, bottles, adapters and spacers should always be washed by hand using a mild detergent with brushes that will not scratch the tubes.
11. Specific tube and bottle sterilization and disinfecting techniques based on material type can be found in the manual.
12. Do not interchange tube-cap components. They are designed as a unit for a particular tube being centrifuged in a particular rotor
13. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for

centrifuges. Contact the centrifuge manufacturer and use the centrifuge log for preparing the derating schedule of the rotor.

## **Beckman L8-70M Ultracentrifuge**

### **Standard Operation**

1. Use only the Beckman rotors and accessories designed for use in this instrument.
2. Inspect bottles and tubes for cracks or flaws prior to use. Do not use if damaged.
3. See manual for specific instructions for filling, sealing and capping tubes and bottles.
4. Do not overfill tubes that require plugs, overfilling can cause overflow when plug is inserted, however, too much air can cause the tube to deform and disrupt gradients and sample bands, as well as increasing the force required to remove the tube from the cavity after centrifugation.
5. Unless otherwise specified the minimum recommended volume for bottles is half full, this will reduce rotor speed for optimum performance. Maximum and minimum fill levels and cap requirements should be referred to in table 3-6 of the manual.
6. Ensure samples are symmetrically placed in rotor.
7. With power on, open the chamber door, install the rotor, and close and lock the chamber door.
8. Enter the required run conditions (Vacuum, Speed, Temp, Max Temp, and Time, Hold or  $\omega^2t$  as outlined in the manual).
9. Select slow ACCEL and/or DECEL profiles if desired.
10. Do not exceed rotors recommended maximum run speed.
11. Do not lean or place items on the instrument while it is operating.
12. Press ENTER/DISPLAY and START (the vacuum system is automatically activated).
13. To end run press STOP. Do not switch off to stop run.
14. At end of run, do not open chamber until the rotor comes to rest.
15. After rotor has stopped, press VACUUM to vent chamber.
16. When working with infectious materials wait 10 minutes after rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures that apply to materials being centrifuged.
17. If a breakage has occurred, wait at least 10 minutes after rotor has stopped for aerosols and droplets to settle before opening lid.
18. Open chamber door and remove the rotor. Ensure rotor chamber is clean and dry, keep door closed between runs.
19. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest to remove the tubes from the rotor.
20. Do not try to remove tubes by pulling the plugs.
21. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug is removed if pressure is applied to the tube.

In case of a power failure, turn off the instrument and disconnect it from the main power source.

In case of a power failure, lasting for several hours the samples must be retrieved from the rotor. The control head cover and the front panel must be removed to disengage the door lock. If possible, refer maintenance to qualified service personnel.

## **Care and Maintenance**

1. Check regularly that the motor and brake circuits are working properly.
2. Always maintain the rotor in the recommended manner. The rotor and all accessories must be clean and inspected prior to each run: do not use if rotor shows signs of corrosion or cracking. (See care and maintenance).
3. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals.
4. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
5. Rotors and sample cups should be cleaned and disinfected after each use with a non-corrosive cleaning solution (mild detergent and distilled water are recommended). Metal test tube brushes must not be used for cleaning inside of the cups. All traces of detergent should be removed prior to air-drying.
6. The O-ring should be cleaned with a tissue every 300 to 400 hours of use. Replace the O-ring if it becomes worn or damaged. Lightly lubricate the O-ring with silicone vacuum grease before reinstalling it to ensure an optimal vacuum seal.
7. Keep chamber door closed between runs to prevent moisture and dirt from collecting inside. Wipe off the chamber walls with a dry cloth before each run.
8. Use the dry cycle to collect condensation after each cold run.
9. The fins on the refrigeration condenser must be clean for efficient heat transfer. Use a vacuum cleaner or damp cloth to clean the fins. Be careful, the fins are sharp.
10. The vacuum pump oil should be changed every 400-600 hours of use (or whenever oil is cloudy).
11. A regular inspection of the unit should be performed before every use and a detailed inspection every 100 hours of use to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting, white powder or deposits on aluminum rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.
12. Sample tubes, bottles, adapters and spacers should always be washed by hand using a mild detergent with brushes that will not scratch the tubes.
13. Do not interchange tube-cap components. They are designed as a unit for a particular tube being centrifuged in a particular rotor.
14. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for centrifuges. Contact the centrifuge manufacturer and use the centrifuge log for preparing the derating schedule of the rotor.

## Sorvall RC-M150GX Micro-Ultracentrifuge

### Standard Operation

1. Turn power switch on
2. Use only Sorvall rotors and accessories designed for use in this instrument.
3. Inspect the rotor for signs of corrosion or cracking before using. If found, do not use the rotor, and inform the person responsible for the centrifuge of the problem.
4. Inspect sample tubes and bottles for cracks or flaws prior to use. Do not use if damaged.
5. Check the chemical compatibility of all materials used (see table in manual).
6. See manual for specific instructions for filling, sealing and capping tubes and bottles.
7. Ensure each tube is below maximum fill capacity to avoid leakage during centrifuging (see manual for maximum tube capacity).
8. Excessively low liquid level may limit the rotor speed or crush the tube.
9. Do not interchange tube-cap components. They are designed as a unit for a particular tube being centrifuged in a particular rotor
10. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals. If exposure occurs, clean the rotor immediately.
11. Ensure samples are symmetrically placed in rotor and that loads are well balanced.
12. Sample balancing can be done visually. The difference between the meniscus level of the samples loaded in the same rotor must be within 5 mm.
13. To prevent rotor failure the average density of liquids in each compartment should not exceed 1.7 g/ml. If it is exceeded, the rotor speed should be reduced.
14. To prevent rotor failure the rotor speed should be reduced whenever the rotor speed/temperature combination exceeds the solubility of the gradient material and causes it to precipitate (i.e. cesium chloride).
15. Before running a swinging rotor, make sure that each bucket is properly seated on its support pins.
16. Some tubes and adapters will not operate at the maximum speed of the rotor. Refer to manual.
17. Ensure samples in rotor are symmetrically placed in rotor.
18. Do not operate keyboard of unit with ballpoint pen or any other sharp object.
19. If sample temperature control is important, you should equilibrate the sample temperature before the run.
20. Install rotor. Close and lock chamber door.
21. Ensure rotor cover is properly locked in place before operating rotor (rotors are equipped with double locking knobs on cover).
22. Enter the required run conditions.
23. Do not exceed the maximum recommended speed for the rotor.
24. Press vacuum key.
25. Press START key. Run operates for specified operation time or press STOP key.
26. Do not open the cover until the rotor has stopped. Once rotor has stopped, press VACUUM key, take rotor out.
27. When working with infectious materials wait 10 minutes after rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures that apply to materials being centrifuged.
28. If a breakage has occurred, wait at least 10 minutes for aerosols and droplets to settle before opening lid.

29. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. When this is happening, allow at least 5 minutes after the rotor comes to rest before removing the tubes from the rotor.
30. Do not try to remove tubes by pulling the plugs or unscrewing caps.
31. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug or screw cap is removed if pressure is applied to the tube.

In case of a power failure, the power should always be turned off and the unit disconnected from the main power source. In case of a power failure lasting for several hours samples must be retrieved from the rotor. Follow instructions in the manual for emergency recovery from power outage. Ensure that the rotor is stopped before removing the cover. If possible, refer maintenance to qualified service personnel.

### **Care and Maintenance**

1. Check regularly that the motor and brake circuits are working properly.
2. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
3. Do not autoclave aluminum covers or rotor body. Aluminum must not be exposed to temperatures greater than 121 C.
4. Wipe the magnet surface (on the bottom of the rotor) to remove any iron powder accumulation.
5. A regular inspection of the unit should be performed before every use and a detailed inspection after every 100 hours of use to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting, white powder, or deposits on aluminum rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.
6. Rotor should be stored clean, dry, upside down with cover and tubes removed (this will allow air to circulate)
7. Rotor chamber should be kept clean and wiped dry routinely to maintain efficient vacuum and cooling. Wash chamber with warm water and mild detergent at least once for every 30 hours of use, rinse the chamber and dry it with soft absorbent cloth. (Ideally after each use).
8. Wipe the drive spindle with a dry soft cloth before every run to reduce the chance of the rotor sticking to the spindle.
9. Wipe door O-ring clean regularly (lubricate after cleaning) to ensure high vacuum. If door is frequently used, take out O-ring after every 300 to 400 hours of use, wipe it with a soft cloth and apply a thin coat of vacuum grease. Clean the door seal O-ring with a clean, soft cloth dampened with alcohol.
10. Use a mild non-alkaline detergent and water or a household wax cleaner to clean cabinet parts.
11. Sample tubes, bottles, adapters and spacers should be washed using warm water, a mild detergent and brushes that will not scratch the tubes. Do not use metal brushes.
12. Specific tube and bottle sterilization and disinfecting techniques based on materials can be found in the manual.
13. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for centrifuges. Contact the centrifuge manufacturer and use the centrifuge log for preparing the derating schedule of the rotor.

## **Sorvall Superspeed Fixed-Angle Centrifuge RC-5C PLUS, RC-5B, RC-2B**

### **Standard Operation**

1. Turn power switch on.
2. Use only Sorvall rotors and accessories designed for use in this instrument.
3. Inspect the rotor for signs of corrosion or cracking before using. If found, do not use the rotor, and inform the person responsible for the centrifuge of the problem.
4. Inspect sample tubes and bottles for cracks or flaws prior to use. Discard if damaged.
5. Check the chemical compatibility of all materials used (see table in Appendix)
6. Ensure each tube is below maximum fill capacity to avoid leakage during centrifuging.
7. Do not interchange tube-cap components. They are designed as a unit for a particular tube being centrifuged in a particular rotor
8. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals.
9. Ensure maximum compartment mass of rotor is not exceeded (includes specimen, tubes, cover and adapter) to prevent rotor failure (if exceeded rotor speed must be reduced).
10. Open chamber door, load rotor.
11. If temperature is important for samples precool the chamber first.
12. Ensure samples in rotor are symmetrically placed in rotor and loads are balanced.
13. Ensure rotor cover is on. Close and lock chamber door (rotors are equipped with double locking knobs on cover).
14. Do not exceed the maximum recommended speed of the rotor. The rotor speed must be reduced if the rotor speed/temperature combination exceeds the solubility of the gradient material and causes it to precipitate.
15. Enter the required run conditions (speed, time, brake). For the RC5C Plus, the rotor code must match the rotor.
16. Press START.
17. After run has stopped (or after pressing stop to end run) wait for rotor to come completely to rest. Open chamber door, remove rotor cover, then remove sample tubes or bottles from rotor. If rotor is not being used again, remove rotor from chamber. Ensure rotor chamber is clean and dry, keep door closed between runs.
18. When working with infectious materials wait 10 minutes after rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures that apply to materials being centrifuged.
19. If a breakage occurs, wait at least 10 minutes after the rotor has stopped for aerosols and droplets to settle before opening the lid.
20. Keep the chamber door closed after the rotor is removed to inhibit formation of condensation on walls. Remove rotor as soon as possible to avoid samples from freezing.
21. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest before removing the tubes from the rotor.
22. Do not try to remove tubes by pulling the plugs or unscrewing caps.
23. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug or screw cap is removed if pressure is applied to the tube.

24. The last user of the day should leave the lid open to allow condensation to evaporate.

In case of a power failure, turn off the instrument and disconnect it from the main power source.

In case of a power failure, lasting for several hours the samples must be retrieved from the rotor. The control head cover and the front panel must be removed to disengage the door lock. Always wait until the rotor has stopped before opening the door. If possible, refer maintenance to qualified service personnel.

### **Care and Maintenance**

1. Check regularly that the motor and brake circuits are working properly.
2. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
3. Wash rotor and cups or cavities with warm water and mild detergent after each use. Do not use metal test tube brushes for cleaning cups or cavities. All traces of detergent should be removed prior to air-drying.
4. The rotor chamber should be defrosted and cleaned periodically to maintain efficient cooling.
5. Wash the tapered spindle after every 30 hours of use.
6. Clean cabinet panels after every 100 hours of use.
7. Clean condenser fins once every 100 to 300 hours of use, or whenever dust accumulates visibly.
8. Replace the motor brushes whenever, the BRUSHES advisory message lights up.
9. Clean the motor exhaust filter each time the brushes are replaced.
10. Rotor should be stored clean, dry, upside down with cover and tubes removed (this will allow air to circulate)
11. Do not pour water directly into rotor chamber
12. A regular inspection of the unit should be performed before every use and a detailed inspection every 100 hours to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting, white powder or deposits on aluminum rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.
13. Sample tubes, bottles, adapters and spacers should be washed using warm water, a mild detergent and brushes that will not scratch the tubes. Do not use metal brushes.
14. Specific tube and bottle sterilization and disinfecting techniques based on material type can be found in the manual.
15. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for centrifuges. Contact the centrifuge manufacturer and the use centrifuge log for preparing the derating schedule of the rotor.

## Jouan MR 22I Centrifuge

### Standard Operation

1. Use only recommended rotors and accessories designed for use in this instrument.
2. Inspect the rotor for signs of corrosion or cracking before using. If found, do not use the rotor, and inform the person responsible for the centrifuge of the problem.
3. Inspect sample tubes for cracks or flaws prior to use. Do not use if damaged.
4. Do not interchange tube-cap components as they are designed as a unit for a particular tube being centrifuged in a particular rotor
5. Do not overfill tubes that require plugs or caps, overfilling can cause overflow when plug or cap is inserted. However, too much air can cause the tube to deform and disrupt gradients and sample bands, as well as increasing the force required to remove the tube from the cavity after centrifugation.
6. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals. If exposure does occur, clean the rotor immediately.
7. Ensure samples are symmetrically placed in rotor and that bucket loads are well balanced. The instrument will automatically shut off if the unbalance is excessive.
8. Rotor must not be run with buckets missing, in case of rotors with free inserts, adapters or swing buckets.
9. Never mix buckets from different sets on the same rotor, in case of rotors with free inserts, adapters or swing buckets.
10. Do not pour samples directly into buckets or tube holders.
11. Ensure the rubber pads or adapters supplied with specific tube holders are installed into the cavity in order to cushion the tube.
12. Ensure all buckets on swing-bucket rotors are allowed to move freely and are properly seated in the hinge pins.
13. With power on, open the chamber door, install the rotor and lock rotor to shaft, and close the chamber door.
14. The centrifuge will not operate until the lid is closed and latched in place. The lid remains latched until the rotor stops spinning.
15. Precool bowl and rotor if desired.
16. Select desired program with speed, temperature and time.
17. Press the START button.
18. Press STOP to terminate a run at any time.
19. Make sure run is proceeding normally before leaving the area.
20. At end of run, do not open chamber until the rotor comes to rest.
21. When working with infectious materials wait 10 minutes after rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures, which apply to materials being centrifuged.
22. If a breakage has occurred, wait at least 10 minutes after the rotor has stopped for aerosols and droplets to settle before opening lid.
23. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest to remove the tubes from the rotor.
24. Do not try to remove tubes by pulling the plugs or unscrewing the caps.

25. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug or cap is removed if pressure is applied to the tube.

In case of a power failure, the power should always be turned off and the instrument disconnected from the main power source. In case of a power failure lasting for several hours the samples must be retrieved from the rotor. Do not open until the rotor has stopped. To open the lid manually a special unlocking tool is required. If possible, refer maintenance to qualified service personnel.

### **Care and Maintenance**

1. Check regularly that the motor and brake circuits are working properly
2. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
3. Rotors should be washed after every use in warm water containing a few drops of mild detergent.
4. Ensure core of rotor, which comes in contact with drive spindle, is washed.
5. Each cup or cavity of the rotor must be washed thoroughly using a small nylon brush (do not use metal brushes). All traces of detergent should be removed prior to air-drying.
6. Once the rotor is clean rinse with water (distilled water is preferable).
7. Dry rotor with a soft absorbent non-woven cloth or tissue. Drying may be finished off with warm air jet.
8. For swing-out rotors, be sure to clean the grease from the trunnions and replace it with a small amount of fresh grease. This will ensure that the buckets swing freely.
9. Never leave a damp rotor on a metal surface, particularly stainless steel because an electrochemical reaction could take place with the aluminum or magnesium in the rotor, causing corrosion.
10. Clean the rotor chamber and the accessories with a cotton wool pad dipped in 70% alcohol after 30 hours of use. After cleaning rinse with clean water and dry.
11. A regular inspection of the unit should be performed before every use and a detailed inspection after 100 hours of use to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting, white powder or deposits on aluminum rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.
12. After every 200 hours of use check that the centrifuge can attain the maximum r.p.m. possible for your rotor (see table 3.3 in manual).
13. After every 200 hours of use check that rotor chamber air temperature is within 1 C of temperature readout.
14. Sample tubes, bottles, adapters and spacers should be washed by hand if possible using a mild detergent with brushes that will not scratch the tubes. Do not use a metal brush.
15. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for centrifuges. Contact the centrifuge manufacturer and use the centrifuge log for preparing the derating schedule of the rotor.

## **IEC Micromax Centrifuge**

### **Standard Operation**

1. Switch ON/OFF button to turn unit on.
2. Press the STOP/OPEN cover button to release the cover interlock.
3. Ensure that rotor turns freely, and that there are no loose objects in the chamber.
4. Ensure the centrifuge chamber is clean and dry.
5. Ensure the appropriate tube size is employed. Use only IEC accessories designed for use in this instrument.
6. Inspect tubes for possible cracks or flaws. Do not use if damaged.
7. If possible use capped tubes to contain samples and prevent aerosols.
8. Avoid overfilling tubes.
9. Ensure samples are symmetrically placed in rotor.
10. Close cover and press down until it latches.
11. Set desired time, speed and temperature (if unit is RF model) and then press the start button.
12. Never spin tubes faster than their recommended G-force, and never centrifuge disposable tubes more than once.
13. Do not use instrument with concentrated mineral acids such as hydrochloric, sulfuric or nitric acid.
14. Rotor will accelerate to set speed, spin for set time and brake to a stop.
15. Wait until rotor comes to a full stop and then unlatch and open the cover.
16. Press the STOP/OPEN cover button to release the safety interlock.
17. When working with infectious materials wait 10 minutes after rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures which apply to materials being centrifuged.
18. Ensure no leakage or glass breakage has occurred before removing tubes. If breakage has occurred, wait at least 10 minutes after rotor has stopped for aerosols and droplets to settle before opening the lid.
19. If leakage has occurred follow all necessary precautions and use applicable decontamination procedures (see lab safety procedures).
20. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest to remove the tubes from the rotor.

In case of a power failure, the power should always be turned off and the instrument disconnected from the main power source. In case of a power failure lasting for several hours, samples must be retrieved from the rotor. Be sure the rotor has stopped rotating before attempting to open it. Use the cover interlock bypass (see manual).

### **Care and Maintenance**

1. Always maintain the rotor in the recommended manner. The rotor and all accessories must be clean and inspected prior to each run: do not use if rotor shows signs of corrosion or cracking. Replace the affected parts immediately.
2. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals.

3. Always unplug unit before cleaning.
4. Release latch, open cover, check chamber for spillage or broken glass prior to use. If present, and materials are non-toxic, non-radioactive and non-pathogenic, mop-up with a sponge dampened with water.
5. Rotors and sample cups or cavities should be cleaned and disinfected after each use with a non-corrosive cleaning solution (mild detergent and distilled water are recommended). Do not use acetone. Metal test tube brushes must not be used for cleaning the cup cavities. All traces of detergent should be removed prior to air-drying.
6. Never pour water directly into chamber.
7. After cleaning any part, dry it properly, preferably using a clean absorbent towel.
8. Should parts need replacement, contact a repair technician.
9. Specific tube and bottle sterilization can be done by autoclaving. Remove caps, stoppers, and other tube closures, before autoclaving to keep tubes from collapsing under pressure.
10. Keep logs of maintenance and use of centrifuge.

## **IEC Spinette (Model 4, 6 or 12) Centrifuge**

### **Standard Operation**

1. Set POWER switch to OFF position. Unlatch and open cover. Ensure that rotor turns freely, and that there are no loose objects in the chamber and that the rubber suction cup mounting feet on the bottom of the unit are not worn or missing.
2. Ensure the centrifuge bowl and tubes are dry.
3. Ensure the appropriate tube size is employed. Use only Spinette accessories designed for use in this instrument.
4. If possible use capped tubes to contain samples and prevent aerosols.
5. Inspect tubes and bottles for possible cracks or flaws. Do not use if damaged.
6. Do not spin fluids having a specific gravity greater than 1.5.
7. Do not use instrument with concentrated mineral acids such as hydrochloric, sulfuric or nitric acid.
8. Avoid overfilling tubes.
9. Ensure samples are symmetrically placed in rotor.
10. Close and latch cover. Do not operate the rotor without the cover in position and latched in place.
11. Set POWER to ON. (Slight vibration and noise are normal).
12. Do not lean or place items on the instrument while it is operating.
13. If vibration is excessive, set POWER to OFF position, wait until rotor completely stops, and then check that the load is correctly balanced.
14. To stop run, set POWER to OFF position. Do not use the cover latch as a start/stop switch.
15. Wait until rotor comes to a full stop and then unlatch and open the cover.
16. When working with infectious materials wait 10 minutes after the rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures which apply to materials being centrifuged.
17. Ensure no leakage or glass breakage has occurred before removing tubes. If breakage has occurred, wait at least 10 minutes after the rotor has stopped for aerosols and droplets to settle before opening the lid.
18. If leakage has occurred follow all necessary precautions and use of appropriate decontamination procedures if applicable should be taken (see lab safety procedures).
19. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest before removing the tubes from the rotor.

### **Care and Maintenance**

1. Always maintain the rotor in the recommended manner. The rotor and all accessories must be clean and inspected prior to each run: do not use if rotor shows signs of corrosion or cracking. Replace the affected parts immediately.
2. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals.
3. Always unplug unit before cleaning.
4. Release latch, open cover, check chamber for spillage or broken glass. If present, and materials are non-toxic, non-radioactive and non-pathogenic, mop-up with a sponge dampened with water.

5. Rotors and sample cups or cavities should be cleaned and disinfected after each use with a non-corrosive cleaning solution (mild detergent and distilled water are recommended). Metal test tube brushes must not be used for cleaning the cup cavities. All traces of detergent should be removed prior to air-drying.
6. Never pour water directly into chamber.
7. Check that vent holes in the cover and in the chamber bottom are not blocked.
8. Should parts need replacement follow detailed instructions provided in manual or contact a repair technician.
9. Keep logs of maintenance and use of centrifuge.

## Beckman TJ-6R Tabletop Centrifuge

### Standard Operation

1. Use only the Beckman rotors and accessories designed for use in this instrument.
2. Inspect tubes for cracks or flaws prior to use. Do not use if damaged.
3. Do not overfill tubes that require plugs, overfilling can cause overflow when plug is inserted, however, too much air can cause the tube to deform and disrupt gradients and sample bands, as well as increasing the force required to remove the tube from the cavity after centrifugation.
4. Ensure samples are symmetrically placed in rotor and that bucket loads are well balanced. The instrument will automatically shut off if the unbalance is excessive.
5. Rotor must not be run with buckets missing.
6. Do not pour samples directly into buckets or tube holders.
7. Ensure the rubber pads supplied with each tube holder are installed into the cavity in order to cushion the tube.
8. Ensure all buckets are allowed to move freely and are properly seated in the hinge pins.
9. For fixed angle rotors, load the rotor symmetrically so that the opposing weights are within 10 grams of one another. When the rotor spins, the air pressure differential will hold the lid firmly in place.
10. Heavier loads may be used provided the rotor is run at a lower speed. See formula in manual for speed derating.
11. With power on, open the chamber door, install the rotor, and close and lock the chamber door.
12. Do not bend the drive shaft when installing or removing the rotor.
13. Do not operate the centrifuge without installing the chamber bowl.
14. Do not operate the rotor without the cover in position and locked in place, and the rotor locked to the centrifuge drive.
15. Select desired settings (refrigeration temperature, run time and brake rate).
16. Press and release the START button.
17. Do not lean or place items on the instrument while it is operating.
18. Turn speed control to 10 and adjust as required to maintain desired speed.
19. At end of run, do not open chamber until the rotor comes to rest.
20. When working with infectious materials wait 10 minutes after rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures which apply to materials being centrifuged.
21. If a breakage has occurred, wait at least 10 minutes after the rotor has stopped for aerosols and droplets to settle before opening lid.
22. After the rotor comes to rest. Open chamber door and remove the rotor. Ensure rotor chamber is clean and dry. Keep door closed between runs.
23. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest to remove the tubes from the rotor.
24. Do not try to remove tubes by pulling the plugs.
25. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug is removed if pressure is applied to the tube.

In case of a power failure or if an emergency stop is required. Turn power switch to OFF and disconnect the power source. See manual for emergency door opening procedure.

## **Care and Maintenance**

1. Always maintain the rotor in the recommended manner. The rotor and all accessories must be clean and inspected prior to each run: do not use if rotor shows signs of corrosion or cracking. (See care and maintenance).
2. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals.
3. When runs are not being made (weekends and overnight) allow the system to defrost by turning the power off or by leaving centrifuge door unlocked. (defrosting should take a few hours).
4. To prevent the samples from freezing, operation should be limited to a setting of 4 or higher, unless the system has been calibrated with the specific rotor and load.
5. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
6. Wipe instrument's vinyl finish with a damp cloth or wash with a mild detergent.
7. Rotors and sample buckets should be cleaned and disinfected after each use with a non-corrosive cleaning solution (mild detergent and distilled water are recommended). Metal test tube brushes must not be used for cleaning the inside of the buckets. All traces of detergent should be removed prior to air-drying.
8. Keep chamber door closed between runs to prevent moisture and dirt from collecting inside. Wipe off the chamber walls with a dry cloth before each run.
9. A regular inspection of the unit should be performed before every use and after 100 hours of use to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting, white powder or deposits on aluminum rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.
10. Drive belt and motor brush replacement when required, should be performed by trained personnel.
11. Sample tubes, bottles, adapters and spacers should always be washed by hand using a mild detergent with brushes that will not scratch the tubes.
12. Inspect tubes and bottles for cracks and any major deformities before use.
13. Do not interchange tube-cap components they are designed as a unit for a particular tube being centrifuged in a particular rotor
14. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for centrifuges. Contact the centrifuge manufacturer and the use centrifuge log for preparing the derating schedule of the rotor.

## **Eppendorf Centrifuge 5804/5804 R and 5810/5810 R**

### **Standard Operation**

1. Turn power switch on
2. Use only Eppendorf rotors and accessories designed for use in this instrument.
3. Inspect the rotor for signs of corrosion or cracking before using. If found, do not use the rotor, and inform the person responsible for the centrifuge of the problem.
4. Inspect tubes and bottles for cracks or flaws prior to use. Do not use if damaged.
5. Do not interchange tube-cap components. They are designed as a unit for a particular tube being centrifuged in a particular rotor
6. Minimize the differences in weight of the filled sample tubes. Refer to instruction manual for details.
7. The maximum recommended weight of a filled bucket is stated on each rotor.
8. Excessively low liquid level may limit the rotor speed or crush the tube. Refer to instruction manual for details.
9. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals. If exposure does occur, clean the rotor immediately.
10. Rotation speed must be reduced below the maximum for liquids with a density of 1.2 g/ccm or higher (see manual).
11. Before running a swinging-bucket rotor, make sure that each is mounted correctly and that they can swing freely. Ensure grooves are clean before inserting buckets. Unclean grooves and pivots prevent buckets from swinging freely.
12. Ensure samples in rotor are symmetrically placed in rotor and that the load is balanced. Refer to the instruction manual for details of how to achieve
13. Install rotor. Close and lock lid.
14. Enter the required run conditions.
15. Press START key. Run operates for specified operation time or press STOP key to stop.
16. Do not use the lid closure override to open the instrument before the rotor has stopped. Wait until the rotor has stopped before opening the lid to remove samples.
17. When working with infectious materials wait 10 minutes after the rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures which apply to materials being centrifuged.
18. If a breakage has occurred, wait at least 10 minutes after the rotor has stopped for aerosols and droplets to settle before opening lid.
19. Centrifugation may cause a slight vacuum to build up in the tube cavity, occasionally resulting in the suction effect when removing the tubes from the rotor. When this occurs, allow at least 5 minutes after the rotor comes to rest before removing the tubes from the rotor.
20. Do not try to remove tubes by pulling the plugs or unscrewing caps.
21. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug or cap is removed if pressure is applied to the tube.

In case of a power failure disconnect machine from the power source. In case of a power failure lasting for several hours the samples must be retrieved from the rotor. Ensure rotor has stopped and activate emergency lid release.

## **Care and Maintenance**

1. Check regularly that the motor and brake circuits are working properly
2. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
3. Before opening cleaning the rotor chamber open the lid of the centrifuge and disconnect the main power plug. Unscrew the rotor with the hexagon key and clean separately. The rotor chamber should only be cleaned with a moist cloth and a neutral detergent after every 100 hours of use. The rotor retainer should be lubricated using Vaseline spray (inside and outside of cone).
4. The rubber seals in the rotor chamber should be rinsed well with water and lubricated with glycerin after every 100 hours of use.
5. Motor shaft should be lubricated after every 100 hours of use using pivot grease. Need to take rotor out first.
6. Check rotor and housing for residue and corrosion after every 100 hours of use.
7. Check magnetic ring on the base of the rotor regularly for damage and have it replaced if necessary.
8. When using swing buckets ensure the grooves in which the buckets are fitted and are free of contamination. The buckets can be lubricated with the grease supplied if necessary.
9. The sealing rings of the aerosol-tight rotor (FA 45-30-11) should be checked and replaced regularly.
10. All rotors are autoclavable (temperature up to 121 °C). After the rotor has been autoclaved 20 times the seals of the aerosol buckets should be replaced.
11. A regular inspection should be performed before every use and at a minimum of 100 hours of use to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting on rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.
12. Sample tubes, bottles, adapters and spacers should always be washed by hand if possible using a mild detergent with brushes that will not scratch the tubes. Do not use metal brushes.
13. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for centrifuges. Contact the centrifuge manufacturer and the use centrifuge log for preparing the derating schedule of the rotor.

## **Clinaspin Model 8C**

### **Standard Operation**

1. Use only recommended rotors and accessories designed for use in this instrument.
2. Inspect tubes and bottles for cracks or flaws prior to use. Do not use if damaged.
3. Open chamber door, load rotor.
4. Ensure samples in rotor are symmetrically placed.
5. Ensure buckets are properly seated in the hinge pins and allowed to move freely. Ensure rubber pads are in place in the buckets.
6. Ensure rotor cover is on. Close and lock chamber door.
7. Specimens should be run at 3500 RPMs for 15-20 minutes.
8. Do not lean or place items on the instrument while it is operating.
9. To stop run turn speed control knob to zero.
10. Wait for rotor to come completely to rest. Open chamber door and remove the rotor. Ensure rotor chamber is clean and dry. Keep door closed between runs.
11. When working with infectious materials wait 10 minutes (preferably 30 minutes) after rotor has stopped before opening the centrifuge lid. Be aware of decontamination and clean-up procedures that apply to materials being centrifuged.
12. If a breakage occurs, wait at least 10 minutes after the rotor has stopped for aerosols and droplets to settle before opening the lid.
13. Centrifugation causes a slight vacuum to build up in the tube cavity, occasionally resulting in a suction effect when removing the tubes from the rotor. Allow at least 5 minutes after the rotor comes to rest before removing the tubes from the rotor.
14. Do not try to remove tubes by pulling the plugs.
15. Do not hold onto or squeeze the tubes. Tube contents will splash out when the plug is removed if pressure is applied to the tube.

### **Care and Maintenance**

1. Always maintain the rotor in the recommended manner. The rotor and all accessories must be clean and inspected prior to each run: do not use if rotor shows signs of corrosion or cracking.
2. To avoid corrosion do not expose aluminum part of rotor to strong acids, bases or alkaline laboratory detergents, liquid chlorine bleach or salts of heavy metals.
3. Wash rotor components immediately if salts or other corrosive materials are used or spillage has occurred. Do not allow corrosive materials to dry on the rotor.
4. Immediate clean up of any blood splattered inside the centrifuge should be done.
5. Rotors and sample buckets should be cleaned and disinfected after each use with a non-corrosive cleaning solution (mild detergent and distilled water are recommended). Metal test tube brushes must not be used for cleaning the inside of the buckets. All traces of detergent should be removed prior to air-drying.
6. Cleaning of the inside of the centrifuge bucket with 70% isopropyl alcohol is recommended after every 30 hours of use.
7. A regular inspection of the unit should be performed after 100 hours of use to inspect the rotor, especially the inside cavities, for rough spots, cracks, pitting, white powder or deposits on aluminum rotors. If any of these signs are evident do not run the rotor and call the manufacturer for servicing.

8. Sample tubes, bottles, adapters and spacers should always be washed by hand using a mild detergent with brushes that will not scratch the tubes.
9. Do not interchange tube-cap components. They are designed as a unit for a particular tube being centrifuged in a particular rotor
10. Centrifuges can suffer from rotor failure and other mechanical hazards, as such they can be compromised by corrosion or fatigue. Keep logs of maintenance and use for centrifuges.

## **Eppendorf 5415, Biofuge A and other Low speed centrifuges**

### **Standard Operation**

1. Turn the power switch on.
2. Ensure the sample tubes are of equal weight and symmetrically placed in the rotor.
3. Secure the rotor top if this is supplied with the rotor.
4. Close the lid.
5. Enter the required run conditions by setting the timer and the rpm indicators.
6. Press the start button. Run continues for the specified time, or can be terminated by setting the timer to "0" or by pressing the stop button.
7. Be aware of decontamination and cleanup procedures that apply to the materials being centrifuged.

### **Care and Maintenance**

1. Keep the interior of the rotor chamber and the rotor clean and dry. Remove the rotor and use water and a mild detergent to clean the interior surfaces and the rotor. Dry all surfaces, then replace the rotor. Follow the instrument manufacturer's instructions in removing and replacing the rotor.
2. Microcentrifuge failure normally occurs as a result of electrical circuit board failures or motor wear. If you detect: a failure to run; failure to attain normal operating speed; failure to engage the self-locking device or to disengage the device at the end of the run; other electrical faults; unusual motor operating noise; or any other sign of failure; report the problem to the laboratory supervisor or employee designate.
3. Laboratory supervisors must maintain microcentrifuges in good operating condition by ensuring that units are serviced when operating faults are detected.