I'm not a robot



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Published on 04 April 2023 The information on this page applies to the following models: AC1715/41, AC2889/40, AC1214/42, AC1214/42,
Respironics machines, encountering error codes can be quite frustrating. As someone who has used these devices personally, I understand how crucial it is to address these errors promptly to ensure uninterrupted use of the equipment. In this article, we will delve into the various error codes that you may come across while using Philips Respironics
devices and provide insights on how to troubleshoot them effectively. When dealing with Philips Respironics Error Codes, its essential to understand the error messages your device may show. These codes can sometimes seem like cryptic messages, but they often provide valuable information that can help troubleshoot issues with your CPAP
machine. One common error code is Error 101, indicating a problem with the devices power supply. Whenever I see this error on my machine, I always make sure to check all the connections and power source to ensure everything is properly set up. Error 303 is another code that users might encounter, signaling an issue with the machines blower
motor. This error reminds me to regularly clean and maintain my CPAP equipment to prevent such issues from occurring. Being familiar with these error codes can save you time and frustration when trying to identify and resolve problems with your Philips Respironics device. Its like having a secret code language between you and your CPAP
machine, helping you communicate better to keep your therapy on track. Common Error CodesWhen it comes to Philips Respironics devices, error code can be concerning. Each error code indicates a specific issue that needs to be
resolved promptly to maintain the functionality of the device. Understanding the meaning behind the error codes is the first step in troubleshooting the problem. Most Philips Respironics devices come with a user manual that lists the error codes and provides instructions on how to address them. It is essential to keep the manual handy so that you can
quickly reference it in case an error code appears. One of the most common error codes that users encounter is Error Code E-87. This error typically indicates a communication error between the devices components. In such cases, restarting the device or checking the connections can often resolve the issue. If the error persists, contacting customer
support for further assistance is recommended. Another frequent error code is Error Code E-33, which usually points to a sensor issue. This error may require recalibration of the sensor or replacement, depending on the severity of the problem. Following the troubleshooting steps outlined in the user manual can help in resolving sensor-related errors
efficiently. It is essential to note that ignoring error codes or attempting to bypass them can lead to more significant problems with the device. Regular maintenance and prompt attention to error codes can help prolong the lifespan of your Philips Respironics device and ensure optimal performance. In conclusion, familiarizing yourself with the common
error codes of Philips Respironics devices and knowing how to troubleshoot them can save you time and prevent unnecessary disruptions in your respiratory therapy. Remember to always refer to the user manual for specific instructions on addressing error codes and seek professional help if needed. Interpreting Error CodesUnderstanding Philips
Respironics Error Codes is crucial for maintaining the functionality of your device. When using Philips Respironics machines for respiratory support, encountering an error code signifies a specific issue that must be dealt with promptly to ensure the proper functioning of the device. Being aware of the meaning
behind the error codes is the initial step in troubleshooting any problems that arise. Most Philips Respironics devices are accompanied by a user manual that details the error codes and provides step-by-step instructions on how to resolve them. Keeping the manual within reach allows for quick reference whenever an error code surfaces. One
commonly encountered error code is Error Code E-87, typically indicating a communication breakdown between the devices components. Often, a simple restart or checking the connections can resolve this issue. If the error persists, reaching out to customer support for further guidance is advisable. Another frequent error code users come across is
Error Code E-33, usually signaling a sensor malfunction. Resolving this error may involve recalibrating the sensor or replacing it, depending on the severity of the issue. Following this error may involve recalibrating the sensor malfunction.
trying to bypass them can lead to more significant problems with the device. Regular maintenance and immediate attention to error codes can extend the lifespan of your Philips Respironics devices and understanding how to
troubleshoot them can save you time and prevent unnecessary interruptions in your respiratory therapy. Always remember to consult the user manual for specific instructions on handling error codes and seek professional assistance when necessary. Troubleshooting Philips Respironics Error Codes When dealing with Philips Respironics error codes, it
can be quite frustrating to encounter issues with your equipment. However, understanding these error code on your Philips Respironics machine, the first step is not to panic. Many errors can be resolved with simple troubleshooting
steps. One common error is Error Code E-45, indicating a motor issue. If you come across this error, try restarting your device first. Sometimes, a simple reset can clear this error. Another frequent error is Error Code E-15, which typically points to a filter issue or clogged tubing. In such cases, make sure to check and clean your filters regularly to
prevent this error from occurring. Should you encounter Error Code E-87, it might be related to a communication problem between components. To troubleshoot this, ensure all connections are secure and restart the device to see if the error resolves. Remember, its essential to consult your Philips Respironics user manual for specific error code details
and troubleshooting steps tailored to your device. If you are unable to resolve the error on your own, dont hesitate to reach out to customer support for assistance. Steps to Take for Common Error CodesWhen troubleshooting Philips Respironics error codes, its crucial to address each code promptly to maintain the functionality of your device. One
common error code you might encounter is E-87, which often indicates a communication breakdown within the device. A simple restart or checking the connections can often resolve this issue, but dont hesitate to contact customer support for further assistance if needed. Another frequent error code is E-33, which usually points to a sensor
malfunction. Depending on the severity of the problem, recalibrating or replacing the sensor may be necessary. Following the user manuals troubleshooting steps can help efficiently resolve sensor-related errors and ensure your device operates smoothly. Ignoring error codes or attempting to bypass them can lead to more significant issues down the
line. By addressing error codes promptly and performance. By familiarizing yourself with common Philips Respironics device and maintain its optimal performance. By familiarizing yourself with common Philips Respironics device and maintain its optimal performance. By familiarizing yourself with common Philips Respironics device and maintain its optimal performance. By familiarizing yourself with common Philips Respironics device and maintain its optimal performance. By familiarizing yourself with common Philips Respironics device and maintain its optimal performance.
your respiratory therapy. Always refer to the user manual for specific instructions on handling error codes and seek professional help when needed. When troubleshooting Philips Respironics error codes serve as valuable indicators of potential issues with the
functionality of your Philips Respironics device. Timely and accurate troubleshooting is key to resolving these errors effectively and ensuring that your device operates optimally. One of the error codes you may come across is E-87, which typically signifies a communication problem within the device. Timely and ensuring that your device operates optimally. One of the error codes you may come across is E-87, which typically signifies a communication problem within the device. Timely and ensuring that your device operates optimally.
simple restart or checking the devices connections. However, if the problem persists, dont hesitate to reach out to customer support for expert assistance and guidance. Another common error code you might encounter is E-33, which usually points to a sensor malfunction. Depending on the severity of the sensor issue, recalibration or sensor
replacement may be necessary to restore the devices proper functionality. Following the detailed troubleshooting steps outlined in the user manual can help you efficiently address sensor-related errors and ensure seamless operation of your device. Its crucial not to ignore error codes or attempt to overlook them, as doing so could potentially lead to
more significant problems in the future. By promptly addressing error codes and conducting familiarity with common Philips Respironics device and maintain its peak performance levels. By gaining familiarity with common Philips Respironics device and maintain its peak performance levels. By gaining familiarity with common Philips Respironics device and maintain its peak performance levels. By gaining familiarity with common Philips Respironics device and maintain its peak performance levels. By gaining familiarity with common Philips Respironics device and maintain its peak performance levels. By gaining familiarity with common Philips Respironics device and maintain its peak performance levels. By gaining familiarity with common Philips Respironics device and maintain its peak performance levels.
with them, you can save time and prevent unnecessary disruptions in your respiratory therapy routine. Always consult the user manual for specific instructions on handling error codes and dont hesitate to seek professional assistance when needed. Preventing Philips Respironics Error Codes When it comes to preventing Philips Respironics error
codes, a proactive approach can save you time and hassle in the long run. As someone who has dealt with these issues firsthand, Ive learned a few tricks that can help you avoid those frustrating error messages. Regular Maintenance: Keeping your Philips Respironics device well-maintained is crucial in preventing error codes. Make sure to follow the
manufacturers recommendations for cleaning and replacing parts to ensure smooth operation. Check Connections can sometimes trigger error codes, so a quick check can go a long way in preventing them. Stay Updated: Keep your devices
software up to date. Manufacturers often release updates that address known issues and bugs, including error code triggers. By staying current with updates, you can prevent many potential problems. Follow Operating Instructions: It may seem simple, but following the operating instructions provided by Philips Respironics can significantly reduce
the chances of encountering error codes. Understanding how to use the device correctly can prevent user-induced errors. By incorporating these preventative measures into your routine, you can minimize the risk of facing Philips Respironics error codes. Remember, a little maintenance and attention to detail can go a long way in ensuring the smooth
operation of your device. Routine Maintenance TipsPreventing Philips Respironics error codes is essential to ensure uninterrupted use of your device. Regular maintenance and proper handling can go a long way in minimizing the occurrence of these error messages. Keep your device clean and dust-free to prevent any blockages or malfunctions that
could trigger error codes. Regularly inspect the cords and connections to make sure they are secure and undamaged, reducing the likelihood of communication errors. Follow the recommended guidelines for device setup and usage to avoid triggering sensor-related error codes. Consider investing in a surge protector to protect your device from power
surges that could lead to errors. Being proactive in maintaining your Philips Respironics device can significantly reduce the chances of encountering error codes, allowing you to enjoy uninterrupted therapy sessions. Best Practices for Extended Device Lifespan Preventing Philips Respironics error codes is crucial for the seamless operation of your
device. As a user myself, I have learned the importance of proactive measures in keeping these errors at bay. Ensuring that your device remains clean and free from dust is not just about aesthetics but also about functionality. A dust-free device is less prone to blockages and malfunctions that can trigger those pesky error codes. Regularly checking the
cords and connections may seem like a small task, but it can make a big difference. Secure and undamaged connections reduce the chances of communication errors and keep your device running smoothly. Adhering to the setup and usage guidelines provided by Philips Respironics is essential. Overlooking these guidelines could inadvertently trigger
sensor-related error codes, disrupting your therapy session. Investing in a surge protector might not have crossed your mind, but it can be a lifesaver for your device. Power surges are unexpected and can lead to errors, so a surge protector adds an extra layer of protection. By taking a proactive approach to maintain your Philips Respironics device,
you can significantly lower the risk of encountering error codes. This proactive stance ensures that your therapy sessions remain uninterrupted, allowing you to focus on what truly matters your well-being. From Apnea Board WikiThis is a listing of CPAP Error Codes and descriptions for Philips-Respironics 50-series and 60-series System One REMstar
and BiPAP machines. We do have the Service & Repair manuals for these and other CPAP machines available. To access them, you will need to join the Apnea Board Forum, log in, and then go to our Private Files and Links area, below the forums. In that forum, there is a post that says "Links to Members-Only Files". If you open that post, you can click
on our current link to the Members Only Files. Please keep in mind that we do not have additional Service/Repair Manuals other than those listed on our Members Only Files page. Types of Error Types are described as follows: Error Types are described as follows
Safe State. The only functionality available to the user is serial communication, turning off the audible alarm via a key press and removing power. REBOOT The error is promoted to a STOP level error by use of the Verbose Mode configuration flag. CONTINUE The error
information is recorded in NVRAM and the unit continues to operate without noticeable alteration. This error is not promoted to a STOP level error by use of the Verbose Mode configuration flag. LOG_ONLY The error information is recorded in NVRAM and the unit continues to operate without noticeable alteration. This error is not promoted to a STOP level error by use of the Verbose Mode configuration flag.
level error by use of the Verbose Mode configuration flag. General Errors Error Code Description Type E-1 ERR SOFTWARE STOP E-2 Not Used N/A E-9 Not Used N/A E
Watchdog and Timer Errors Error Code Description Type E-10 ERR_WDOG_TEST_RAM REBOOT E-11 ERR_WDOG_TEST_REBOOT E-13 ERR_BACKGROUND_WDOG_SD CARD REBOOT E-14 ERR WDOG LOWRES TIMER REBOOT E-15 ERR CYCLE HANDLER OVERRUN REBOOT E-16
ERR_RASP_RESTORE_TIMEOUT CONTINUE E-17 ERR_ONEMS_HANDLER_OVERRUN REBOOT E-18 Not Used N/A E-19 ERR_WOTOR_FLUX_MAGNITUDE REBOOT E-23 ERR_MOTOR_SPINUP_FLUX_LOW REBOOT E-21 ERR_MOTOR_VBUS_HIGH STOP E-22 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-23 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-23 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-23 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-24 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-25 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-25 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-26 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-26 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-27 ERR_MOTOR_FLUX_MAGNITUDE REBOOT E-28 ERR_MOTOR_FLUX_MAGNITUDE REBOOT
ERR MOTOR OVERSPEED REBOOT E-24 ERR MOTOR THERMISTOR OPEN CONTINUE E-27 ERR MOTOR THERMISTOR OPEN CONTINUE E-26 ERR MOTOR THERMISTOR OPEN CONTINUE E-27 ERR MOTOR THERMISTOR SHORTED CONTINUE E-27 ERR MOTOR THERMISTOR OPEN CONTINUE E-28 ERR MOTOR THERMISTOR SHORTED CONTINUE E-28 ERR MOTOR THERMISTOR OPEN CONTINUE E-28 ERR MOTOR THERMISTOR SHORTED CONTINUE E-28 ERR MOTOR THERMISTOR SHORTED CONTINUE E-28 ERR MOTOR THERMISTOR OPEN CONTINUE E-28 ER
ERR MOTOR SPINUP FLUX HIGH REBOOT E-31 thru E-39 Not Used N/A NVRAM Low Level Errors Error Code Description Type E-40 ERR NVRAM REBOOT E-41 ERR STORAGE UNIT RAM REBOOT E-42 ERR UNABLE TO OBTAIN BUS REBOOT E-43 ERR NVRAM NO CALLBACK OCCURRED REBOOT E-44 ERR NV BUFFER NULL REBOOT
E-45 ERR NV CALLBACK NULL REBOOT E-46 ERR NV ZERO LENGTH REBOOT E-47 ERR NVRAM INVALID BYTES XFRRED REBOOT E-48 Not Used N/A E-70 COMPLIANCE LOG CONTINUE E-52
ERR CORRUPT COMPLIANCE CB CONTINUE E-53 ERR COMP LOG SEM TIMEOUT CONTINUE E-54 ERR COMPLOG REQS OVERFLOW REBOOT E-55 ERR COMPLOG PACKET STATUS REBOOT E-57 ERR SESS OBS QUEUE OVF REBOOT E-58 ERR SESS OBS NO CALLBACK REBOOT E-59
ERR SWI ABORT EXCEPTION REBOOT E-126 Not Used REBOOT See AlsoPhilips-Respironics DreamStation error codes (for older, pre-2007 REMstar smart card error card err
power cord is securely connected and the power source is functioning properly. The Philips Respironics Simplygo is a reliable and convenient portable oxygen concentrator, but like any device, it may encounter issues from time to time. Troubleshooting these problems can be crucial for maintaining uninterrupted oxygen therapy. Whether its a
beeping alarm, power loss, or other malfunctions, understanding how to identify and resolve these issues is essential. In this guide, well explore some common troubleshooting steps to help you address problems with your Philips Respironics Simplygo and ensure a smooth and reliable oxygen therapy experience. Learn how to troubleshoot your
Philips Respironics SimplyGo with our comprehensive guide. Discover easy fixes for common errors and ensure your oxygen concentrator is always in optimal working tips. When facing issues with your Philips Respironics SimplyGo, certain common
symptoms may indicate the need for troubleshooting. These include error alarms, power failures, and performance fluctuations. Prior to initiating troubleshooting on your SimplyGo device, it is crucial to observe safety precautions. Ensure the device is powered off, unplugged, and isolated from oxygen sources. Always refer to the user manual for
guidance. Important Safety Steps: Disconnect power source Remove oxygen tubing Allow device to cool down before handling By following these safety measures, you can effectively address any issues with your Philips Respironics SimplyGo while minimizing risks. Credit: oxygenconcentratorsupplies.com Having power-related problems with your
 Philips Respironics Simplygo can be frustrating, especially if you rely on it for oxygen therapy. Identifying and fixing power issues is crucial to ensure that your device functions properly. In this section, well go over common power issues is crucial to ensure that your device functions for the Philips Respironics Simplygo. If your Simplygo is not turning on, be sure to check the battery
level or power source. If using a battery, ensure that it is charged and installed correctly. If using a power cord, ensure that it is plugged in securely to both the concentrator and the power source. Another common power issue is the device beeping or flashing error messages. This can be caused by a lack of power or battery issues. If youre using a
portable oxygen concentrator with a battery, such as the Simplygo Mini, the alarm may sound if the battery drops below a certain percentage. Additionally, make sure the AC power cord is not damaged or frayed. To ensure proper power connections, follow these steps: Make sure the power cord is securely connected to both the concentrator and the
power source. Check the battery level and ensure it is charged and installed correctly. If using an AC power strips, as they can cause power fluctuations and damage to the device. Power issues can be a common problem with the Philips Respironics Simplygo. By
identifying and fixing power-related problems, you can ensure that your device functions properly and you can continue to experience power issues, it may be time to contact your healthcare provider or the manufacturer for further assistance. When using the Philips Respironics SimplyGo, its
crucial to understand the various alarm codes and beeping signals it may produce. This knowledge can help you troubleshoot issues and ensure uninterrupted oxygen therapy. Lets delve into the essential aspects of interpreting alarm codes and resolving beeping problems. Understanding the meaning behind the alarm codes on your Philips
Respironics SimplyGo is vital for quick problem identification. Heres a reference guide to interpret the most common alarm codes: Alarm 104High breath rate detected. Check if the users breathing pattern is within the normal range. Alarm 105Low breath rate
detected. Ensure the user is breathing adequately. Beeping problems: Check power source: Ensure the device is connected to a stable power supply. If using a battery, verify that its adequately charged. Inspect filters: Dirty filters can trigger
beeping. Clean or replace the filters as per the user manual. Examine tubing: Check for any kinks or blockages in the tubing system, as these can lead to beeping alarms. By understanding and addressing the alarm codes and
beeping signals of the Philips Respironics SimplyGo, users can ensure a seamless and uninterrupted oxygen therapy experience. Credit: mainclinicsupply.com Proper battery care and management are essential to ensure the reliable performance of your Philips Respironics SimplyGo. Understanding how to check battery health, cycle, and replace
batteries is crucial for uninterrupted oxygen therapy. Regularly assessing the health of your SimplyGos batteries is vital for optimal performance. Use the battery charge level indicator on the device. Utilize the batterys diagnostic
feature, if available, to assess its health. Proper cycling and timely replacement of batteries are essential for maintaining the efficiency of your Philips Respironics SimplyGo. Heres what you need to know: Follow the recommended battery cycling procedure provided in the user manual. Replace the batteries according to the manufacturers specified
interval or when the battery health deteriorates. Ensure that the replacement batteries are compatible and meet the devices power requirements. When it comes to the Philips Respironics SimplyGo, understanding the display and control functions is crucial for troubleshooting potential issues. The devices display and control settings allow users to
monitor and adjust various parameters, ensuring optimal performance. In this section, we will explore common troubleshooting steps related to the display and control functions. If the screen on your Philips Respironics SimplyGo appears dark or unresponsive, there are several steps you can take to address this issue. Start by checking the power
source and ensuring that the device is properly connected to a functional outlet. If the screen remains unresponsive, try adjusting the manufacturers guidelines. Properly adjusting the control settings is essential for ensuring
the Philips Respironics SimplyGo functions optimally. Start by reviewing the user manual to understand the various control settings, such as unresponsiveness or erratic behavior, consider recalibrating the controls or performing a firmware update as
recommended by the manufacturer. Additionally, ensure that the devices software is up to date to prevent potential control-related issues. When it comes to using the Philips Respironics SimplyGo, encountering flow and delivery problems can be frustrating. Whether its inconsistent flow or issues with delivery, troubleshooting is essential to ensure that the devices software is up to date to prevent potential control-related issues.
uninterrupted oxygen therapy. Lets delve into some common flow and delivery problems and how to address the flow of the SimplyGo to identify any irregularities. Using a flow meter, monitor the oxygen output to determine if it matches the prescribed rate. If
discrepancies are detected, its advisable to seek professional assistance to calibrate the device. Kinked tubing can impede the smooth delivery of oxygen, leading to inadequate therapy. Regularly inspect the tubing for any kinks or bends that may restrict the flow. Carefully straighten out any kinks to ensure a clear path for oxygen delivery
Additionally, ensure that the tubing is properly connected and secured to prevent any disruptions in the oxygen supply. Maintaining your Philips Respironics SimplyGo is vital for optimal performance. Regularly clean the exterior, store properly, and troubleshoot any error alarms promptly to ensure seamless operation. Monthly maintenance checks
and following manufacturer guidelines will help extend the lifespan of your device. Cleaning and Maintenance can extend the life of your device and ensure optimal performance. In this section, we will discuss some tips and guidelines for
cleaning and maintaining your Simplygo concentrator. To maintain the exterior of your Simplygo concentrator, follow these steps: Wipe down the outside of the device with a soft, damp cloth Avoid using harsh chemicals or abrasive materials to clean the concentrator. To maintain the exterior of your Simplygo concentrator, follow these steps: Wipe down the outside of the device with a soft, damp cloth Avoid using harsh chemicals or abrasive materials to clean the concentrator.
Performing monthly maintenance on your Simplygo concentrator can prevent future issues and ensure that the device for any visible damage or wear Clean the outside of the concentrator as described above Check the power cord and connections for any
fraying or damage Run the device on AC power for at least one hour to maintain the battery Check the pulse oximeter to ensure it is functioning correctly By following these monthly maintenance tasks, you can ensure the longevity of your Simplygo concentrator and avoid any future problems. In conclusion, regular cleaning and maintenance are vita
for the proper functioning of your Philips Respironics Simplygo. Ensure that you clean the exterior of the device as directed and perform monthly maintenance tasks to keep your concentrator. One essential component of the Philips
Respironics SimplyGo is the humidifier bottle attachment. This attachment helps to add moisture to the air being delivered, making the breathing experience more comfortable for users. To connect the humidifier bottle attachment port on
the device. Insert the humidifier bottle into the attachment port securely. Make sure the bottle is filled with distilled water to the indicated level. Turn on the SimplyGo device and adjust the settings as needed. If you encounter humidifier bottle attachment, consider the following troubleshooting tips: Check the humidifier
bottle for any leaks or cracks. Ensure the bottle is filled with distilled water and not exceeding the maximum level. Verify that the attachment port is securely connected to the device. Clean the humidifier bottle regularly to prevent clogs or blockages. Consult the user manual for specific troubleshooting steps related to humidify settings. When facing
persistent issues with your Philips Respironics SimplyGo, advanced resets and contacting customer service may be necessary steps to resolve the problem effectively. In case of unresponsive behavior or error alerts, performing a hard reset on your SimplyGo can often rectify the issue. Follow these steps: Turn off the device and remove any power
 source. Wait for at least 30 seconds before powering the device back on. If the problem persists, consult the user manual for specific reset instructions. If the troubleshooting steps and hard reset do not resolve the issue, it may be time to customer service for further assistance. Here are some scenarios when contacting customer service
is recommended: Continual error alerts despite troubleshooting attempts. Physical damage to the device. Issues with battery performance or charging. Remember, customer service representatives are trained to assist with technical problems and can provide guidance on the next steps to take to ensure your SimplyGo functions optimally. Traveling
with your Philips Respironics SimplyGo can be made hassle-free by following some simple tips and tricks. Below are some travel tips for SimplyGo is fully charged before leaving. Carry extra batteries for longer journeys. Keep your device and accessories
in a protective case for safety. Wear your device with the carrying case or backpack for hands-free use. Regularly check the battery status to avoid running out of power. Follow the user manual for troubleshooting common issues while traveling. By following these travel tips, SimplyGo users can enjoy peace of mind while on the move with their
portable oxygen concentrator. For optimal performance with your Philips Respironics SimplyGo, ensure regular maintenance checks, handle the device with care, and troubleshoot error alarms promptly. Keep the concentrator clean, check power sources, and cycle batteries regularly to avoid disruptions in oxygen supply. Regular Maintenance
 Ensure routine cleaning and maintenance of the SimplyGo unit to prevent the buildup of dust and debris, which can impact its performance. Proper Storage: Store the unit in a clean, dry area to prevent damage from environmental factors, and always use the carrying case or protective cover when transporting the device. Battery Care: Follow the
manufacturers guidelines for charging and discharging the battery to prolong its lifespan, and avoid exposing it to extreme temperatures. Check Power Sources: Ensure the power cord is securely connected to both the unit and the power source, and verify that the battery is adequately charged for portable use. Inspect Tubing: Regularly examine the
tubing for any kinks or blockages that could impede the flow of oxygen, and address any issues promptly. Review Error Alarms: Familiarize yourself with the meaning of the different alarm codes and troubleshoot any issues as per the manufacturers instructions. Frequently Asked Questions To reset a Respironics oxygen concentrator, first turn off the
device and unplug it from the power source. Wait for at least 30 seconds, then plug the concentrator back in and turn it on. The reset process should be complete. Its important to follow the manufacturers instructions and consult a healthcare professional if you have any concerns or questions. The Philips SimplyGo may beep due to low battery. Check
and recharge the battery to resolve the issue. To perform a hard reset on a portable oxygen concentrator, follow these steps: Disconnect the battery and power source. Remove the battery to reset your Inogen oxygen concentrator, first turn it
off, then unplug it. Wait for 5 minutes, then plug it back in and turn it on. Troubleshooting the Philips Respironics SimplyGo is essential for optimal performance. Regular maintenance, checking power sources, and addressing error alarms are key steps. By following these guidelines, you can ensure your device functions efficiently and provides the
necessary oxygen support. Share copy and redistribute the material in any purpose, even commercially. Adapt remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution You must give appropriate credit
provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions You
may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation. No warranties are given. The license may not give you all of the
permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. Published on 23 March 2023 The information on this page applies to the following models: AMF765/70, AC1711/10, AC3033/73, AC2939/70, AC3039/73, AC2987/70, DE5205/70
AC1215/70, AC3256/70, AC2882/70, AC6608/70, AC4372/70, AC4012/70, AC4012/70, AC4025/70. Click here to show more product numbers Click here to show the biological system. For other uses, see Breathing system. Respiratory systemA complete.
schematic view of the human respiratory system with their parts and functionsDetailsIdentifiersLatinsystema respiratory system (also respiratory apparatus, ventilatory system) is a biological system consisting of specific organs and
structures used for gas exchange in animals and plants. The anatomy and physiology that make this happen varies greatly, depending on the size of the organism, the environment in which it lives and plants. The anatomy and physiology that make this happen varies greatly, depending on the size of the organism, the environment in which it lives and its evolutionary history. In land animals, the respiratory surface is internalized as linings of the lungs.[1] Gas exchange in the lungs occurs in millions of
small air sacs; in mammals and reptiles, these are called alveoli, and in birds, they are known as atria. These microscopic air sacs communicate with the external environment via a system of airways, or hollow tubes, of which the largest is the
trachea, which branches in the middle of the chest into the two main bronchi. It is the bronchioles are termed parabronchi. It is the bronchioles, or parabronchi that generally open into
the microscopic alveoli in mammals and atria in birds. Air has to be pumped from the environment into the alveoli or atria by the process of breathing which involves the muscles of respiratory system consists of gills, which are either partially or
completely external organs, bathed in the watery environment. This water flows over the gills by a variety of active or passive means. Gas exchange takes place in the gills which consist of thin or very flat filaments and lammellae which expose a very large surface area of highly vascularized tissue to the water. Other animals, such as insects, have
respiratory systems with very simple anatomical features, and in amphibians, even the skin plays a vital role in gas exchange can be opposite to that in animals. The respiratory system in plants includes anatomical features such as stomata, that are found in various parts of
the plant.[3]Main articles: Lung and Respiratory tractFig. 1. Respiratory systemFig. 2. The lower respiratory tract. The tract is
divided into an upper and a lower respiratory tract. The upper tract includes the lower part of the larynx, the trachea, bronchi, bronchioles and the alveoli. The branching airways of the lower tract are often described as the
respiratory tree or tracheobronchial tree (Fig.2).[4] The intervals between successive branch points along the various branching "generations", of which there are, in the adult human, about 23. The earlier generations (approximately generations of the trachea and the bronchi, as well as the
larger bronchioles which simply act as air conduits, bringing air to the respiratory bronchioles, alveolar ducts and alveoli (approximately generations 1723), where gas exchange takes place.[5][6] Bronchioles are defined as the small airways lacking any cartilaginous support.[4]The first bronchi to branch from the trachea are the right and left main
bronchi. Second, only in diameter to the trachea (1.8cm), these bronchi (11.4cm in diameter)[5] enter the lungs at each hilum, where they branch into narrower tertiary bronchi known as segmental bronchi. Further divisions of the segmental bronchi (1 to 6mm in diameter)[7]
are known as 4th order, 5th order, 5th order, and 6th order segmental bronchi, or grouped together as subsegmental bronchi, for grouped together as subsegmental bronchi, branchings. The alveoli are the dead end terminals of the "tree", meaning that any air that enters a subsegmental bronchi.
them has to exit via the same route. A system such as this creates dead space, a volume of air (about 150ml in the adult human) that fills the end of inhalation, the airways are filled with environmental air, which is exhaled without
coming in contact with the gas exchanger.[10]Fig. 3 Output of a 'spirometer'. Upward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the intake of air; downward movement of the graph, read from the left, indicates the graph of 
of air moved in or out of the lungs under normal resting circumstances (the resting tidal volume of about 500ml), and volumes moved during maximally forced exhalation are measured in humans by spirometry.[12] A typical adult human spirogram with the names given to the various excursions in volume the lungs can
undergo is illustrated below (Fig.3):Not all the air in the lungs can be expelled during maximally forced exhalation (ERV). This is the residual volume (volume of air remaining even after a forced exhalation) of about 1.01.5 liters which cannot be measured by spirometry. Volumes that include the residual volume (i.e. functional residual capacity of about
2.53.0liters, and total lung capacity of about 6liters) can therefore also not be measurement requires special techniques.[12]The rates at which air is breathed in or out, either through the mouth or nose or into or out of the alveoli are tabulated below, together with how they are calculated. The number of breath cycles
volume of air entering or leaving the alveoli per minute. Dead space ventilationdead space * respiratory ratethe volume of air that does not reach the alveoli during inhalation, but instead remains in the airways, per minute. Fig. 6 Real-time magnetic resonance imaging (MRI) of the chest movements of human thorax during breathing Main article:
Breathing MechanicsThe "pump handle" and "bucket handle movements" of the ribsFig. 4 The effect of the muscles of inhalation in expanding the rib cage. Fig. 5 In this view of the rib cage the downward slope of the lower ribs from the midline outwards can be
clearly seen. This allows a movement similar to the "pump handle effect", but in this case, it is called the bucket handle movement. The color of the ribs refers to their classification, and is not relevant here. Breathing Fig. 7 The muscles of breathing at rest: inhalation on the left, exhalation on the right. Contracting muscles are shown in red; relaxed
muscles in blue. Contraction of the diaphragm generally contributes the most to the expansion of the chest cavity (light blue). However, at the same time, the intercostal muscles pull the ribs upwards (their effect is indicated by arrows) also causing the rib cage to expand during inhalation (see diagram on other side of the page). The relaxation of all
                        exhalation causes the rib cage and abdomen (light green) to elastically return to their resting positions. Compare with Fig. 6, the MRI video of the chest movements during the breathing (inhalation and exhalation). The color code is the same as on the left. In addition to a more
forceful and extensive contraction of the diaphragm, the intercostal muscles are aided by the accessory muscles of inhalation to exaggerate the movement of the ribs upwards, causing a greater expansion of the muscles of inhalation to exaggerate the movement of the ribs upwards, causing a greater expansion of the ribs upwards, causing a greater expansion of the ribs upwards, causing a greater expansion of the muscles of inhalation, the abdominal muscles actively contract to pull the lower
edges of the rib cage downwards decreasing the volume of the rib cage, while at the same time pushing the diaphragm upwards deep into the thorax. In mammals, inhalation at rest is primarily due to the contraction of the diaphragm. This is an upwardly domed sheet of muscle that separates the thorax. In mammals, inhalation at rest is primarily due to the contraction of the diaphragm.
contracts, the sheet flattens, (i.e. moves downwards as shown in Fig.7) increasing the volume of the thoracic cavity in the antero-posterior axis. The contracting diaphragm pushes the abdominal organs downwards as shown in Fig.7) increasing the volume of the thoracic cavity in the antero-posterior axis.
cause the belly to bulge outwards to the front and sides, because the relaxed abdominal muscles do not resist this movement (Fig.7). This entirely passive bulging (and shrinking during exhalation) of the abdominal breathing", which is not
visible on the outside of the body. Mammals only use their abdominal muscles during forceful exhalation (see Fig. 8, and discussion below). Never during any form of inhalation. As the diaphragm contracts, the ribs slant downwards
from the rear to the front (as shown in Fig.4); but the lowermost ribs also slant downwards from the midline outwards (Fig.5). Thus the rib cage's transverse diameter can be increased in the same way as the antero-posterior diameter is increased by the so-called pump handle movement shown in Fig.4. The enlargement of the thoracic cavity's vertical
dimension by the contraction of the diaphragm, and its two horizontal dimensions by the lifting of the front and being elastic, therefore expand to fill the increased space, pleura fluid between double-layered pleura covering of lungs helps in
reducing friction while lungs expand and contract. The inflow of air into the lungs occurs via the respiratory airways (Fig. 2). In a healthy person, these airways begin with the most, which is the backup breathing system. However, chronic mouth breathing leads to, or is a sign of, illness.[15][16][17]) It
ends in the microscopic dead-end sacs called alveoli, which are always open, though the diameters of the various systems. The alveolar air pressure is therefore always close to atmospheric air pressure (about 100kPa at sea level) at rest, with the pressure gradients because of
lungs contraction and expansion cause air to move in and out of the lungs during breathing rarely exceeding 23kPa.[18][19]During exhalation, the diaphragm and intercostal muscles relax. This returns the chest and abdomen (Fig.7)
when the lungs contain their functional residual capacity of air (the light blue area in the right hand illustration of Fig.7), which in the adult human has a volume of about 2.53.0 liters (Fig.3), [6] Resting exhalation because the diaphragm relaxes passively more gently than it contracts actively during inhalation. Fig. 30 liters (Fig.3), [6] Resting exhalation because the diaphragm relaxes passively more gently than it contracts actively during inhalation.
9 The changes in the composition of the alveolar air during a normal breathing cycle at rest. The scale on the left, and the partial pressures of oxygen, also in kPa (to convert kPa into mm Hg, multiply by 7.5). The volume of air that
moves in or out (at the nose or mouth) during a single breathing cycle is called the tidal volume. In a resting adult human, it is about 500ml per breath. At the end of exhalation, the airways contain about 150ml of alveolar air which is the first air that is breathed out of the
alveoli and back in again is known as dead space ventilation, which has the consequence that of the 500ml breathed into the alveoli after a normal exhalation (i.e.
the functional residual capacity of about 2.53.0liters), it is clear that the composition of the alveolar air changes very little during the breathing cycle (see Fig. 9). The oxygen tension (or partial pressure) remains close to 1314kPa (about 100mmHg), and that of carbon dioxide very close to 5.3kPa (or 40mmHg). This contrasts with composition of the
dry outside air at sea level, where the partial pressure of oxygen is 21kPa (or 160mmHg) and that of carbon dioxide 0.04kPa (or 0.3mmHg).[6]During heavy breathing (hyperpnea), as, for instance, during exercise, inhalation is brought about by a more powerful and greater excursion of the contracting diaphragm than at rest (Fig. 8). In addition, the
 "accessory muscles of inhalation" exaggerate the actions of the intercostal muscles (Fig. 8). These accessory muscles of inhalation are muscles of inhalation are muscles that extend from the cervical vertebrae and base of the skull to the upper ribs and sternum, sometimes through an intermediary attachment to the clavicles. [6] When they contract, the rib cage's internal
volume is increased to a far greater extent than can be achieved by contraction of the intercostal muscles alone. Seen from outside the body, the lifting of the clavicular breathing, seen especially during asthma attacks and in people with chronic obstructive pulmonary disease. During strenuous or labored inhalation is sometimes called clavicular breathing, seen especially during asthma attacks and in people with chronic obstructive pulmonary disease. During strenuous or labored inhalation is sometimes called clavicular breathing, seen especially during asthma attacks and in people with chronic obstructive pulmonary disease. During strenuous or labored inhalation is sometimes called clavicular breathing, seen especially during asthma attacks and in people with chronic obstructive pulmonary disease.
heavy breathing, exhalation is caused by relaxation of all the muscles of inhalation. But now, the abdominal muscles, instead of remaining relaxed (as they do at rest), contract forcibly pulling the lower edges of the rib cage, but also pushes the abdominal
organs upwards against the diaphragm which consequently bulges deeply into the thorax (Fig.8). The end-exhalatory lung volume is now well below the resting "functional residual capacity". However, in a normal mammal, the lungs cannot be emptied completely. In an adult human, there is
always still at least 1 liter of residual air left in the lungs after maximum exhalation. [6] The automatic rhythmical breath) and by such voluntary
acts as speech, singing, whistling and the playing of wind instruments. All of these actions rely on the muscles described above, and their effects on the movement of air in and out of the lungs. Although not a form of breathing, the Valsalva maneuver involves the respiratory muscles. It is, in fact, a very forceful exhalatory effort against a tightly closed
glottis, so that no air can escape from the lungs.[21] Instead, abdominal muscles contract very powerfully, causing the pressure inside the abdomen and thorax to rise to extremely high levels. The Valsalva maneuver can be carried out voluntarily but is
more generally a reflex elicited when attempting to empty the abdomen during, for instance, difficult defecation, or during childbirth. Breathing ceases during this maneuver. Main article: Gas exchange in the mammalian lungs, emphasizing the
differences between the gas compositions of the ambient air, the alveolar air (light blue) with which the pulmonary capillary blood equilibrates, and the blood gas tensions in the pulmonary arterial (blue blood entering the lung on the left) and venous blood (red blood leaving the lung on the right). All the gas tensions are in kPa. To convert to mm Hg,
multiply by 7.5. Fig. 12 A diagrammatic histological cross-section through a portion of lung tissue showing a normally inflated alveolus (at the end of a normal exhalation), and its walls containing the pulmonary capillaries (shown in cross-section). This illustrates how the pulmonary capillaries (shown in cross-section).
human lung, all the alveoli together contain about 3 liters of alveolar air. All the pulmonary capillaries contain about 100ml of blood. Fig. 10 A histological cross-section through an alveolar air. The dark blue objects are the nuclei of the capillary
endothelial and alveolar type I pneumocytes). The two red objects labeled "RBC" are red blood cells in the pulmonary capillary blood. The primary purpose of the respiratory system is the equalizing of the partial pressures of the respiratory gases in the alveolar air with those in the pulmonary capillary blood. The primary purpose of the respiratory system is the equalizing of the partial pressures of the respiratory gases in the alveolar air with those in the pulmonary capillary blood.
process occurs by simple diffusion, [22] across a very thin membrane (known as the bloodair barrier), which forms the walls of the alveolar capillaries (Fig. 10). [23] This blood gas barrier is extremely thin (in humans, on
average, 2.2m thick). It is folded into about 300 million small air sacs called alveoli[23] (each between 75 and 300m in diameter) branching off from the respiratory bronchioles in the lungs, thus providing an extremely large surface area (approximately 145m2) for gas exchange to occur.[23]The air contained within the alveoli has a semi-permanent
volume of about 2.53.0 liters which completely surrounds the alveolar capillary blood (Fig. 12). This ensures that equilibration of the partial pressures of the gases in the two compartments is very efficient and occurs very quickly. The blood leaving the alveolar capillaries and is eventually distributed throughout the body therefore has a partial pressure
of oxygen of 1314kPa (100mmHg), and a partial pressure of carbon dioxide of 5.3kPa (40mmHg) (i.e. the same as the oxygen and carbon dioxide in the ambient (dry) air at sea level are 21kPa (160mmHg) and 0.04kPa
(0.3mmHg) respectively.[6]This marked difference between the composition of the alveolar air and that of the ambient air can be maintained because the functional residual capacity is contained in dead-end sacs connected to the outside air by fairly narrow and relatively long tubes (the airways: nose, pharynx, trachea, bronchi and their
branches down to the bronchioles), through which the air has to be breathed both in and out (i.e. there is no unidirectional through-flow as there is in the bird lung). This typical mammalian anatomy combined with the fact that the lungs are not emptied and re-inflated with each breath (leaving a substantial volume of air, of about 2.53.0liters, in the
alveoli after exhalation), ensures that the composition of the alveolar air is only minimally disturbed when the 350ml of fresh air is mixed into it with each inhalation. Thus the animal is provided with a very special "portable atmosphere", whose composition differs significantly from the present-day ambient air.[24] It is this portable atmosphere (the
functional residual capacity) to which the blood and therefore the body tissues are exposed not to the outside air. The resulting arterial pressure of CO2 and, to a lesser extent, a fall in the arterial pressure of O2, will reflexly cause deeper
and faster breathing until the blood gas tensions in the lungs, and therefore the arterial blood, return to normal. The converse happens when the carbon dioxide tension falls, or, again to a lesser extent, the oxygen tension rises: the rate and depth of breathing are reduced until blood gas normality is restored. Since the blood arriving in the alveolar
capillaries has a partial pressure of O2 of, on average, 6kPa (45mmHg), while the pressure in the alveolar air is 1314kPa (100mmHg), there will be a net diffusion of oxygen into the capillaries has a partial pressure of CO2 of
also about 6kPa (45mmHg), whereas that of the alveolar air is 5.3kPa (40mmHg), there is a net movement of carbon dioxide out of the alveolar air necessitate the replacement of about 15% of the alveolar air with ambient air every 5seconds
or so. This is very tightly controlled by the monitoring of the arterial blood gases (which accurately reflect composition of the alveolar air) by the aortic and carotid bodies, as well as by the blood gase and pH sensor on the anterior surface of the medulla oblongata in the brain. There are also oxygen and carbon dioxide sensors in the lungs, but they
primarily determine the diameters of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries, and are therefore responsible for directing the flow of air and blood to different parts of the bronchioles and pulmonary capillaries.
some oxygen is taken up from the outside air. If more carbon dioxide than usual has been lost by a short period of hyperventilation, respiratory system
is to rid the body of carbon dioxide "waste". The carbon dioxide that is breathed out with each breath could probably be more correctly be seen as a byproduct of the body's extracellular fluid carbon dioxide and pH homeostats are compromised, then a respiratory acidosis, or a respiratory alkalosis will occur. In the long run these
can be compensated by renal adjustments to the H+ and HCO3 concentrations in the plasma; but since this takes time, the hyperventilation syndrome can, for instance, occur when agitation or anxiety cause a person to breathe fast and deeply thus causing a distressing respiratory alkalosis through the blowing off of too much CO2 from the blood into
the outside air.[25]Oxygen has a very low solubility in water, and is therefore carried in the blood loosely combined with hemoglobin molecule. When all the heme groups carry one O2 molecule each the blood is said to be "saturated" with oxygen, and
no further increase in the partial pressure of oxygen will meaningfully increase the oxygen concentration of the blood. Most of the carbon dioxide in the plasma. However the conversion of dissolved CO2 into HCO3 (through the addition of water) is too slow for the rate at which the blood circulates
through the tissues on the one hand, and through alveolar capillaries on the reaction is therefore catalyzed by carbonic anhydrase, an enzyme inside the red blood cells. [26] The reaction can go in both directions depending on the protein portion of the
hemoglobin molecules as carbamino groups. The total concentration of carbon dioxide (in the form of bicarbonate ions, dissolved CO2, and carbamino groups) in arterial blood (i.e. after it has equilibrated with the alveolar air) is about 26mM (or 58ml/100 ml),[27] compared to the concentration of oxygen in saturated arterial blood of about 9mM (or
20ml/100 ml blood).[6]Main article: Control of ventilation Ventilation of the lungs in mammals occurs via the respiratory centers in the medulla oblongata and the pons of the brainstem.[6] These areas form a series of neural pathways which receive information about the partial pressures of oxygen and carbon dioxide in the arterial blood. This
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information determines the average rate of ventilation of the lungs, to keep these pressures constant. The respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does so via motor nerves which activate the diaphragm and other muscles of respiratory center does not never a constant. The respiratory center does not never a constant and the partial pressure of constant. The respiratory center does not never a constant and the partial pressure of constant and

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breathing rate and depth, is determined primarily by the arterial partial pressure of carbon dioxide rather than by the arterial pressure of oxygen, which is allowed to vary within a fairly wide range before the respiratory centers in the medulla oblongata and pons respond to it to change the rate and depth of breathing.[6]Exercise increases the
breathing rate due to the extra carbon dioxide produced by the enhanced metabolism of the exercising muscles. [28] In addition, passive movements of the limbs also reflexively produce an increase in the breathing rate. [6][28] Information received from stretch receptors in the lungs' limits tidal volume (the depth of inhalation and exhalation). The
alveoli are open (via the airways) to the atmosphere, with the result that alveolar air pressure is exactly the same as the ambient air pressure at sea level, at altitude, or in any artificial atmosphere (e.g. a diving chamber) in which the individual is breathing freely. With expansion of the lungs the alveolar air occupies a
larger volume, and its pressure falls proportionally, causing air to flow in through the airways, until the pressure in the alveoli is again at the ambient air pressure falls proportionally, causing air to flow in through the airways, until the pressure in the alveoli is again at the ambient air pressure falls proportionally, causing air to flow in through the airways, until the pressure in the alveoli is again at the ambient air pressure. The reverse happens during exhalation.
 chamber. Fig. 14 A graph showing the relationship between total atmospheric pressure and altitude above sea level However, as one rises above sea level the density of the air decreases exponentially (see Fig. 14), halving approximately with every 5500m rise in altitude. [29] Since the composition of the atmospheric air is almost constant below 80km.
as a result of the continuous mixing effect of the weather, the concentration of oxygen in the air (mmols O2 per liter of ambient air) decreases at the same amount of oxygen per minute, the person has to inhale a proportionately greater volume of air per minute
at altitude than at sea level. This is achieved by breathing deeper and faster (i.e. hyperpnea) than at sea level (see below). Fig. 13 Aerial photo of Mount Everest from the south, behind Nuptse and Lhotse There is, however, a complication that increases the volume of air that needs to be inhaled per minute (respiratory minute volume) to provide the
 same amount of oxygen to the lungs at altitude as at sea level. During inhalation, the air is warmed and saturated with water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx. Saturated water vapor during its passage through the nose passages and pharynx.
influences, including altitude.[31] Thus at sea level, where the ambient atmospheric pressure is about 100kPa, the moistened air that flows into the lungs from the trachea consists of water vapor (6.3kPa), nitrogen (74.0kPa) and trace amounts of carbon dioxide and other gases (a total of 100kPa). In dry air the partial pressure of O2
at sea level is 21.0kPa (i.e. 21% of 100kPa), compared to the 19.7kPa of oxygen entering the alveolar air. (The tracheal partial pressure of oxygen is 21.0kPa (i.e. 21% of 100kPa), compared to the 19.7kPa, of which 7.1kPa (or 21%) is oxygen.[29] The air
entering the lungs also has a total pressure of 33.7kPa, of which 6.3kPa is, unavoidably, water vapor (as it is at sea level). This reduces the partial pressure of oxygen in the inhaled air is therefore substantially greater than the
reduction of the total atmospheric pressure at altitude would suggest (on Mt Everest: 5.8kPa vs. 7.1kPa). A further minor complication exists at altitude. If the volume of the lungs would be halved. This happens regardless of altitude. Thus, halving of the
sea level air pressure (100kPa) results in an intrapulmonary air pressure of 50kPa. Doing the same at 5500m, where the atmospheric pressure is only 50kPa. Therefore, the same change in lung volume at sea level results in a 50kPa difference in pressure falls to 25kPa. Therefore, the same change in lung volume at sea level results in an intrapulmonary air pressure falls to 25kPa. Therefore, the same change in lung volume at sea level results in a 50kPa difference in pressure falls to 25kPa.
air, whereas it result in a difference of only 25kPa at 5500m. The driving pressure forcing air into the lungs during inhalation at sea level is therefore twice that which occurs at 5500m. However, in reality, inhalation and exhalation occur far more gently and
less abruptly than in the example given. The differences between the atmospheric and intrapulmonary pressures, driving air in and out of the lungs during the breathing cycle, are in the region of only 23kPa.[18][19] A doubling or more of these small pressure differences could be achieved only by very major changes in the breathing effort at high
 altitudes. All of the above influences of low atmospheric pressures on breathing are accommodated primarily by breathing deeper and faster (hyperpnea). The exact degree of hyperpnea is determined by the blood gas homeostat prioritizes the
regulation of the arterial partial pressure of CO2 is maintained at very close to 5.3kPa (or 40mmHg) under a wide range of circumstances, at the expense of the arterial partial pressure of O2, which is allowed to vary within a very wide range of
 values, before eliciting a corrective ventilatory response. However, when the atmospheric pressure (and therefore the partial pressure of O2 in the ambient air) falls to below 5075% of its value at sea level, oxygen homeostasis is given priority over carbon dioxide homeostasis. [6] This switch-over occurs at an elevation of about 2500m (or about
 8000ft). If this switch occurs relatively abruptly, the hyperpnea at high altitude will cause a severe fall in the arterial plasma. This is one contributor to high altitude sickness. On the other hand, if the switch to oxygen homeostasis is incomplete, then hypoxia may
complicate the clinical picture with potentially fatal results. There are oxygen in the smaller bronchi and bronchioles. In response to low partial pressures of oxygen in the exact opposite of the corresponding reflex in the tissues, where low arterial
partial pressures of O2 cause arterial pressure to rise resulting in a much more even distribution of blood flow to the lungs receive far less blood than the bases, which
 are relatively over-perfused with blood. It is only in the middle of the lungs that the blood and air flow to the alveoli great the bottoms is eliminated, with all the alveoli perfused and ventilated in more or less the physiologically ideal
manner. This is a further important contributor to the acclimatatization to high altitudes and low oxygen pressures. The kidneys measure the oxygen content (mmolO2/liter blood, rather than the partial pressure of O2) of the arterial blood. When the oxygen content of the blood is chronically low, as at high altitude, the oxygen-sensitive kidney cells are content of the blood.
secrete erythropoietin (EPO) into the blood.[33][34] This hormone stimulates the red bone marrow to increase in the hematocrit of the blood, and a consequent increase in the hematocrit of the blood. In other words, at the same arterial
partial pressure of O2, a person with a high hematocrit carries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood than a person with a lower hematocrit tarries more oxygen per liter of blood tarries more oxygen per liter oxygen per lit
cause air to be expelled forcefully from the trachea or nose, respectively. In this manner, irritants caught in the mucus which lines the respiratory tract are expelled or moved to the mouth where they can be swallowed. [6] During coughing, contraction of the smooth muscle in the airway walls narrows the trachea by pulling the ends of the cartilage
plates together and by pushing soft tissue into the lumen. This increases the expired airflow rate to dislodge and remove any irritant particle or mucus. Respiratory epithelium can secrete a variety of molecules that aid in the defense of the lungs. These include secretory immunoglobulins (IgA), collectins, defensins and other peptides and proteases,
 reactive oxygen species, and reactive nitrogen species. These secretions can act directly as antimicrobials to help keep the airway free of infections. Surfactant immune function is primarily attributed to two proteins: SP-
A and SP-D. These proteins can bind to sugars on the surface of pathogens and thereby opsonize them for uptake by phagocytes. It also regulates inflammatory responses and interacts with the adaptive immune response. Surfactant degradation or inactivation may contribute to enhanced susceptibility to lung inflammation and infection.[36]Most of
the respiratory system is lined with mucous membranes that contain mucosa-associated lymphoid tissue, which produces white blood cells such as lymphocytes. Main article: Pulmonary surfactant, a surface of the thin
 watery layer which lines the insides of the alveoli, reducing the water's surface tension of a watery surface (the water-air interface) tends to make that surface decreases the diameter of the alveoli. The more acute the curvature of
the water-air interface the greater the tendency for the alveolus to collapse. [6] This has three effects. Firstly, the surface tension inside the alveoli during inhalation (i.e. it makes the lung stiff, or non-compliant). Surfactant reduces the surface tension and therefore makes the lungs more compliant, or less stiff, than if it
 were not there. Secondly, the diameters of the alveoli increase and decrease during the breathing cycle. This means that the end of inhalation. Since surfactant floats on the watery surface, its molecules are more tightly packed together when the
alveoli shrink during exhalation.[6] This causes them to have a greater surface tension-lowering effect when the alveoli are small than when they are large (as at the end of inhalation, when the surface tension-lowering effect when the alveoli are small than when they are large (as at the end of inhalation, when the surface tension-lowering effect when the surfac
 inhalation. Thirdly, the surface tension of the curved watery layer lining the alveoli tends to draw water from the lung tissues into the alveoli dry.[6][37]Pre-term babies who are unable to manufacture surfactant have lungs that tend to collapse each time they breathe out.
 Unless treated, this condition, called respiratory distress syndrome, is fatal. Basic scientific experiments, carried out using steroids as a means of furthering the development of type II alveolar cells.[38] In fact, once a premature birth is threatened, every effort is made to delay the birth, and a
 series of steroid injections is frequently administered to the mother during this delay in an effort to promote lung maturation by embolism, often from the deep veins in the legs. They also release a variety of substances that enter
the systemic arterial blood, and they remove other substances from the systemic venous blood that reach them via the pulmonary artery. Some prostaglandins are removed from the circulation, while others are synthesized in the lungs and released into the blood when lung tissue is stretched. The lungs activate one hormone. The physiologically
 inactive decapeptide angiotensin I is converted to the aldosterone-releasing octapeptide, angiotensin II, in the pulmonary circulation. The reaction occurs in other tissues as well, but it is particularly prominent in the lungs. Angiotensin II also has a direct effect on arteriolar walls, causing arteriolar vasoconstriction, and consequently a rise in arterial
 blood pressure.[40] Large amounts of the angiotensin-converting enzyme responsible for this activation are located on the surfaces of the endothelial cells of the alveolar capillaries is less than one second, yet 70% of the angiotensin I reaching the
 lungs is converted to angiotensin II in a single trip through the capillaries. Four other peptidases have been identified on the surface of the pulmonary endothelial cells. The movement of gas through the larynx, pharynx and mouth allows humans to speak, or phonate. Vocalization, or singing, in birds occurs via the syrinx, an organ located at the base
of the trachea. The vibration of air flowing across the larynx (vocal cords), in humans, and the syrinx, in birds, results in sound. Because of this, gas movement is vital for communication purposes. Panting in dogs, cats, birds and some other animals provides a means of reducing body temperature, by evaporating saliva in the mouth (instead of
 evaporating sweat on the skin). Disorders of the respiratory system can be classified into several general groups: Airway obstructive conditions (e.g., fibrosis, sarcoidosis, alveolar damage, pleural effusion). Vascular diseases (e.g., pulmonary embolism, pulmonary 
 hypertension)Infectious, environmental and other "diseases" (e.g., pneumonia, tuberculosis, asbestosis, particulate pollutants)Primary cancers (e.g. bronchial carcinoma, mesothelioma)Secondary cancers (e.g. bronchial carcinoma)Secondary (
 syndrome in pre-term babies). Disorders of the respiratory system are usually treated by a pulmonologist and respiratory therapist. Where there is an inability to breathe or insufficiency in breathing, a medical ventilator may be used. This section is an excerpt from Cetaceans have lungs, which means that they breathe air. An
individual can last without a breath from a few minutes to over two hours depending on the species. Whales are deliberate breathers: they must be awake to inhale and exhale. When stale air, warmed from the lungs, is exhaled, it condenses as it meets colder external air. As with a terrestrial mammal breathing out on a cold day, a small cloud of
 'steam' appears. This is called the 'spout' and varies across species in shape, angle and height. Species can be identified at a distance using this characteristic. The structure of the respiratory and circulatory systems is of particular importance for the life of marine mammals. The oxygen balance is effective. Each breath can replace up to 90% of the
total lung volume. For land mammals, in comparison, this value is usually about 15%. During inhalation, about twice as much oxygen is stored in the blood and the lungs, but in cetaceans, it is also stored in various tissues, mainly in the muscles. Here, this happens
through the muscle pigment, myoglobin, provides an effective bond. This additional oxygen storage is vital for deep diving, since beyond a depth around 100m (330ft), the lung tissue is almost completely compressed by the water pressure. Main article: Respiratory system of the horse-Horses are obligate nasal breathers which means that they are
 different from many other mammals because they do not have the option of breathing through their mouths and must take in air through their moses. A flap of tissue called the soft palate blocks off the pharynx from the mouth (oral cavity) of the horse, except when swallowing. This helps to prevent the horse from inhaling food, but does not allow use
of the mouth to breathe when in respiratory distress, a horse can only breathe through its nostrils.[citation needed]The elephant is the only mammal known to have no pleural space. Instead, the parietal and visceral pleura are both composed of dense connective tissue and joined to each other via loose connective tissue.[41] This lack of a pleural
space, along with an unusually thick diaphragm, are thought to be evolutionary adaptations allowing the elephant to remain underwater for long periods while breathing through its trunk which emerges as a snorkel.[42]In the elephant to remain underwater for long periods while breathing through its trunk which emerges as a snorkel.
 the ribcage.[43]See also: Bird anatomy Respiratory system Fig. 15 The arrangement of the air sacs and lungs in birdsFig. 16 The anatomy of bird's respiratory system, showing the relationships of the trachea, primary and intra-pulmonary bronchi, the dorso- and ventro-bronchi, with the parabronchi running between the two. The posterior and
anterior air sacs are also indicated, but not to scale. Fig. 17 A dove skeleton, showing the movement of the chest during inhalation. Arrow 1 indicates the movement of the vertebral ribs. Arrow 2 shows the consequent movement of the sternum (and its keel). The two movements increase the vertical and transverse diameters of the chest portion of the
trunk of the bird. Key: 1. skull; 2. cervical vertebrae; 3. furcula; 4. coracoid; 5. vertebrae; 17. pygostyle; 18. synsacrum; 19. scapula; 20. tibia (tibiotarsus); 15. ilium (innominate); 16. caudal vertebrae; 17. pygostyle; 18. synsacrum; 19. scapula; 20.
 dorsal vertebrae; 21. humerus; 22. ulna; 23. radius; 24. carpus (carpometacarpus); 25. metacarpus (carpometacarpus); 26. digits; 27. alulaThe respiratory system of birds differs significantly from that found in mammals. Firstly, they have rigid lungs which do not expand and contract during the breathing cycle. Instead an extensive system of air sacs
(Fig.15) distributed throughout their bodies act as the bellows drawing environmental air into the sacs, and expelling the spent air after it has passed through the lungs (Fig.18).[44] Birds also do not have diaphragms or pleural cavities. Bird lungs (Fig.18) distributed throughout their bodies act as the bellows drawing environmental air into the sacs, and expelling the spent air after it has passed through the lungs (Fig.18).[44] Birds also do not have diaphragms or pleural cavities. Bird lungs are smaller than those in mammals of comparable size, but the air sacs account for 15% of the total body
volume, compared to the 7% devoted to the alveoli which act as the bellows in mammals.[45]Inhalation and exhalation are brought about by alternately increasing and decreasing the volume of the entire thoraco-abdominal cavity (or coelom) using both their abdominal and costal muscles.[46][47][48] During inhalation the muscles attached to the
vertebral ribs (Fig.17) contract angling them forwards and outwards and outwards and forwards an
forward and downward movement of, particularly, the posterior end of the sternum pulls the abdominal wall downwards, increasing the wolume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in volume of the trunk as well.[46] The increase in vol
 exhalation the external oblique muscle which is attached to the sternum and vertebral ribs anteriorly, and to the pelvis (pubis and ilium in Fig.17) posteriorly (forming part of the abdominal wall) reverses the inhalatory movement, while compressing the abdominal contents, thus increasing the pressure in all the air sacs. Air is therefore expelled from
the respiratory system in the act of exhalation.[46]Fig. 19 The cross-current respiratory gas exchanger in the lungs of birds. Air is forced from the parabronchi. The pulmonary capillaries surround the parabronchi in the manner shown (blood flowing from below the parabronchus
to above it in the diagram).[46][49] Blood or air with a high oxygen content is shown in red; oxygen-poor air or blood is shown in various shades of purple-blue. During inhalation air enters the trachea branches into two primary bronchi, going to the two lungs
(Fig.16). The primary bronchi enter the lungs to become the intrapulmonary bronchi, which give off a set of parallel branches called ventrobronchi and, a little further on, an equivalent set of dorsobronchi (Fig.16).[46] The ends of the intrapulmonary bronchi and, a little further on, an equivalent set of dorsobronchi and, a little further on, an equivalent set of dorsobronchi (Fig.16).[46] The ends of the intrapulmonary bronchi and, a little further on, an equivalent set of dorsobronchi (Fig.16).[46] The ends of the intrapulmonary bronchi and, a little further on, an equivalent set of dorsobronchi and, a little further on, an equivalent set of dorsobronchi and, a little further on, an equivalent set of dorsobronchi and, a little further on, an equivalent set of dorsobronchi and for the bird. Each pair of dorsobronchi and for the bird.
 ventrobronchi is connected by a large number of parallel microscopic air capillaries (or parabronchi) where gas exchange occurs (Fig.16).[46] As the bird inhales, tracheal air flows through the intrapulmonary bronchi into the posterior air sacs, as well as into the dorsobronchi, but not into the ventrobronchi (Fig.18). This is due to the bronchial
architecture which directs the inhaled air away from the openings of the ventrobronchi and posterior air sacs.[50][51][52] From the dorsobronchi the intrapulmonary bronchus towards the dorsobronchi and posterior air sacs.[50][51][52] From the dorsobronchi air sacs.[50][52][52] From the dorsobronchi air sacs.[50][52][52] From the dorsobronchi air sacs.[50][52][52] From the dorsobronchi air sacs.[50][52][52][52] From the dorsobronchi air sacs.[50][52][52][52][52][52][52][
only escape into the expanding anterior air sacs. So, during inhalation, both the posterior air sacs filling with fresh inhaled air, while the anterior air sacs filling with fresh inhaled air, while the anterior air sacs filling with fresh inhaled air, while the anterior air sacs fill with "spent" (oxygen-poor) air that has just passed through the lungs. Fig. 18 Inhalation-exhalation cycle in birdsDuring exhalation the pressure in
the posterior air sacs (which were filled with fresh air during inhalation) increases due to the contraction of the oblique muscle described above. The aerodynamics of the interconnecting openings from the posterior air sacs to the dorsobronchi and intrapulmonary bronchi ensures that the air leaves these sacs in the direction of the lungs (via thee
dorsobronchi), rather than returning down the intrapulmonary bronchi (Fig.18).[50][52] From the dorsobronchi and anterior air sacs to the intrapulmonary
bronchi direct the "spent", oxygen poor air from these two organs to the exterior. [46] Oxygenated air therefore flows constantly (during the entire breathing cycle) in a single direction through the parabronchi. [53] The blood flow through the parabronchi through the parabronchi through the parabronchi through the parabronchi.
forming a cross-current flow exchange system (Fig.19).[44][46][49] The partial pressure of oxygen in the exchanger near the entrance of airflow take up more O2 than do the capillaries leaving near the exit end of the parabronchi. When the
contents of all capillaries mix, the final partial pressure of oxygen of the mixed pulmonary venous blood is higher than that of the inhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the inhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the inhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the inhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the inhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the inhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled air,[46][49] but is nevertheless less than half that of the exhaled a
 trachea is an area of dead space: the oxygen-poor air it contains at the end of exhalation is the first air to re-enter the posterior air sacs and lungs. In comparison to the mammalian respiratory tract, the dead space volume in a bird is, on average, 4.5times greater than it is in mammals of the same size.[45][46] Birds with long necks will inevitably have
long tracheae, and must therefore take deeper breaths than mammals do to make allowances for their greater dead space volumes. In some birds (e.g. the whooping crane, Grus americana, and the helmeted curassow, Pauxi pauxi) the trachea, which some cranes can be 1.5m
 long,[46] is coiled back and forth within the body, drastically increasing the dead space ventilation.[46] The purpose of this extraordinary feature is unknown. Main article: Respiratory systemFig. 20 X-ray video of a female American alligator while breathingThe anatomical structure of the lungs is less complex in reptiles than in mammals, with
reptiles lacking the very extensive airway tree structure found in mammalian lungs. Gas exchange in reptiles still occurs in alveoli however.[44] Reptiles do not possess a diaphragm. Thus, breathing occurs via a change in the volume of the body cavity which is controlled by contraction of intercostal muscles in all reptiles except turtles. In turtles,
contraction of specific pairs of flank muscles governs inhalation and exhalation. [54] Main article: Amphibians relies on positive pressure ventilation. Muscles lower the floor of the oral cavity, enlarging it and drawing in
 air through the nostrils into the oral cavity. With the nostrils and mouth closed, the floor of the oral cavity is then pushed up, which forces air down the trachea into the lungs. The skin of these animals is highly vascularized and moist, with moisture maintained via secretion of mucus from specialised cells, and is involved in cutaneous respiration.
While the lungs are of primary organs for gas exchange when amphibians are submerged in oxygen-rich water. [55]Some amphibians have gills, either in the early stages of their development (e.g. tadpoles of frogs), while others
retain them into adulthood (e.g. some salamanders).[44]Main article: Fish physiology RespirationFig. 21. The operculum or gill cover of a pike has been pulled open to expose the gill arches bearing filaments. Fig. 22. A comparison between the operations and effects of a cocurrent and a countercurrent flow exchange system is depicted by the upper
 and lower diagrams respectively. In both, it is assumed that red has a higher value (e.g. of temperature or the partial pressure of a gas) than blue and that the property being transported in the channels, therefore, flows from red to blue. In fish a countercurrent flow (lower diagram) of blood and water in the gills is used to extract oxygen from the
in the air at sea level.[59] Furthermore, the coefficient of diffusion (i.e. the rate at which a substances diffuses from a region of high concentration, under standard conditions) of the respiratory gases is typically 10,000 faster in air than in water.[59] Thus oxygen, for instance, has a diffusion coefficient of 17.6mm2/s in air
but only 0.0021mm2/s in water.[60][61][62][63] The corresponding values for carbon dioxide are 16mm2/s in air and 0.0016mm2/s in water.[62][63] This means that when oxygen is taken up from the water in contact with a gas exchanger, it is replaced considerably more slowly by the oxygen from the oxygen-rich regions small distances away from
the exchanger than would have occurred in air. Fish have developed gills deal with these problems. Gills are specialized organs containing filaments, which further divide into lamellae contain a dense thin walled capillary network that exposes a large gas exchange surface area to the very large volumes of water passing over them.
[64]Gills use a countercurrent exchange system that increases the efficiency of oxygen-uptake from the water.[56][57][58] Fresh oxygenated water taken in through the gills in one direction, while the blood in the lamellae flows in the opposite direction, while the blood and water flow and w
(Fig. 22), on which the fish's survival depends.[58]Water is drawn in through the mouth by closing the mouth cavity then contracts, inducing the
 closure of the passive oral valves, thereby preventing the back-flow of water from the mouth (Fig. 23). [58][65] The water in the mouth is, instead, forced over the gill chambers contract emptying the inhalatory phase is prevented by
a membrane along the ventroposterior border of the operculum (diagram on the left in Fig. 23). Thus the mouth cavity and gill chambers act alternately as suction pump and pressure pump to maintain a steady flow of water over the gills in one direction. [58] Since the blood in the lamellar capillaries flows in the opposite direction to that of the water
the consequent countercurrent flow of blood and water maintains steep concentration gradients for oxygen and carbon dioxide along the entire length of each capillary (lower diagram in Fig.22). Oxygen is, therefore, able to continually diffuse down its gradient into the blood, and the carbon dioxide down its gradient into the water.[57] Although
countercurrent exchange systems theoretically allow an almost complete transfer of a respiratory gas from one side of the exchanger to the blood.[56]In certain active pelagic sharks, water passes through the mouth and over the gills while they
are moving, in a process known as "ram ventilation".[66] While at rest, most sharks pump water over their gills, as most bony fish do, to ensure that oxygenated water continues to flow over their gills. But a small number of species have lost the ability to pump water through their gills and must swim without rest. These species are obligate ram
ventilators and would presumably asphyxiate if unable to move. Obligate ram ventilation is also true of some pelagic bony fish species.[67]There are a few fish that can obtain oxygen for brief periods of time from air swallowed from above the surface of the water. Thus lungfish possess one or two lungs, and the labyrinth fish have developed a special
 "labyrinth organ", which characterizes this suborder of fish. The labyrinth organ is a much-folded suprabranchial accessory breathing organ. It is formed by a vascularized expansion of the epibranchial bone of the first gill arch, and is used for respiration in air.[68] This organ allows labyrinth fish to take in oxygen directly from the air, instead of
 taking it from the water in which they reside through the use of gills. The labyrinth organ helps the oxygen in the inhaled air to be absorbed into the bloodstream. As a result, labyrinth fish can survive for a short period of time out of water, as they can inhale the air around them, provided they stay moist. Labyrinth fish are not born with functional
labyrinth organs. The development of the organ is gradual and most juvenile labyrinth fish breathe entirely with their gills and develop the labyrinth organs when they grow older.[68]See also: Spiracle (arthropods)Some species of crab use a respiratory organ called a branchiostegal lung.[69] Its gill-like structure increases the surface area for gas
exchange which is more suited to taking oxygen from the air than from water. Some of the smallest spiders and mites can breath passively through their
spiracles (special openings in the exoskeleton) and the air reaches every part of the body by means of a series of smaller tubes called 'trachaea' when their diameters are relatively large, and 'trachaea' when their diameters are very small. The tracheoles make contact with individual cells throughout the body.[44] They are partially filled
into the active cells. Diffusion of gases is effective over small distances but not over larger ones, this is one of the reasons insects are all relatively small. Insects which do not have spiracles an insect has is variable
between species, however, they always come in pairs, one on each side of the body, and usually one pair per segment. Some of the Diplura have eleven, with four pairs on the thorax, but in most of the ancient forms of insects, such as Dragonflies and Grasshoppers there are two thoracic and eight abdominal spiracles. However, in most of the
remaining insects, there are fewer. It is at the level of the tracheal system. More recently, however, large variation in insect ventilatory patterns has been documented
and insect respiration appears to be highly variable. Some small insects do not demonstrate continuous respiratory movements and may lack muscular contraction of the abdomen along with coordinated spiracle contraction and relaxation to generate cyclical gas exchange patterns and to
reduce water loss into the atmosphere. The most extreme form of these patterns is termed discontinuous gas exchange between the aqueous environment and their circulatory systems. These animals also possess a heart that pumpsess gills that allow gas exchange between the aqueous environment and their circulatory systems.
 blood containing hemocyanin as its oxygen-capturing molecule.[44] Hence, this respiratory system is similar to that of vertebrate fish. The respiratory system of gastropods can include either gills or a lung. Main article: Photosynthesis plants use carbon dioxide gas in the process of photosynthesis, and exhale oxygen gas as waste. The chemical
equation of photosynthesis is 6 CO2 (carbon dioxide) and 6 H2O (water), which in the presence of sunlight makes C6H12O6 (glucose) and 6 O2 (oxygen). Photosynthesis uses electrons on the carbon atoms as the repository for the energy obtained from sunlight.[72] Respiration is the opposite of photosynthesis. It reclaims the energy to power
chemical reactions in cells. In so doing the carbon atoms and their electrons are combined with oxygen forming CO2 which is easily removed from both the cells and the organism. Plants use both processes, photosynthesis to capture the energy and oxidative metabolism to use it. Plant respiration is limited by the process of diffusion. Plants take in
carbon dioxide through holes, known as stomata, that can open and close on the undersides of their leaves and sometimes other parts of their anatomy. Most plants require some oxygen for catabolic processes (break-down reactions that require some oxygen for catabolic processes (break-down reactions that require some oxygen for catabolic processes (break-down reactions that release energy). But the quantity of O2 used per hour is small as they are not involved in activities that require
high rates of aerobic metabolism. Their requirement for air, however, is very high as they need CO2 for photosynthesis, which constitutes only 0.04% of the environmental air. Thus, to make 1g of glucose requires the removal of all the CO2 from at least 18.7 liters of air at sea level. But inefficiencies in the photosynthetic process cause considerably
greater volumes of air to be used.[72][73]Great Oxidation Event Paleoproterozoic surge in atmospheric oxygenRespiratory adaptation Breathing Campbell, Neil A. (1990). Biology (2nded.). Redwood City, Calif.: Benjamin/Cummings Pub
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 West (also at YouTube) Library resources about Respiratory system Resources in your library Retrieved from "Service Required Error Codes - Inner Workings of a CPAP machine [note: some parts of this thread were copied from our old forum] dunhamq Wrote: Is there something that I can do to reset something, I am leaving for vacation first thing in
the morning to Mexico for the week. Last night my Remstar Pro M with AFlex gave me this message. I checked the clinician menu and didn't see anything there. Thanks for any help. Grady Support Apnea Board & OSCAR RE: Service Required Error Codes - Inner Workings of a CPAP machine [copied] Hi Grady, welcome to Apnea Board! To help
diagnose the issue, it should give you an error code of some type... Is there a specific error code or does it simply say "Service Required"? Also, does your machine have a smart card? If so, try removing the card and seeing if that solves the problem. Here are the Error Code of some type... Is there a specific error code or does it simply say "Service Required"? Also, does your machine have a smart card? If so, try removing the card and seeing if that solves the problem.
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prescription type that is not supported. Perhaps card is intended for another device. C-105 SMARTCARD BAD CPB SCRIPT READY Card is corrupt and should be reprogrammed. C-107
SMARTCARD BAD CPB START ADDR Card is corrupt and should be reprogrammed.C-108 SMARTCARD BAD CPB ERASE PERMISSION Card is corrupt and should be reprogrammed.C-200 SMARTCARD BAD CDCB VERSION Card is corrupt and should be
reprogrammed.C-201 SMARTCARD BAD CDB VERSION Card contains a storage format that is not supported. Perhaps card is intended for another device.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-203 SMARTCARD BAD CDCB CONTROL BLOCKS CARD BAD CDCB CONTROL BLOCKS CARD BAD CDCB CONTROL BLOCKS CARD BAD CDCB CONTROL BAD CDCB 
204 SMARTCARD BAD CDCB START ADDR Card is corrupt and should be reprogrammed.C-205 SMARTCARD BAD CDB END ADDR Card is corrupt and should be reprogrammed.C-207 SMARTCARD BAD CDB END ADDR Card is corrupt and should be
reprogrammed.C-300 SMARTCARD BAD UIDB VERSION Card is corrupt and should be reprogrammed.C-301 SMARTCARD BAD UIDB START ADDR Card is corrupt and should be reprogrammed.C-303 SMARTCARD BAD UIDB END ADDR Card is corrupt
and should be reprogrammed.C-400 SMARTCARD BAD DDCB VERSION Card is corrupt and should be reprogrammed.C-401 SMARTCARD BAD DDCB PROFILE CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-403
SMARTCARD BAD DDCB HISTOGRAM CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-404 SMARTCARD BAD DDCB FOSQ COMPL CONTROL BLOCKS Card is corrupt and should be reprogrammed.C-501 SMARTCARD FILE TELL FAIL
Card is corrupt and should be reprogrammed.C-502 SMARTCARD FILE SEEK FAIL Card is corrupt and should be reprogrammed.C-503 SMARTCARD FILE GET PTR FAIL Card
is corrupt and should be reprogrammed. C-506 SMARTCARD FILE SET PTR FAIL Card is corrupt and should be reprogrammed. RE: Service Required Error Codes - Inner Workings of a CPAP machine [copied] minime Wrote: My husband didn't empty the humidifier before packing his c-pap up, I fear the machine is toast. There is no error code, only
that it needs service. No air comes out and the buttons flash and beep. Is there anything we can do to get this working again?TIA, minime RE: Service Required Error Codes - Inner Workings of a CPAP machine [copied] minime, (time=1263670937) Wrote:My husband didn't empty the humidifier before packing his c-pap up, I fear the machine is toast.
There is no error code, only that it needs service. No air comes out and the buttons flash and beep. Is there anything we can do to get this working again? TIA, minimeHi minime, welcome to the forum! So I take it that the machine got soaked with water, correct? If that's the case, you need to allow it to completely dry out before you plug it back in,
perhaps for a few days in a dry area with good air circulation (even in front of a fan if you want). If you plug it back in without all the water evaporated off the circuit boards and electrical connections, it could short out. If that's what happened (it shorted out), you're right, it may indeed be "toast". If this machine was given to you through your home
 health equipment provider (DME) and is a rental, contact them and tell them that it's not working. If not, and it's an expensive machine, you may want to send it to the manufacturer for repairs. Or, you could purchase another one. You can get a very basic CPAP over the Internet for about $150 these days, as long as you have a copy of your
prescription from your doctor. Support Apnea Board & OSCAR RE: Service Required Error Codes - Inner Workings of a CPAP machine (CPAP machine Eros CPAP Machine Broken REMstar Pro CPAP Machine A few weeks
ago I was looking around our stock room when I came across a non-functioning CPAP machine sitting on a shelf. It was an old REMstar Pro with an E-24 error, usually associated with some sort of water damage (figure 1). With the same level of curiosity I had with machines (radios, tvs, video games, etc.) when I was a kid, I found a screw driver and
opened up the machine. We don't repair CPAP machines here, so this was the first time I'd ever seen the inside of a CPAP machine case was filled with mostly sound-absorbing foam. Besides that, of course, there was a circuit board with buttons and an LCD display screen, a blower
motor and some tubing connecting the blower to the air outlet port on the CPAP machine. FIGURE 1 I've taken pictures of the components of this CPAP machine and I'm going to share them here so that you know a little bit more about your unit, even if it's not the exact same CPAP machine. After all, every CPAP machine works in pretty much the
same way. These photos should also prevent you from feeling any temptation to open your CPAP machine out of curiosity. If your CPAP machine is within it's warranty will be voided. So, sit back and enjoy my broken CPAP machine. Top Enclosure Removed from the CPAP Machine Opening the
Respironics REMstar Pro CPAP machine only requires the removal of three philips head screws. Once those screws are removed the top enclosure of the Puritan Bennett 420G. The Puritan Bennett 420G CPAP machine only has four screws, but they're weird
ones that appear to require some sort of star-shaped allen-wrench-type of tool for removal. The Puritan Bennett 420G is made in France, which likely explains the unusual type of fastener. FIGURE 2 Circuit Board - or Main PCA - of the REMstar Pro CPAP MachineOnce the top enclosure is removed from the CPAP machine the fun can begin. The circuit
board - also known as the main printed circuit assembly or Main PCA (figure 3) is attached to the top enclosure and can easily be removed from the top enclosure and circuit board from the main body of the CPAP
machine. Figure 4 shows the CPAP machine completely separated into two parts. FIGURE 3FIGURE 4CPAP Machine in Two Parts The Main PCA utilizes a microcontroller chip which reads from and writes to various I/O devices (control pad, LCD, memory, pressure sensor, motor
control circuitry, RS-232 interface, etc.). With all of this information, the microcontroller makes appropriate decisions so the CPAP machine is properly controlled to deliver the desired CPAP therapy in a safe and reliable manner. The serial number of the CPAP machine is properly controlled to deliver the desired CPAP therapy in a safe and reliable manner.
manufacturing process. Part of the Main PCA consists of the SmartCard functionality. On the Respironics REMstar pro offer SmartCard functionality. On the Respironics REMstar series of CPAP machines, the SmartCard is a plastic card similar in size and shape to a credit card. Instead of holding information on a
magnetic strip, it holds it in a small silicon chip embedded into the card. When installed in the REMstar Pro CPAP machine, the usage data can be downloaded and viewed. You can see the Encore SmartCard in figure 4. REMstar
Pro CPAP Machine Sound Absorbing FoamNotice that the bulk of the interior of the CPAP machine is filled with foam. Surrounded by the foam is the blower assembly, which is obviously a key component of the CPAP machine is filled with foam.
 - the part of the CPAP machine that actually generates air pressure (figure 6). The blower is a three phase brushless DC motor with a permanent magnet rotor and stationary coils that are conenected in a "Y" configuration and serve as its stator coils. The microcontroller sets the motor speed - and this in turn determines the output pressure - by
varying the voltage which is delivered to the motor. FIGURE 5REMstar Pro CPAP Machine Blower Assembly In figure 6 you can see that the CPAP blower assembly and this spinning fan generates air pressure and pushes the air out of the blower
assembly and through the pressure outlet port. This particular REMstar Pro CPAP machine features C-Flex which is a technology which lowers the motor (in the form of a lower voltage) in order to briefly slow the motor down. Upon
inhalation the voltage to the motor is increased and the motor speeds up to deliver a higher inhalation pressure. This happens with each breath you take - thousands of times per night. FIGURE 6 That's all there is to a CPAP machine! Micro-processing technology and a motor hooked up to a fan. This should satisfy your curiosity about the inner
workings of your CPAP machine. If you do ever take apart your CPAP machine, be sure not to plug it in. It'll work just fine, and that's the problem. There's a risk of electric shock, so be careful. Note: this article includes some technical information copied from the REMstar Pro Service Manual. Attached Files Thumbnail(s) RE: Service Required Error
Codes - Inner Workings of a CPAP machine [copied] rayhapes, (time=1266741842) Wrote:Ok, now I don't feel quite so dumb.. I have soaked my Goodknight 420s. I did turn it back on before dry however. I have let it dry out and am getting error 15. could you post the error codes for this model please? Hi ray, and welcome to Apnea Board! I don't
currently have the error codes for the Puritan Bennett machines - maybe someone who has them can post them here. Might want to check back from time to time and see. RE: Service Required Error Codes - Inner Workings of a CPAP machine [copied] as mawi Wrote:my CPAP can not power on. already checked. supply fuse burnt. also power regulator
burnt. but unfortunately i don't have the circuit diagram to check the power regulator part number. my model #1009587 RemPlus w/C-Flex Intl. attached herewith the damaged board...any help is very much appreciated...many
thanks. Attached Files Thumbnail(s) Support Apnea Board & OSCAR RE: Service Required Error Codes - Inner Workings of a CPAP machine [copied] asmawi, (time=1280922427) Wrote:my CPAP can not power on. ... the power regulator part number. my model #1009587 RemPlus w/C-Flex Intl. attached herewith the damaged board... any help is very
much appreciated...many thanks. Hi asmawi, welcome to Apnea Board! We have a copy of the Service Manual for the Respironics REMstar Plus w/ Cflex machine, I would think. You can get this service manual and many other service & repair manuals (available
for download) online, in our Private Files & Links Area (you'll need to sign in to get access to the forum), then find the thread that says "Links to Members Only Files". RE: Service Required Error Codes - Inner Workings of a CPAP machine [copied] djharkavy Wrote: Is there any way to do a reset of the error codes. I am travelling and my Remstear Auto
M-Series just started flashing the 'service required.' It beeps and flashes the lights, but does not start up. I can have it fixed/replaced when I get home, but I would like to get it running for the next few days. No error codes showing, and I don't know how to get them otherwise. RE: Service Required Error Codes - Inner Workings of a CPAP machine
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[copied] claudeg Wrote:SuperSleeper, (time=1266768276) Wrote:rayhapes, (time=1266741842) Wrote:Ok, now I don't feel quite so dumb.. I have let it dry out and am getting error 15. could you post the error codes for this model please? Hi ray, and welcome to Apnea Board! I

Respironics cpap error codes. How do i reset my philips respironics dreamstation. Philips dreamstation error codes. Philips respironics simplygo mini error codes. Philips respironics error messages. Philips respironics service required codes.