

LAST REVIEW: 2009/2010

NEXT REVIEW: 2014/2015

STATUS:

COURSE TITLE: Respiratory Therapy Equipment

COMMON COURSE NUMBER: RET 1026

CREDIT HOURS: 3

CONTACT HOUR BREAKDOWN: 3 hours/week

CLOCK HOURS:

Lecture:

Lab:

Clinic:

Other:

PREREQUISITE(S): BSC 1085 ,MAT 1033 ,CHM 1033

COREQUISITE(S): RET 1026 L ,RET 1485

PRE/COREQUISITE(S):

COURSE DESCRIPTION: This course reviews all of the equipment normally used for respiratory therapy with the exception of mechanical ventilation. Especially emphasized are methods used in manufacturing, storing and administering oxygen; humidity and aerosol therapy, airway management and airway clearance techniques.

UNIT TITLES

- 1. Physics for Respiratory Therapy**
- 2. Manufacture of Oxygen**
- 3. Oxygen Administration**
- 4. Humidification and Aerosol Therapy**
- 5. Airway Clearance Techniques**
- 6. Airway Management**
- 7. Cleaning and Sterilization**

EVALUATION:

There will be six biweekly quizzes combined with six on line self tests during the term which will be worth 60 points each. The lowest quiz score will be dropped when computing the final course grade. Research Assignment 25 points
Final Exam 100 points

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UNITS

Unit 1. Physics for Respiratory Therapy

General outcomes:

- 1.0 The student will describe the physical characteristics of the atmosphere and perform calculations using metric and English systems of measurement.

SPECIFIC LEARNING OBJECTIVES:

To successfully complete this unit the student will:

- 1.1 List the normal metric units used for measuring temperature, volume, length, weight, and pressure.
- 1.2 Give the conversion factors for:
- liters or cubic meters
 - inches to millimeters and centimeters
 - feet or yards to meters
 - pounds to grams and kilograms
 - lb./in² to cm H₂O and mm Hg
 - Fahrenheit to centigrade and Kelvin
- 1.3 Write the formula and explain each of these gas laws:
- Boyle's
 - Charle's
 - Gay Lussac's
 - Dalton's
 - Henry's
- 1.4 List the normal values for BTPS, STPD

Unit 2. Manufacture of Oxygen

General outcomes:

- 2.0 The student will describe the manufacturing and storage processes and the safety systems which are used with medical gases.

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SPECIFIC LEARNING OBJECTIVES:

To successfully complete this unit the student will:

- 2.1 Describe the technique of fractional distillation for oxygen manufacture.
- 2.2 Define critical temperature and critical pressure
- 2.3 Describe a liquid oxygen storage system.
- 2.4 Define a bulk supply oxygen storage system.
- 2.5 Diagram a typical oxygen piping system including pressure regulators, shut off valves, pressure relief valves, outlets and storage systems.
- 2.6 Describe the major NFPA regulations for the safe handling and storage of medical gases.
- 2.7 Compare and contrast the diameter index, pin index and American Standard safety systems.
- 2.8 Calculate the gas contents of H and E cylinders when given the gas pressure of the cylinder and calculate how long the cylinder will last at any given flow.
- 2.9 Identify the markings on an oxygen cylinder.
- 2.10 Define filling density
- 2.11 Identify those gases which liquefy when pressurized at room temperature.
- 2.12 List the color codes for oxygen, helium, carbon dioxide, air and nitrous oxide.
- 2.13 Describe the function and application of an O₂ concentrator.
- 2.14 Describe the types of oxygen analyzers and their principles of function.
- 2.15 Describe a pulse oximeter:
 - A. The mechanism for detecting oxygen in the blood
 - B. The accuracy in different clinical situations
 - C. Functional versus Fractional

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- 2.16 The student will describe the fundamentals of capnography
- A. Compare paCO_2 to ETCO_2
 - Normal
 - Disease states
 - B. Describe the different types of sampling
 - sidestream sampling
 - mainstream sampling
 - C. Identify a normal capnogram tracing
 - Using tracings from a capnograph, be able to interpret the readings
 - D. Troubleshoot problems with the capnometer

Unit 3. Oxygen Administration

General outcomes:

- 3.0 The student will describe the rationale for and the hazards of oxygen therapy and the methods used to determine the appropriate method of oxygen administration.

SPECIFIC LEARNING OBJECTIVES:

To successfully complete this unit the student will:

- 3.1 List the normal flow rate used and FiO_2 obtained with each of these devices:
 - nasal cannula
 - transtracheal oxygen catheter
 - simple face mask
 - venturi mask
 - partial rebreather mask
 - non rebreather mask
 - oxygen tents and croupettes
 - infant hoods and isolettes
- 3.2 Write the alveolar air equation
- 3.3 Calculate $\text{P}_{\text{A}}\text{O}_2$ when given barometric pressure, FiO_2 , PaCO_2 and respiratory quotient.
- 3.4 Calculate the mixing ratios of oxygen and air for any FiO_2 between 21% and 100%.
- 3.5 Differentiate between high flow and low flow oxygen delivery systems.
- 3.6 Calculate the total flow rate of gas to the patient from any venturi device when FiO_2 and source gas flow rate are given.

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- 3.7 Calculate the source gas flow rate needed when the desired FiO_2 and total flow rate are known.
- 3.8 List the indications for oxygen therapy.
- 3.9 List the chemical symbol, chemical formula and major physical characteristics of oxygen.
- 3.10 List the causes and manifestations of each of the following forms of oxygen toxicity:
 - absorptive atelectasis
 - retinopathy of prematurity
 - pulmonary structural damage
 - oxygen induced hypoventilation
- 3.11 Indicate how the possible occurrence of the above conditions can be minimized
- 3.12 Relate FiO_2 to speed of onset and severity of pulmonary damage.
- 3.13 Define the Clinical Practice Guidelines.

Unit 4. Humidification and Aerosol Therapy

General outcomes:

- 4.0 The student will describe the methods used to humidify the airways and the advantages and disadvantages for each method.

SPECIFIC LEARNING OBJECTIVES:

To successfully complete this unit the student will:

- 4.1 Define these terms:
 - relative humidity
 - absolute humidity
 - vapor
 - aerosol
 - humidifier
 - nebulizer
- 4.2 Calculate relative humidity, body humidity and humidity deficit
- 4.3 List the indications and hazards for the use of humidifiers.
- 4.4 List the indications and hazards for the use of nebulizers.
- 4.5 Differentiate between humidifiers and nebulizers.

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- 4.6 Describe the various methods by which humidifiers function.
- 4.7 Describe the various methods by which nebulizers function.
- 4.8 Describe the Bernoulli Theorem.

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Unit 5. Airway Clearance Techniques

General Outcomes:

5.0 The student will describe the methods used in airway clearance techniques.

Specific Learning Objectives:

To successfully complete this unit the student will:

5.1 List the indications of CPT, postural drainage, incentive spirometry, PEP therapy, HFCWO, and IPV

A. Describe the hazards and complications of each.

5.2 Describe all of the steps and precautions which must be taken when performing tracheal suctioning through endotracheal and tracheostomy tubes and the nasopharynx and oropharynx.

5.3 Describe the indications for and potential hazards of tracheal suctioning.

Unit 6. Airway Management

General outcomes:

6.0 The student will describe the structure of the human airway and the methods used to maintain airway patency.

SPECIFIC LEARNING OBJECTIVES:

To successfully complete this unit the student will:

6.1 Describe the anatomic structure of the human conducting airways.

6.2 Describe the common forms of airway obstruction.

6.3 Describe the methods used to assess airway patency.

6.4 Describe all of the methods which can be used to establish a patent airway in emergency situations.

6.5 Describe the methods used to insert nasopharyngeal and oropharyngeal artificial airways and indicate the circumstances under which they should be used.

6.6 Describe high volume low pressure and low volume high pressure cuffs and the disadvantages and advantages of each

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- 6.7 Identify all of the markings which are normally found on endotracheal tubes.
- 6.8 Describe indications for manual resuscitation bags.
 - 6.8.1 Identify the parts of a manual resuscitation bag.
 - 6.8.2 Describe the function of a manual resuscitation bag
- 6.9 Describe the systems used to measure the size of endotracheal and tracheostomy tubes and indicate the size range used for neonate, pediatric and adult use.
- 6.10 Compare and contrast the Miller and Macintosh laryngoscope blades.
- 6.11 List the complications associated with the use of endotracheal and tracheostomy tubes.
- 6.12 Describe the proper techniques for endotracheal intubation and extubation.
- 6.13 List the means of determining proper tube position in the trachea.

Unit 7. Cleaning and Sterilization

General outcomes:

- 7.0 The student will identify the primary pathogens, the routes of transmission and methods of infection control.

SPECIFIC LEARNING OBJECTIVES:

To successfully complete this unit the student will:

- 7.1 Identify the pathogenic organisms which are most commonly encountered in the hospital setting.
- 7.2 Identify the organisms which most commonly contaminate respiratory therapy equipment.
- 7.3 Describe these methods of sterilization.
 - cidex
 - ethylene oxide
 - pasteurization
 - steam autoclave
 - hydrogen peroxide
- 7.4 Indicate the advantages and disadvantages to each of the methods listed above.