PERFORMANCE EVALUATION - #28
NON-INVASIVE VENTILATION (BiPAP)

NAME: _____
DATE: _____
INSTRUCTOR: _____

Non-Invasive Ventilator Used: _____

	0	1	2	3	NA
1. Verifies, interprets, and evaluates physician's order.					
2. Selects, gathers and assembles Non-Invasive Ventilator (NIV) circuitry.					
3. Washes hands.					
4. Fills humidifier with sterile, distilled water (if used).					
5. Identifies patient.					
6. Introduces self and department.					
7. Assesses patient.					
8. Explains therapy and confirms patient's understanding.					
9. Measures for appropriate size of patient interface with sizing gauge and checks fit of selected interface to patient's face.					
10. Determines appropriate spacer (if needed).					
11. Activates power to Non-Invasive Ventilator.					
12. Adjusts NIV to ordered IPAP level, occludes circuit and verifies proper level on manometer or digital display.					
13. Adjusts NIV to ordered EPAP/CPAP level, occludes circuit, and verifies proper level on manometer or digital display.					
14. Adjusts NIV to ordered Respiratory Rate setting.					
15. Selects oxygen flow rate in liter/minute per orders.					
16. Adjusts NIV to ordered mode.					
17. Places interface on patient's face and adjust to ensure a comfortable fit.					
18. Instructs patient to breath through nose while keeping mouth closed.					
19. Confirms IPAP level and adjusts as required					
20. Confirms EPAP level and adjusts as required					
21. Verifies leak level.					
22. Sets high-pressure alarm setting to appropriate level.					
23. Sets low pressure alarm setting to between IPAP and EPAP levels.					
24. Sets alarm delay per departmental policy					
25. Assess patient. a. Comfort level. b. Respiratory Rate c. Exhaled Volume d. Heart Rate e. Blood Pressure					
26. Documents per departmental policy thoroughly and concisely.					
25. Prepares and delivers clear, concise and accurate shift report.					
27.					
28. Knowledge/Comprehensive Level: Can the student answer all oral review questions					

Students must pass all critical steps with a score of 2 or 3

ORAL REVIEW QUESTIONS
NON-INVASIVE VENTILATION

1. Explain the indications for Non-Invasive Ventilation therapy.
   a. **ALVEOLAR HYPOVENTILATION (PACO2).**
   b. **CHRONIC VENTILATORY MUSCLE DYSFUNCTION OR FATIGUE.**
   c. **POST EXTUBATION DIFFICULTY.**
   d. **NO CODE PATIENTS WHO DO NOT WISH TO BE INTUBATED.**
   e. **CHF/PULMONARY EDEMA.**
2. Explain contraindications for Non-Invasive Ventilation therapy.
   a. **PATIENT INCAPABLE OF MAINTAINING LIFE SUSTAINING VENTILATION (E.G. APNEA, NEED INVASIVE MECHANICAL VENTILATION)**
   b. **POSSIBILITY OF ASPIRATION (FULL FACE MASK).**
   c. **PNEUMOTHORAX/PNEUMOMEDIASTINUM.**
   d. **HYPOTENSION.**
   e. **ALLERGY OR HYPERSENSITIVITY TO THE MASK MATERIAL.**
   f. **FACIAL TRAUMA**
   g. **CLAUSTROPHOBIA**
3. Explain the clinical data and lab data that should be monitored and assessed prior to beginning Non-Invasive Ventilation therapy.
   a. **PATIENT VITAL SIGNS, ABG RESULTS, PULSE OXIMETRY RESULTS**
4. Explain the modes available on the Non-Invasive Ventilation unit.
   a. **SPONTANEOUS**
   b. **SPONTANEOUS/TIMED**
   c. **TIMED**
5. Which controls are active in each mode?
   a. **SPONTANEOUS: IPAP & EPAP**
   b. **SPONTANEOUS/TIMED: IPAP, EPAP, & BPM**
   c. **TIMED: IPAP, EPAP, BPM, % IPAP**
6. Differentiate between the IPAP and EPAP controls.
7. How is PSV determined?
   a. **THE LEVEL OF PRESSURE SUPPORT VENTILATION (PSV) IS DETERMINED BY THE DIFFERENCE BETWEEN THE IPAP AND EPAP PRESSURE, ALSO KNOWN AS THE DELTA PRESSURE.**
8. Explain the importance of setting the alarms correctly.
   a. **TO ENSURE PATIENT SAFETY.**
9. What is considered an “acceptable leak”?
   a. **20 to 40 LPM**
10. Explain when the EPAP level should be increased.
    a. **INCREASE THE EPAP LEVEL TO IMPROVE OXYGENATION. THE IPAP LEVEL MAY NEED TO BE ADJUSTED PROPORTIONALLY TO CONTROL VENTILATION AS YOU DECREASE THE DELTA PRESSURE BY ONLY INCREASING EPAP.**
11. Explain when the IPAP level should be increased.
    a. **INCREASE THE IPAP LEVEL TO IMPROVE VENTILATION BY CREATING A LARGER DELTA PRESSURE.**
12. Does the IPAP pressure change when you increase EPAP? What will happen to tidal volume if IPAP is not increased also?
    a. **NO, THE IPAP PRESSURE DOES NOT CHANGE WHEN YOU CHANGE EPAP. IF THE EPAP IS INCREASED WITHOUT CHANGING THE IPAP, DELTA PRESSURE WILL DECREASE AND DELIVERED TIDAL VOLUME WILL DECREASE.**
13. Explain how to adjust FiO_2 level.

a. **YOU CAN ADD OXYGEN TO THE SYSTEM BY USING A TEE ADAPTER BEFORE THE MAIN FLOW FILTER OR BLEEDING IT IN TO THE MASK THROUGH ONE OF THE PORTS.**

14. How can you assess the adequacy of the supplemental oxygen therapy being provided?
    a. **BY MONITORING PULSE OXIMETRY**
15. Identify the exhalation port on the device.
16. What flowrate is required to trigger on a breath?
    a. **IGNORE THIS QUESTION. THE MECHANISM BY WHICH THE UNIT TRIGGERS IS MORE CONFUSING THAN IT IS WORTH.**
17. What signs would indicate that the mask was putting too much pressure on the patient's face?
    a. **SIGNS OF EXCESSIVE PRESSURE INCLUDE SKIN BREAKDOWN AND REDNESS.**
18. How would you alleviate the above problem?
    a. **SELECT THE APPROPRIATE SIZE INTERFACE, USE THE APPROPRIATE SPACER, ADJUST THE INTERFACE STRAPS APPROPRIATELY.**
19. Does the "Vt" display give a constant number? Why or why not?
    a. **UNDER NORMAL CONDITIONS THE ESTIMATED TIDAL VOLUME (V_{tEST}) IS DISPLAYED AS A CONSTANT NUMBER. IF THE UNIT CANNOT DETERMINE A MEASURED TIDAL VOLUME (BECAUSE OF A LEAK), THE DISPLAY WILL FLASH.**
20. When and how would you wean a patient from NIPPV?
    a. **WEANING SHOULD BE ATTEMPTED WHEN THE CONDITION WHICH PRECIPITATED THE NEED FOR NIPPV HAS BEEN RESOLVED. WEANING IS ACCOMPLISHED BY REDUCING THE LEVELS OF IPAP AND EPAP AND TRANSITIONING TO THE SPONTANEOUS MODE.**
21. What other types of noninvasive devices were used in the pasts? List several.
    a. **IRON LUNG, CHEST CUIRASS, PNEUMOBELT, ROCKING BED**

Revised 6/05

PERFORMANCE EVALUATION #34
7200 Ventilator Set Up

NAME: _____
DATE: _____
INSTRUCTOR: _____

		0	1	2	3	NA
1.	**Identify and name the filters on the 7200ae.					
1.	**Explain how each filter is sterilized.					
2.	**Trace the gas flow through the ventilator circuit.					
3.	**Identify the following a. Alarm volume control b. On – off switch c. EST button					
4.	**Perform a TEST					
5.	**Identify how options available on the 7200 ae can be quickly identified.					
6.	Answer oral review questions.					

Students must pass all critical steps with a score of 2 or 3

ORAL REVIEW QUESTIONS

1. Name the four ventilator tests on the 7200ae ventilator and which ones are therapist initiated.
   a. **POWER ON SELF TEST (POST) – INITIATED WHEN MACHINE IS TURNED ON.**
   b. **TOTAL EXTENDED SELF TEST (TEST) – INITIATED BY USER**
   c. **QUICK EXTENDED SELF TEST (QUEST) – INITIATED BY USER**
   d. **LAMP TEST – INITIATED BY USER**
2. Explain each of the following including length of time needed to run the tests:
   a. POST **– 5 TO 12 SECONDS**
   b. QUEST **– 2 MINUTES**
   c. TEST **– 5 MINUTES**
   d. Lamp Test **- 40 SECONDS**
3. What do the initials POST, QUEST and TEST stand for?
   a. **POST - POWER ON SELF TEST**
   b. **QUEST - QUICK EXTENDED SELF TEST**
   c. **TEST - TOTAL EXTENDED SELF TEST**
4. During the EST, explain how the leak test is performed.
   THE VENTILATOR CIRCUIT IS PRESSURIZED TO 90 cmH_2O AT AN AIR FLOW OF 10 L/min WITHIN 30 SECONDS. THE VENTILATOR THEN LOOKS FOR A PRESSURE DROP OF LESS THAN 15 cmH_2O WITHIN 10 SECONDS TO QUALIFY AS A "PASS".
5. Explain what the tubing compliance factor means.
   THIS FACTOR IS THE COMPRESSIBLE VOLUME OF THE PATIENT-VENTILATOR CIRCUIT AS DETERMINED IN THE TEST OR QUEST. THE VENTILATOR NOTES THE AVERAGE AIRWAY PRESSURE OF THE PRIOR FOUR BREATHS AND MULTIPLIES THAT PRESSURE BY THE TUBING COMPLIANCE FACTOR. THE DELIVERED TIDAL VOLUME IS THEN ADJUSTED TO ACCOMMODATE THIS COMPRESSIBLE VOLUME LOSS WITHIN THE VENTILATOR CIRCUIT.
6. Explain when TEST and QUEST should be performed.
   THE TEST SHOULD BE PERFORMED BEFORE EACH NEW PATIENT IS PLACED ON THE VENTIALTOR. THE QUEST SHOULD BE PERFORMED WHENEVER THE PATIENT CIRCUIT IS CHANGED.
7. Explain what should be done if TEST or QUEST fails.
   TO REPEAT AN INDIVIDUAL TEST WHICH HAS FAILED DURING EITHER THE TEST OR

QUEST PROCEDURE, PRESS THE ASTERISK (*) KEY TWICE. IF A NON-CRITICAL ERROR HAS BEEN ENCOUNTERED DURING EITHER THE QUEST OR TEST PROCEDURE, PRESS "ENTER" WHEN PROMPTED "OVERIDE-ENTER". IF A CRITICAL ERROR HAS BEEN ENCOUNTERED, THE ENTIRE QUEST OR TEST SHOULD BE REPEATED.

8. Which key is depressed when you wish to bypass QUEST to perform a TEST?
   PRESS THE "++" KEY FOLLOW BY "ENTER" TO BYPASS THE QUEST AND PERFORM A TEST.
9. Which key is depressed to bypass the nebulizer during QUEST/TEST?
   TO BYPASS THE NEBULIZER TEST, THE "CLEAR" BUTTON IS PUSHED.
10. Explain why the patient's exhaled gas is heated back to body temperature when returning to the ventilator.
    THIS IS A BTPS CORRECTION FACTOR THAT THE VENTILATOR USES. THE DISPLAYED EXHALED TIDAL VOLUME IS CORRECTED TO BTPS. THE ANALOG DISPLAY ON THE OLDER KEYPADS IS NOT BTPS CORRECTED.

PERFORMANCE EVALUATION #35
7200ae Ventilator Initiation

NAME: _____
DATE: _____
INSTRUCTOR: _____

	0	1	2	3	NA
1. **Demonstrate the ability to adjust the following parameters a. Tidal volume b. Respiratory rate c. Peak flowrate d. PEEP e. Sensitivity f. FiO_2 g. Mode selector h. Flow waveform i. Low pressure alarm j. High pressure alarm					
2. **Connect to the test lung and adjust the following parameters: a. Apnea parameters b. Audible alarm volume					
3. **Identify the location of the patient data, alarm data and ventilator data on the keyboard.					
4. **Demonstrate how to measure the static or plateau pressure during volume ventilation a. Observe the pressure-time, volume-time and flow-time waveforms.					
5. **Turn on and off the 100% oxygen.					
6. **Select the waveforms. a. Change the scale on each of the waveforms. b. Identify the components of the waveforms.					
7. Answer oral review questions					

Students must pass all critical steps with a score of 2 or 3

ORAL REVIEW QUESTIONS

1. Identify the control variable. **TECHNICALLY FLOW, BUT VOLUME IS OK.**
2. Identify the trigger variable. **WITH FLOW-BY OFF, IT IS PRESSURE.**
3. Identify the cycle variable. **TECHNICALLY TIME, BUT VOLUME IS OK.**
4. Identify the limit variable. **FLOW IS THE LIMITING VALUE.**
5. Identify the baseline variable. **PEEP IS THE BASELINE VALUE.**
6. Which parameter changes with changes in the patient's compliance and/or Raw? **PEAK AIRWAY PRESSURE.**
7. Explain how the following is calculated.
   a. Dynamic compliance: $C_{DYN} = \frac{CORRECTED\ V_t}{P_{PEAK} - TOTAL\ P_{BASELINE}}$
   b. Static compliance $C_{ST} = \frac{CORRECTED\ V_t}{P_{PLATEAU} - TOTAL\ P_{BASELINE}}$
   c. Airway resistance $R_{aw} = \frac{P_{PEAK} - P_{PLATEAU}}{CONSTANT\ (SQUARE)\ FLOW}$

8. Explain how to calculate the volume lost in the ventilator circuit given the TCF. **MULTIPLY THE PEAK AIRWAY PRESSURE BY THE TUBING COMPLIANCE FACTOR OBTAINED DURING THE TEST PROCEDURE.**
9. Explain two problems associated with volume ventilation.
    a. **VARIABLE PRESSURES THAT MAY BE EXCESSIVE AND CAUSE HEMODYNAMIC COMPLICATIONS OR PULMONARY BAROTRAUMA.**
    b. **INADEQUATE FLOW RATE SETTING LEADING TO PATIENT DYSCHRONY.**
10. Explain which parameter changes will affect the PIP.
    a. **TIDAL VOLUME**
    b. **PEAK INSPIRATORY FLOW RATE (INDEPENDENT OF THE FLOW PATTERN)**
    c. **FLOW PATTERN (INDEPENDENT OF THE PEAK INSPIRATORY FLOW RATE)**
    d. **BASELINE PRESSURE**
    e. **SENSITIVITY (IF INAPPROPRIATELY SET)**
11. Explain where the high and low pressure alarms should be set. **THE HIGH PRESSURE LIMIT SHOULD BE SET 10 TO 15 cmH_2O ABOVE THE AVERAGE PEAK PRESSURE AND THE LOW SHOULD BE SET 10 TO 15 cmH_2O BELOW THE AVERAGE PEAK PRESSURE.**

Given the following, establish the appropriate settings on the 7200ae ventilator

Patient is 70 Kg
TCF: 3 mL/cm H_2O
Mode: CMV
Tidal volume: 700 mL
Respiratory Rate: 12/min
Peak Flowrate: 60 L/min
Sensitivity: -2 cm H20
FiO_2: .24
PEEP: +10 cm H20
Flow waveform: Decelerating

Set the high and low pressure alarm appropriately.

PERFORMANCE EVALUATION #36
7200ae Ventilator – Advanced

NAME: _____
DATE: _____
INSTRUCTOR: _____

		0	1	2	3	NA
1.	**Place the patient in A/C–VC.					
2.	**Place the patient in CPAP mode.					
3.	**Activate Pressure Support Ventilation.					
4.	**Activate Flow Triggering.					
5.	Answer oral review questions.					

Students must pass all critical steps with a score of 2 or 3

ORAL REVIEW QUESTIONS

1. Explain where to set the high and low pressure alarm. **THE HIGH PRESSURE LIMIT SHOULD BE SET 10 TO 15 cmH_2O ABOVE THE AVERAGE PEAK PRESSURE AND THE LOW SHOULD BE SET 10 TO 15 cmH_2O BELOW THE AVERAGE PEAK PRESSURE.**
2. Explain the two parameters set in Function #50 Flow-by. **BASE FLOW IS THE CONTINUOUS FLOW PRESENT IN THE CIRCUITRY. THE SENSITIVITY FLOW IS THE MINIMUM FLOW THAT THE PATIENT MUST CREATE TO TRIGGER THE BREATH. THE SENSITIVITY FLOW MAY NOT ME MORE THAN HALF OF THE BASE FLOW. TYPICAL SETTINGS ARE BASE FLOW OF 6 L/min AND A SENSITIVITY FLOW OF 3 L/min.**
3. Explain the parameter set in Function #10 PSV. **INSPIRATORY PRESSURE LEVEL (PSV LEVEL) IN cmH_2O.**
4. Explain the flow waveform pattern seen in PSV. **THE INSPIRATORY PRESSURE TRACING IS SQUARE WAVE (OR NEARLY SO) AND FIXED. THE INSPIRATORY FLOW TRACING IS A DECELERATING EXPONENTIAL DECAY AND IS VARIABLE.**
5. Explain which modes you can use PSV. **PSV CAN BE USED IN ANY MODE WHERE SPONTANEOUS BREATHS ARE ALLOWED. THIS INCLUDES THE CPAP (SPONTANEOUS) MODE AND THE SIMV MODE (EITHER VCV OR PCV).**

6 Explain in which modes you can use Flow-by. **FLOW-BY CAN BE USED IN ANY MODE: CMV (A/C), SIMV, OR CPAP (SPONTANEOUS).**

7. Classify the following modes of ventilation:
   a. CMV–VC: **TIME (MACHINE), PRESSURE (PATIENT), FLOW (PATIENT), OR MANUALLY TRIGGERED, FLOW LIMITED, TIME-CYCLED (VOLUME CYCLED IS ACCEPTABLE) OR PRESSURE CYCLED (IF THE HIGH-PRESSURE THRESHOLD IS REACHED), BASELINE AS DICTATED BY THE PEEP/CPAP SETTING.**
   b. CPAP: **PRESSURE (PATIENT), OR FLOW (PATIENT), TRIGGERED (MANUAL TRIGGERING FOR MANDATORY BREATH IS POSSIBLE), PRESSURE LIMITED, PRESSURE OR FLOW-CYCLED (IF PSV IS PRESENT) OR PRESSURE CYCLED (IF THE HIGH-PRESSURE THRESHOLD IS REACHED), BASELINE AS DICTATED BY THE PEEP/CPAP SETTING.**
8. Explain which flow waveform pattern gives you
   a. The shortest inspiratory time **SQUARE WAVE**
   b. The highest PIP **SQUARE WAVE**
   c. The highest MAP **SQUARE WAVE**

PERFORMANCE EVALUATION #37
840 Ventilator

NAME: _____
DATE: _____
INSTRUCTOR: _____

		0	1	2	3	NA
6.	**Place the patient in A/C–VC.					
7.	**Place the patient in CPAP mode.					
8.	**Activate Pressure Support Ventilation.					
9.	**Activate Tube Compensation Ventilation.					
10.	Answer oral review questions.					

Students must pass all critical steps with a score of 2 or 3

ORAL REVIEW QUESTIONS

1. Explain Tube Compensation.
   a. **A MODIFICATION OF PRESSURE SUPPORT VENTILATION WHERE, BASED UPON THE INSPIRATORY FLOW RATE, THE AIRWAY'S INNER DIAMETER, AND THE TYPE OF AIRWAY PRESENT, THE VENTILATOR AUTOMATICALLY CHANGES THE PRESSURE SUPPORT LEVEL TO MATCH THE PRESSURE DROP DUE TO THE RESISTANCE OF THE TUBE.**
2. Explain differences between the 7200 and 840 ventilator.
   a. **FASTER PROCESSOR, MORE MEMORY, ACTIVE EXHALATION VALVE, ADDITIONAL MODES (VC+, VS, NON-INVASIVE APPLICATION, NEONATAL)**

A/C- VC

V_t 700 mL
f 15/min
Flow Sensitivity 3 LPM
FiO_2 .25
Peak Flowrate 60 L/min
Decelerating Flow Pattern
Pressure sensitivity -2 cm H_2O
PEEP +5 cm H_2O

Set Apnea Parameters
Set alarms appropriately

Spontaneous Breathing

Patient 75 kg
FiO_2 .25
PEEP +5 cm H_2O
Pressure sensitivity -2 cm H_2O
Flow sensitivity 3 LPM
Peak Flowrate 60 L/min
Select Tube Compensation
Set Apnea Parameters
Set alarms appropriately

PERFORMANCE EVALUATION #39 NAME: _____
Dräger E-4 Ventilator DATE: _____
INSTRUCTOR: _____

		0	1	2	3	NA
1.	**Identify and name the filters on the Dräger E-4.					
2.	**Explain how each filter is processed.					
3.	**Trace the gas flow through the ventilator circuit.					
4.	**Identify the following, states its function, and describe how it is removed and processed if appropriate. a. On – off switch b. Exhalation Valve c. Expiratory Flow Sensor					
5.	Perform a Device Check.					
6.	**Establish A/C-VC ventilation with the following settings: a. AutoFlow: On b. Flow Triggering: On and @ 3 L/min c. Tidal volume: 700 mL d. Respiratory rate: 15 breaths/minute e. $Time_{inspiratory}$: 1.0 sec f. PEEP: 5 cmH_2O a. FIO_2: .25 b. Pressure Rise Time: 0.2 seconds c. Set the following alarms appropriately: › High/Low Minute Volume › High Spontaneous Respiratory Rate Alarm › High/Low Inspired Tidal Volume Alarm › High/Low Airway Pressure Alarm d. Apnea Parameters in SIMV, CPAP or APRV.					
6.	**Identify the location of the patient data, alarm data and ventilator data on the GUI (screen).					
7.	**Demonstrate how to measure the static or plateau pressure during volume ventilation.					
8.	**Demonstrate how to measure the amount of Auto-PEEP.					
9.	**Turn on and off the 100% oxygen.					
10.	Change the graphic display to pressure, flow, or volume.					
11.	**Change the ventilator settings to the following: Mode: Spontaneous ($P_{supp.}$) Spontaneous Breath Type: Pressure Support PSV: 15 cm H_2O					
12.	With spontaneous breaths being simulated, adjust all alarm parameters as needed.					
13.	Answer oral review questions.					

Students must pass all critical steps with a score of 2 or 3

ORAL REVIEW QUESTIONS

1. Given ventilator settings identify the following:
   a. The control variable.
   b. The trigger variable.
   c. The cycle variable.
   d. The limit variable.
   e. The baseline variable.
2. Which parameter changes with changes in the patient's compliance and/or Raw?
3. Describe AutoFlow.
   a. **AUTO-FLOW IS A DUAL-MODE OF CONTROLLING A BREATH WHERE A PRESSURE CONTROL BREATH IS APPLIED AND ADJUSTED TO TARGET A DESIRED TIDAL VOLUME BASED UPON THE LAST DELIVERED BREATH.**
4. State why AutoFlow and Flow Triggering should always be active during Volume-oriented Ventilation (CMV).
   a. **CMV GENERATES A PRESSURE-TRIGGERED, SQUARE-WAVE FLOW PATTERN BREATH.**
5. Describe the function of the Inspiratory Hold soft-touch key. **IGNORE THIS QUESTION.**
6. Describe the function of the Configuration soft-touch key and state the access code to change ventilatory parameters. **IGNORE THIS QUESTION.**