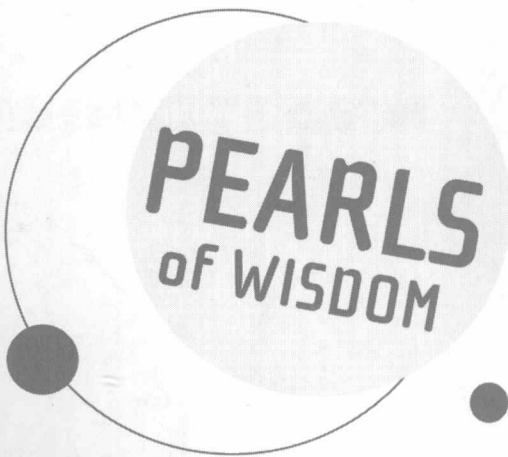


# Nurse Anesthetist EXAM REVIEW

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Lisa J. Thiemann • Kerri M. Robertson • David A. Lubarsky • Sudharma Ranasinghe



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of WISDOM

# **Nurse Anesthetist**

## **EXAM REVIEW**

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## Nurse Anesthetist Review

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## DEDICATION

*To all my family, for their undying support and words of encouragement throughout the years; to Mary E. Shirk Marienau, Edward S. Thompson, and the faculty at the Duke University School of Nursing for their ongoing inspiration and advisement.*

LJT

*Dr. Jerry Reves*

*To a great man who has dedicated his career to creating a truly academic Department of Anesthesiology at Duke University.*

*Many thanks for your tireless efforts on behalf of the faculty and for your inspiration, guidance and support.*

KMR and DAL

*Dedicated to two great departments at the University of Miami and Duke University Medical Center who made this all possible.*

DAL and SR



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*for his outstanding editorial assistance,  
patience and humor.*

To  
*my simply amazing children, Mitchel and Sasha,  
my unconditional love, always.*

Kerri Robertson, MD



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## INTRODUCTION

- 1 and 3.
- 2 and 4.
- 1, 2, and 3.
- 4 alone.

If 1 is true, then 3 is true and vice-a-versa.

If 2 is true, so is at least one other choice.

We have it on good authority that the Marquis de Sade used “K-type” questions on those he wished to torture most. His minions, in the guise of academic test creators, have persevered over the centuries to make sure this unique form of torture is widely inflicted.

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If you would like to contribute questions for consideration into the next edition, please email them to [thiem002@mc.duke.edu](mailto:thiem002@mc.duke.edu) or [lisajcrna@yahoo.com](mailto:lisajcrna@yahoo.com). To be considered a contributing author, please create a series of original questions with referenced answers based on board questions or requisite board topics.

LJT, KMR & DAL



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# MACHINES

*I Think That Anyone Who Comes Upon A Nautilus Machine Suddenly Will Agree With Me That Its Prototype Was Clearly Invented At Some Time In History When Torture Was Considered A Reasonable Alternative To Diplomacy.*

Anna Quindlen

- ☐ **If you are using a self-inflating resuscitation bag and mask to ventilate a patient, what will an increase in the minute ventilation do to the  $\text{FiO}_2$  delivered?**

$\text{FiO}_2$  generally decreases. The exact change depends on the rate of oxygen delivery to the bag, the minute ventilation, and the specific method of oxygen delivery to the bag. The use of a reservoir combined with high oxygen flows allows 100% oxygen to be delivered irrespective of the minute ventilation.  $\text{FiO}_2$  delivered is *directly proportional to  $\text{O}_2$  flow rate* (usually 100%- with 10L/ min of  $\text{O}_2$ ) and *inversely proportional to  $\text{MV}$* . Use of a Venturi delivery system allows a constant  $\text{FiO}_2$ , although a lower maximal  $\text{FiO}_2$  is achieved than with a reservoir and high flow oxygen.

- ☐ **If you add an oxygen reservoir tube to a self-inflating resuscitation bag, what happens to the maximal  $\text{FiO}_2$  that can be delivered?**

The addition of an oxygen reservoir tube to a self-inflating resuscitation bag increases the maximal  $\text{FiO}_2$  that can be delivered.

- ☐ **What are the primary components of soda lime?**

The primary components of "wet" or "high moisture" soda lime (the most common type in use today) are calcium hydroxide (76-81%), sodium hydroxide (4%), potassium hydroxide (1%), and water (14-19%).

- ☐ **What are the primary components of Baralyme?**

Calcium hydroxide (80%), and barium hydroxide (20%). Moisture in Baralyme is incorporated into the structure of the barium hydroxide, which exists as an octahydrate.

- ☐ **What are the basic reactions involved in  $\text{CO}_2$  absorption by soda lime and Baralyme?**

In both cases,  $\text{CO}_2$  first reacts with water to form carbonic acid. The carbonic acid then combines with the various hydroxides found in the absorber chemicals to form carbonates and heat.

- ☐ **What is the optimum size for absorbent granules?**

The optimum size for absorbent granules is 4 to 8 mesh. Granules smaller than 8 mesh cause excess resistance and tend to cake, while granules larger than 4 mesh offer less surface area for absorption.

- ☐ **What volume of intergranular air must be in the carbon dioxide canister to maximize carbon dioxide absorption?**

The intergranular air space must be at least as large as the maximal tidal volume in order to trap all the  $\text{CO}_2$  that passes through the absorber.

- ☐ **If the canister of Baralyme or soda lime doesn't feel warm, what should you suspect?**



The absorption of  $\text{CO}_2$  by either Baralyme or soda lime is exothermic. If the canister is not warm, you should suspect that  $\text{CO}_2$  is not being absorbed.

☐ **What is the maximal absorbant capacity for Baralyme and soda lime?**

The maximal absorbant capacity for Baralyme is variously reported as 9-27.1 liters of  $\text{CO}_2$ / 100g of absorbent. The maximal absorbant capacity for soda lime is generally reported as about 25 liters of  $\text{CO}_2$ / 100g of absorbant. With either absorber, the color indicator may revert back to its pre-exhausted color if the absorbant is rested. This does not indicate a significant recovery of absorbant capacity and the color will quickly change to is exhausted state if the absorbant is re-used.

☐ **What constitutes the dead space in a circle system?**

Everything distal to the partition in the Y-piece. Examples include the face mask, endotracheal tube, "artificial nose", etc.

☐ **How much does the  $\text{FiO}_2$  increase for each liter per minute increase in oxygen flow via nasal cannula?**

$\text{FiO}_2$  increases approximately 4% for each L/min increase in delivered  $\text{O}_2$ , up to 6 L/min. Flow rates beyond 6 L/min do not predictably increase  $\text{FiO}_2$  above approximately 44% and are also poorly tolerated because of drying and crusting of the nasal mucosa.

☐ **What is the main advantage of the Venturi (air-entrainment) face mask?**

The Venturi face mask provides a stable  $\text{FiO}_2$  between 24-40%, irrespective of changes in minute ventilation and inspiratory flow rate.

☐ **What is the purpose of using an isolation transformer in the electrical supply to the operating room?**

The isolation transformer converts the grounded electrical power from the utility company into ungrounded power in the OR. This decreases the risk of shock because there is no electrical potential between the wire and ground, only between the two wires. Thus, to receive a shock from an ungrounded power supply, a person must contact two wires. To receive a shock from a grounded system, however, a person must merely be in contact with ground and also touch the "hot" wire.

☐ **What is the significance of the line isolation monitor sounding its alarm?**

The line isolation monitor measures the potential for current flow from the isolated operating room power supply to ground. It determines the amount of current that could flow if a second short circuit should develop and sounds the alarm if this current exceeds 2mA or 5mA, depending on the particular monitor used.

☐ **Why is the line isolation monitor more useful for preventing macroshock than microshock?**

Macroshock is current delivered to the body surface and current up to 5 mA is accepted as harmless. The line isolation monitor alarms when there is potential for current flow of 2mA or 5mA. Microshock (current delivered directly to the heart) can cause ventricular fibrillation with current as low as 0.1 mA, well below the alarm point of a line isolation monitor.

☐ **What is the purpose of the flow proportioning system?**

The flow proportioning system interlinks the oxygen and nitrous oxide flow controls such that a fresh gas mixture containing at least 25% oxygen is created at the level of the rotameters.

☐ **What are the four major functions of the breathing bag in a circle system?**