1-Semi-closed system/Partial Rebreathing system page 3, 12, 13, 17, 18, 19, 28, 64

- Run in an **intermediate flow rates** 130 -200ml/Kg/min, the animal rebreathes some exhaled gases
- **Fresh gas Flow rate in induction and recovery is about 100 ml/Kg/min or 2-3 times the calculated maintenance flow**
- **During the maintenance of anesthesia the flow rate may be reduced to 30-50 ml/kg/min**
- **Fresh gas** is delivered in excess of metabolic consumption,
- In **large animal 10** ml/Kg/min, in **small animals 30** ml/Kg/min

2-Bain anesthetic circuit / Bain system /non breathing circuit

- Fresh gas flow rate is 100-300 ml/Kg/min
- 1-If Run at **high flow rate** of 200-300 ml/Kg/min **(High)**, are the **best for small animal under 7 Kg not allow rebreathing of exhaled gas**
- **Bain system** like a tube in a tube, **new oxygen** and **anesthesia** is inhaled down the inner tube, and exhaled gas exits through the outer tube
- **There is a modified form of circular system called Universal F circuit which is also tube in a tube**

The vet asks you to set up a non-rebreathing anesthetic circuit for the next surgery case. What kind of patient do you expect?

- ○ Asthmatic bulldog
- ○ Greyhound with no body fat
- ○ Siamese cat over 20 lbs
- ◉ Miniature poodle under 7 kg ✓

Correct: A non-rebreathing anesthetic circuit is better for SMALLER animals, under 7 kg (under 15 pounds).

Ref: McCurnin and Bassert, Clin Textbook for Vet Technicians, 6th ed. pp. 580.

- 2-If Run in an **intermediate flow rates** 130 -200 (or less) ml/Kg/min act as a **Partial Rebreathing system** but substantially high flow rate than semi closed system

3-Closed anesthetic rebreathing system/Circle rebreathing delivery system

Provide enough fresh gas flow to meet an animal's need, 5-10 ml/Kg/min according anima size

Flow is is lower for large animal, and higher for small animal

Why is it o.k. for an animal to rebreathe exhaled gasses in a closed or semi-closed anesthetic circuit?

What part keeps exhaled gasses moving away from the patient in a circular rebreathing anesthetic delivery system?

- ○ Two way valves prevent CO2 buildup
- ○ Oxygen requirements of anesthetized animals are very low
- ○ Modern anesthetic gasses remain potent for 2-3 inhalations
- ◉ Exhaled gasses pass through a CO2 absorbent canister ✓

Correct: Expired gasses pass through a CO2 scavenger canister to remove carbon dioxide. One way valves help direct gas flow. The remaining oxygen and anesthetic gas recirculates with fresh incoming gas and is rebreathed by the animal. The higher the flow rate, the more CO2 is pushed through the absorbent canister and is not rebreathed.

Which choice correctly lists the order in which gasses pass through a typical circular anesthetic circuit?

- ○ Vaporizer, pressure regulator, flowmeter,CO2 canister, patient
- ◉ Pressure regulator, flowmeter, vaporizer, patient, CO2 canister ✓
- ○ Pressure regulator, vaporizer, patient, CO2 canister, flowmeter
- ○ Flowmeter, pressure regulator, vaporizer, patient, CO2 canister

Correct: Pressure regulator, flowmeter, vaporizer, patient, CO2 canister. Gas passes from the high pressure tank through the pressure regulator, which DECREASES the gas pressure. Gas then flows through the flowmeter, (which controls the amount of carrier gas flow) then the vaporizer (where anesthetic vapor mixes) and then into the breathing circuit where the animal inhales the mix. Exhaled gasses pass through a CO2 scavenger canister and are then recycled, or are disposed of completely (non-rebreathing system.)

What is the function of a vaporizer in an anesthetic gas breathing circuit?

- ○ Scavenges CO2 vapor from exhaled gasses
- ○ Controls fresh gas flow rate into breathing circuit
- ◉ Vaporizes liquid anesthetics ✓
- ○ Moisturizes inhaled gasses

Correct: Vaporisers convert volatile liquid anesthetics (like isoflurane) into a vapor that is combined with a carrier gas (mainly oxygen, sometimes with nitrous oxide) for delivery into the gbreathing circuit. There are two kinds of vaporizers.
1. Precision vaporizers, which deliver precise vapor concentrations regardless of gas flow rate or temperature, and typically lie OUTSIDE the breathing circuit.
2. Non-precision vaporizers, do NOT deliver precise vapor concentrations, and are affected by changes in the gas flow rate or temperature. Non-precision vaporizers typically lie INSIDE the breathing circuit.

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When is the best time to refill the vaporizer in an anesthetic machine?

- ◉ After the last surgery of the day ✓
- ○ Whenever the fill volume is below 50%
- ○ Before the first surgery of the day
- ○ When the CO2 absorbent granules are completely purple

Correct: The best time to refill the anesthetic vaporizer is at the END of the day, after surgeries are done, when fewer people are present and in the event of an accidental spill, there is less exposure time for anyone who needs to work in the surgery room.

STRATEGY HINT: This is another kind of "frequency" question. That is, you

Which choice indicates that the soda lime granules in a CO2 absorbent canister have become exhausted?

- ○ Color change from purple to white
- ○ Color stays pink, regardless of exposure
- ○ Color stays white, regardless of exposure
- ◉ Color change from white to purple ✓

Correct: A color change from white to purple typically indicates that the CO2 scavenger granules have exhausted their ability to remove carbon dioxide and need to be changed. Most granules contain a dye that becomes visible as the absorbent granules become exhausted. (The color itself is not so important as the color changing). Absorbant granules are made of soda lime or barium hydroxide.

What will happen if you hit the oxygen flush button on an anesthetic machine?

- ○ The patient will go to a deeper anesthetic plane
- ◉ The patient may start to wake up ✓
- ○ Oxygen is flushed out of the system
- ○ Anesthetic gas concentration goes up in the breathing circuit

Correct: The oxygen flush sends pure oxygen into the breathing circuit, BYPASSING the vaporizer. Anesthetic gas concentration DECREASES, and patients start to wake up.
Remember you should NOT hit the oxygen flush button if the pop-off valve is closed, or when using a non-rebreathing system, because you can deliver dangerously high airway pressure to the patient.

Which anesthetic breathing system is the worst choice when using nitrous oxide?

- ○ Bain nonrebreathing
- ○ Nonrebreathing
- ◉ Closed rebreathing ✓
- ○ Semi-closed rebreathing

Correct: Oxygen depletion and nitrous oxide buildup are common problems in a closed rebreathing system, so you should NOT use nitrous oxide with a closed system. Because higher gas flow rates are used with semi-closed and nonrebreathing systems, nitrous oxide (N20) buildup is lees of a concern.

For anesthetics, what does MAC, (Minimum Alveolar Concentration) measure?

- (•) Anesthetic potentcy ✓
- ( ) Minimum safe concentration
- ( ) Speed of expected induction
- ( ) Anesthetic fat solubility

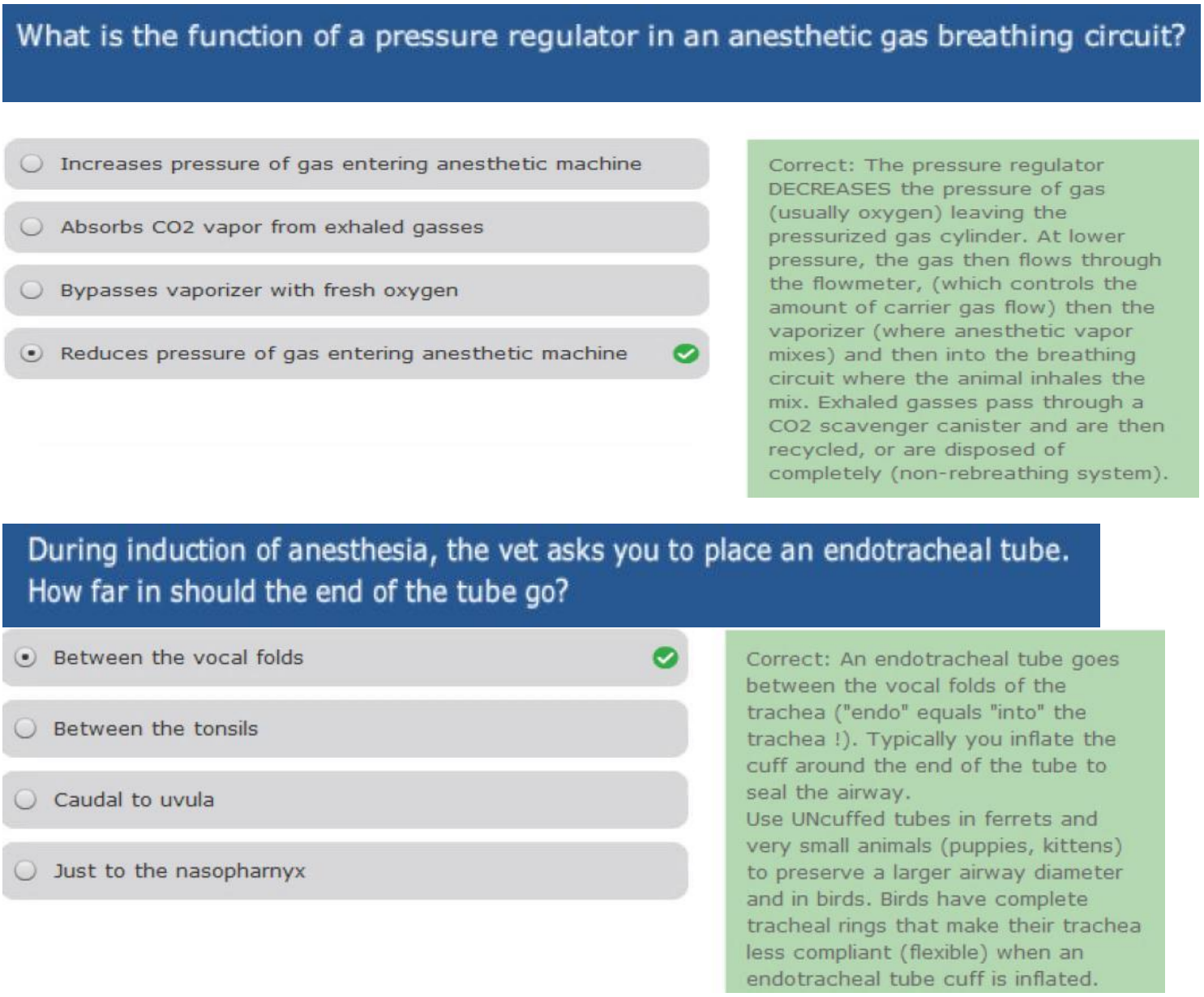
Correct: MAC, (Minimum Alveolar Concentration) is a measure of anesthetic potency. Technically, it is the minimum concentration of anesthetic in the alveolar gas that prevents a physical response in 50% of animals exposed to a surgical stimulus.

Because you want to be 100% sure that an animal is completely anesthetized, you usually use MULTIPLES of MAC to determine vaporizer settings (ie:, 1-2X MAC) to guarantee anesthesia during surgery.

Minimum alveolar concentration (MAC) is the minimum concentration of anesthetic in alveolar gas that prevents physical response in what percent of animals exposed to a surgical stimulus?

- ( ) 75
- ( ) 25
- ( ) 95
- (•) 50 ✓

Correct: Minimum alveolar concentration (MAC) is the minimum concentration of anesthetic in the aleveolar gas that prevents response in 50% of animals exposed to a surgical stimulus.
Refs: McCurnin & Bassert, Clin Textbook for Vet Technicians, 7th ed pp 896-7.



-**Endotracheal tube (Uncuffed & cuffed) tube** goes between focal folds page 14

- Use cuffed endotracheal tube in an adult dog
- Use uncuffed endotracheal tube in small animals (puppies, kitten),birds

-**Methoxyfluran** is highest solubility and slower induction and recovery, not use in large animal for this reason

-**Isoflurane** and **sevoflurane** is very slow solubility page 63

High solubility anesthesia mean the gas is absorbed into the body tissue (lipid solubility)

Causing slow induction and slow recovery

What color is an oxygen tank supposed to be in the U.S.?

page 43

- Red or brown
- White or green ✓
- Blue
- Yellow

Correct: No matter what color the tank is, ALWAYS read the tag or label on the tank first to verify the gas contents inside. One instructor in Surgical Nursing and Anesthesia has reported seeing of a green tank containing carbon dioxide instead of oxygen!

That being said, oxygen tanks in the U.S are typically white or green. Nitrous oxide tanks, (laughing gas) are blue. (Try remembering-"Laughing gas chases the blues")

-**Xylazine** in **cat** cause vomiting/**emetic** & bradycardia, reduce respiratory rate page 4

- reverse by **Yohimbine**
- Pretreatment with **atropine** to decrease bradycardia (slow heart rate) and excessive salivation
- Cattles are very sensitive (dose is 20 times lower than dog and horse)

Antiemetic in cat as Diphenhydramine (**Bendary**), Metoclopramide

-**Ultra-short acting barbiturate** (**thiopental, Methohexital**) is IV. If outside cause **slough tissue**

- **Thiopental and propofol in cat** cause apnea (temporary cessation breathing especially during sleeping) **page 50, 61**
- Opiates, barbiturates and gas anesthesia promote bradycardia (slow heart rat**)**
- **Thiopental** is contraindicate in **sight hound** (Greyhound, Whippet, Aphgan) because they have low body fat so metabolize is very slowly and can cause **heart arrethemias** (ventricular bigeminy) and **apnea** after injection

Which drug is the most fat soluble and might have delayed elimination/excretion in an obese dog or cat?

- Xylazine
- Thiopental ✓
- Ketamine
- Ace-promazine

Correct: Thiopental is an ultra-short-acting barbiturate that can be stored in fat and slowly released. Usually use thiopental to INDUCE anesthesia (IV injection).
3 things to remember about barbiturates:
1. Really fat animals & sighthounds (like greyhounds, afghans) have trouble excreting barbiturates. Methohexital is a better choice for both.
2. Beware of RESPRATORY DEPRESSION w/ barbiturates.
3. Two other barbiturates often used are PENTObarb (in euthanasia solutions) and PHENObarb (used to control epilepsy/seizures)

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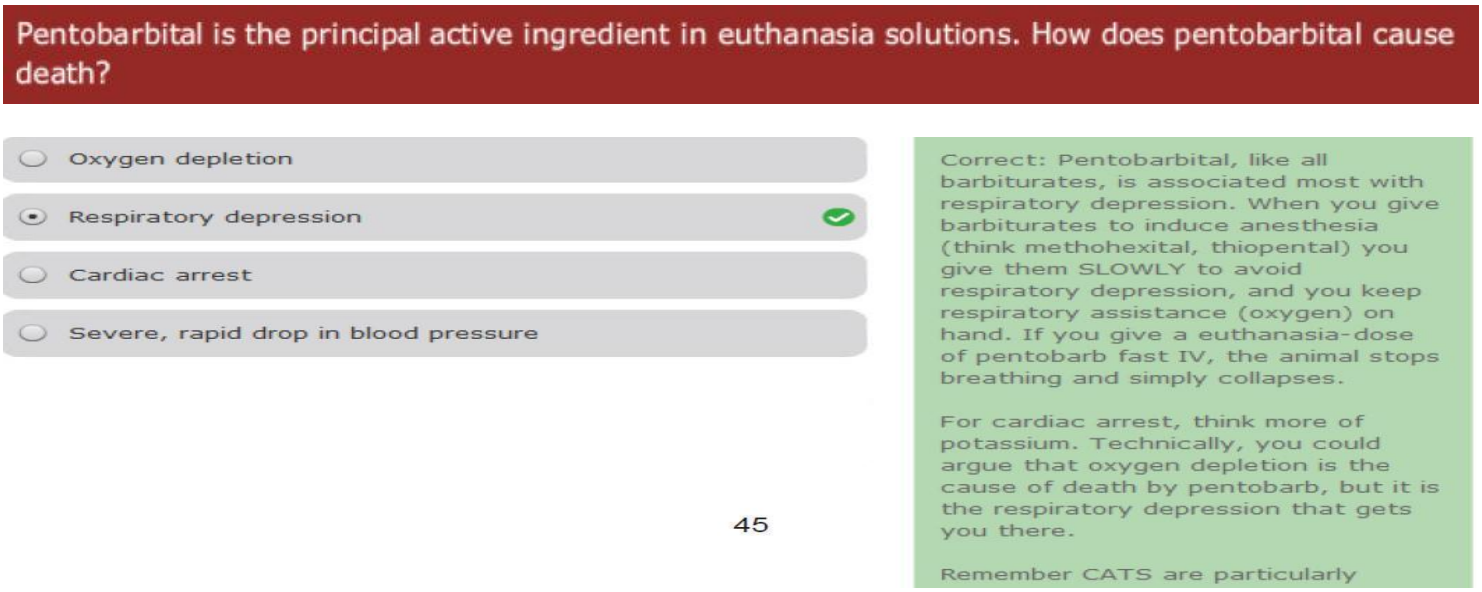
- **Methohexital** is drug of choice in Really fat (very fat) animals and sight hound because it doesn't absorbed into fat and rapid induced anesthesia
- **Propofol**
  - Open vial of propofol should be discard after 6 hours from opening or support bacteria growth
  - is rapidly cleared from the body
  - not irritant to tissue if it goes outside the vein accidentally
  - can mix 2.5% thiopental with 1% propofol as an induction agent

-Phenobarbital is long acting barbiturate used to control epilepsy (idiopathic seizures)

In the first you can see agitation إثارة /excitement or profound عميق depression so need to monitor



-Ketamine and Tiletamine is Dissociative anesthesia page 21

- Cause **seizures** at high does, induce **excessive salivation**
- Don't use in dog with history of epilepsy (type of seizures) and Glaucoma (intraocular pressure)and can cause respiratory depression
- - **Acepromazine, Ketamine, Xylazine** are contraindicated in animal with seizures history page 52
- When used **ketamine in cat** as pre-medication to immobilize cats prior to catheter replacement or general anesthesia should be use **ophthalmic ointment as lacri-tube** to protect ***cat 'eyes*** *because eyes remain opening after injection*
- **1-2%Lidocaine spray** to prevent laryngospasm in cat, pig, small ruminant during induction & maintenance anesthesia

Laryngospasm in cat in

- Overzealous (المفرط) manipulation of larynx by laryngoscope
- During intubation

-Benzocaine in **cat** is avoided due to methemoglobinemia

-**Atropine** is Midrise, if **high dose** decrease GI motility and urinary tract motility, **very High dose** inhibit gastric secretion

- Not used as premedication in **horse because slow the gut and induced colic** page 53

- **Glycopyrrolate** is less so sometimes used to decrease bradycardia in apathetic horse

-**Glycopyrrolate** (**does not pass placenta**) so is better than Atropine in anesthetic premedication in **pregnant animal** page **56**

Atropine and Glycopyrrolate (anticholinergic drugs) used as premedication to dog and cat before inducing anesthesia with Ketamine or Tiletamine because

- Decrease salivation
- Decrease airway secretion
- Increase heart rate (decrease bradycardia)

- **Guaifenesin** in **horse** is used with **Ketamine** and **Thiopental** page 10, 23

- to induce anesthesia because it is antitussive, decongestant, Mm. relaxant