# NREMT Paramedic 1.4.12 - Quiz Questions with Answers

# Airway, Respiration & Ventilation



**1.**

Which of the following tubes would be most appropriate for nasotracheal intubation for an average height and weight adult?

**Cuffed 6.0–6.5 mm endotracheal tube**

Uncuffed 6.0–6.5 mm endotracheal tube

Cuffed 7–8 mm endotracheal tube

Uncuffed 7–8 mm endotracheal tube

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*Correct answer: Cuffed 6.0–6.5 mm endotracheal tube*

*At times, nasotracheal intubation may be the preferred method of airway control. This may be the case in patients who have spontaneous respirations, when laryngoscopy is determined too difficult due to anatomy or laryngospasm or when the motion of the cervical spine must be very limited. Conscious patients tolerate a nasal tube better; they cause less tracheal trauma. The best nasal tube for intubating an average height and weight adult would be a tube that is one size smaller than the optimal tube size for endotracheal intubation and cuffed.*

*When performing nasal intubation, it is important to choose a tube that is cuffed and one size smaller than the optimal endotracheal tube for the patient. Therefore, using an uncuffed tube of any size would not allow the paramedic to seal the air from escaping from around the tube, making the tube useless.*

*Using a 7–8 mm cuffed ET tube for nasally intubating an average height and weight adult would likely be too large a diameter to fit into the nostrils without causing unneeded trauma. Remember, the optimal nasal tube is cuffed, and one size smaller than the appropriate endotracheal tube would have been.*

*A 7.0–7.5 mm cuffed ET tube is considered the correct size for orotracheal intubation of an average height and weight adult patient.*

**2.**

Which of the following airway devices are indicated for patients who depend on hypoxic drive to breathe?

**Venturi mask**

Non-rebreather mask

Nasal cannula

Simple face mask

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*Correct answer: Venturi mask*

*The Venturi mask is a high-flow oxygen entrainment delivery device. It delivers a precise fraction of inspired oxygen at typically low concentrations. It can deliver a precise FiO2 between 25–50 percent. It is used for patients who require specific concentrations, such as COPD patients.*

*A non-rebreather mask is a high-flow oxygen delivery system. It is designed to deliver 10–15 liters of oxygen per minute at concentrations approaching 100 percent. These masks are not intended for the long-term treatment of hypoxic drive patients.*

*A nasal cannula delivers low-concentration oxygen between 20–44 percent and is designed to deliver up to 6 liters per minute. Nasal cannulas are often used but cannot deliver specific concentrations as a Venturi mask can.*

*Simple face masks are seldom used today but are capable of delivering 6–10 liters of oxygen per minute. They are not indicated for the long-term treatment of patients who breathe on hypoxic drive.*

**3.**

Continuous Positive Airway Pressure (CPAP) is used in the management of patients with acute pulmonary edema. Which of the following would be contraindications for using CPAP?

Select the 2 answer choices that are correct.

**Patient is unable to protect their own airway**

**History of recent upper GI surgery**

Respiratory distress after a recent submersion incident

Respiratory rate is rapid

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*Continuous Positive Airway Pressure (CPAP) provides pressure to keep alveoli open and reverse atelectasis caused by pulmonary edema. If a patient is unable to maintain their own airway, had recent upper GI surgery, has altered mental status, hypotension, a closed head injury, or signs of a pneumothorax, CPAP would be contraindicated.*

*Patients with respiratory distress after a recent submersion incident may be experiencing pulmonary edema and would benefit from CPAP if they do not exhibit any contraindications. Patients who need CPAP commonly have rapid respiratory rates, so it is not a contraindication.*

**4.**

Which of the following steps are correct for suctioning a stoma?

Select the 2 answer options which are correct.

**Apply suction while withdrawing the catheter**

**Use an appropriately sized soft suction catheter**

Inject 10 mL of sterile saline through the stoma and into the trachea

Use a rigid suction catheter such as the Yankauer

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*To suction a stoma, inject a small amount (no more than 3 mL) of sterile saline through the stoma and into the trachea. Next, insert an appropriately sized soft suction catheter without applying suction until resistance is met. Then, apply suction while withdrawing the catheter.*

*Do not use a rigid suction catheter to suction a stoma. These are for suctioning the mouth and nose only. 10 mL of saline is too much for suctioning and may cause aspiration.*

**5.**

Which of the following are contraindications for attempting endotracheal intubation?

Select the three correct answer options.

**Intact gag reflex**

**Inability to open the patient's mouth**

**Inability to see the glottic opening**

Traumatic brain injury

Respiratory compromise

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*General contraindications for attempting endotracheal intubation include an intact gag reflex, the inability to open the patient's mouth because of trauma or pathological condition, the inability to see the glottic opening, or substances such as blood or vomit in the airway.*

*Traumatic brain injury often results in airway and respiratory compromise and is an indication of endotracheal intubation.*

**6.**

An adult asthma patient is experiencing severe respiratory distress with laryngospasm, making orotracheal intubation impossible. What is the most appropriate immediate action to manage this patient's airway?

**Initiate bag-valve-mask (BVM) ventilation with positive pressure**

Attempt nasotracheal intubation

Administer nebulized bronchodilators

Perform immediate cricothyrotomy

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*Correct answer: Initiate bag-valve-mask (BVM) ventilation with positive pressure*

*In a patient with laryngospasm and severe respiratory distress, initiating bag-valve-mask (BVM) ventilation with positive pressure is the most appropriate immediate action. Positive pressure ventilation can help force air past the obstruction caused by laryngospasm, potentially relieving the spasm and providing critical oxygenation. BVM ventilation is non-invasive and can be rapidly applied in an emergency setting.*

*Attempting nasotracheal intubation is contraindicated because laryngospasm involves closure of the vocal cords, making this approach highly unlikely to succeed and potentially exacerbating the situation.*

*Administering nebulized bronchodilators may be useful in treating asthma, but it is not the most immediate action needed for airway management when laryngospasm is present. Airway patency must be addressed first.*

*Cricothyrotomy is an invasive procedure typically reserved for situations where all other less invasive airway management techniques have failed. Since BVM ventilation is a viable option, cricothyrotomy is not the first-line intervention in this scenario.*

**7.**

Your patient is suffering cardiac arrest with adequate CPR and ACLS interventions initiated, including intubation by your crew. Once capnography is introduced to monitor the effectiveness of the resuscitation effort, what can the paramedic expect to see on the monitor if the patient has a return of spontaneous circulation (ROSC)?

**A waveform that suddenly rises from around 10–20 mmHg with high-quality CPR to above 40 mmHg**

A waveform that gradually decreases from 45 mmHg to less than 10 mmHg

A waveform that looks like a shark's fin and is above 45 mmHg

A sudden, complete loss of waveform from around 10 mmHg to 0 mmHg

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*Correct answer: A waveform that suddenly rises from around 10–20 mmHg with high-quality CPR to above 40 mmHg*

*Capnography can be used to monitor the effectiveness of cardiopulmonary resuscitation and ventilation delivered to intubated patients during the arrest. If adequate cardiopulmonary circulation is being properly provided by the rescuers, a waveform of above 10 mmHg is the goal. If the waveform suddenly surges within one waveform from 10 mmHg to well above 40 mmHg, it is most likely the patient has a Return Of Spontaneous Circulation (ROSC). CPR should be stopped, and the patient assessed for a pulse.*

*A waveform that gradually decreases from 45 mmHg is most likely on a ventilator. If the waveform gradually decreases in intensity until it is under 10 mmHg, it is most likely caused by an ET tube cuff problem or tube obstruction. This is not a finding indicative of patients with ROSC.*

*Waveforms that appear as if they are shark fins are most likely caused by bronchospasm, not ROSC.*

*A sudden, complete loss of waveform during continued adequate chest compressions and ventilations is most likely caused by a disconnected or kinked ET tube.*

**8.**

Your fifty-year-old COPD patient presents with a productive cough, pleuritic chest pain, and a fever with chills. Which of the following should you suspect due to the patient's signs, symptoms, and history?

**Bacterial pneumonia**

COPD exacerbation

Congestive heart failure

Chronic bronchitis

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*Correct answer: Bacterial pneumonia*

*Pneumonia can be classified as viral, bacterial, mycoplasmal, or aspiration. Bacterial pneumonia normally manifests with the classic signs and symptoms of a productive cough, pleuritic chest pain, and a fever with chills. Bacterial pneumonia is often referred to as typical pneumonia.*

*The classic signs associated with a COPD exacerbation include a cough and chest tightness. The patient may even have a productive cough and wheezing; however, the fever with chills is a tell-tale sign of an infectious disease such as pneumonia.*

*Patients with congestive heart failure will likely present with a cough, orthopnea, and nocturnal dyspnea. However, there is no fever associated with congestive heart failure.*

*Patients with chronic bronchitis present with a productive cough but not with fever and chills.*

**9.**

You are evaluating a 20-year-old male patient experiencing respiratory problems. You apply an End-Line CO2-equipped nasal cannula to the patient and attach it to your monitor. You notice a shark-fin-shaped graph on the capnography and the patient's EtCO2 at 45 mmHg.

What is this most likely indicative of?

**The patient is experiencing asthma exacerbation and needs to be treated accordingly**

The patient is hyperventilating due to the distress and should be coached to breathe slower

The patient is experiencing a foreign body airway obstruction in the upper airway and cannot breathe adequately

The patient is experiencing diabetic ketoacidosis (DKA) and needs to be treated accordingly

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*Correct answer: The patient is experiencing asthma exacerbation and needs to be treated accordingly*

*A capnography wave that shows a consistent shark-fin appearance is indicative that the patient is having constriction in the lower airways, as air is not passing through them consistently. While the CO2 measurement of 45 mmHg is on the high side of normal (normal is 35–45 mmHg), this shows that the patient is unable to expel CO2 as effectively, which helps hold up the hypothesis of asthma (other possibilities include COPD and possibly pneumonia, depending on the patient).*

*If the patient is hyperventilating, this would most likely cause low CO2 measurement, as the patient is breathing too fast to properly retain CO2. Also, generally with just hyperventilation, the graph will have a normal box-like appearance.*

*While an airway obstruction may cause a higher CO2 reading that is normal due to inadequate ventilation, it would still likely retain a box-like appearance because the air in the patient's respiratory system would all be moving at the same time, just slower than normal. This is opposed to asthma, wherein the bronchioles are having a harder time moving air, and the upper airway is unobstructed.*

*Diabetic KetoAcidosis (DKA) results in the patient experiencing Kussmaul respirations, which are faster than normal in an attempt to blow off the excess acid in*

*the patient's body. This could result in a possibly lower CO2 measurement, but at the very least, the capnography would not show shark fins.*

**10.**

You are on-scene with a six-year-old who is unconscious and unable to protect his own airway. He is of average height, and his estimated weight is 23 kg. Which of the following endotracheal tube sizes would be most appropriate for this patient?

**5.5-millimeter uncuffed endotracheal tube**

5-millimeter cuffed endotracheal tube

7-millimeter cuffed endotracheal tube

4-millimeter uncuffed endotracheal tube

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*Correct answer: 5.5-millimeter uncuffed endotracheal tube*

*The EndoTracheal Tube (ETT) size formula, (age/4) + 3.5 is used for cuffed ETT, or the formula (16+age)/4 or (age/4) + 4 to calculate the uncuffed pediatric ETT size.*

*The appropriate size endotracheal tube for a 23-kg, six-year-old child would be a 5- to 5.5-mm internal diameter tube. However, since the child is six, he has a natural narrowing around the cricoid cartilage and does not require the use of a ballooned or cuffed endotracheal tube. A cuffed endotracheal tube may not correctly seal this patient's airway due to the narrowing or cause mucosal injury. Uncuffed ETT should be used in patients under 8 years of age.*

*A 5-mm cuffed ET tube would more appropriate for a very small adult or child who is over the age of eight. At eight years old, the natural narrowing of the cricoid cartilage expands to normal dimensions. Cuffed tubes should be used on all patients over age eight.*

*A 7-mm cuffed ET tube would be used on an average weight and height adult patient. It would not be appropriate for use on a 23-kg, six-year-old child.*

*A 4-mm uncuffed ET tube would be appropriate for use on a 10- or 11-kg toddler, not a six-year-old, 23-kg child.*

**11.**

You have an intubated patient who is unconscious but has a pulse of 90 and a BP of 120/80. You have capnography in-line with your ET tube, and you have a CO2 reading of 30 mmHg. What should you do because of this reading?

**Check your ventilation rate; you may need to slow it down**

Increase your ventilation rate

Increase the FiO2

Administer albuterol through an in-line nebulizer

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*Correct answer: Check your ventilation rate; you may need to slow it down*

*The normal reading for end-tidal CO2 is 35-45 mmHg. A reading of 30 is indicative that there is less than normal CO2 retention by the respiratory system. Especially in a mechanically ventilated patient, it is likely that their respiratory rate is too fast, which is corrected by slowing down respirations. A good number to shoot for is one breath every six seconds, or 10 breaths per minute.*

*Increasing the Fi02 would not affect the ETC02 levels, so it would not be appropriate.*

*As stated above, the issue is that the patient is being ventilated too rapidly, so the ventilation rate should be slowed down instead of sped up. While a low EtCO2 number can be indicative of patient deterioration and insufficient blood flow for proper gas exchange, the reading for this patient is only marginally lower than normal and does not mean that the patient's heart will soon stop.*

*With a patient requiring albuterol, the reading would generally be elevated above normal to reduce ventilation ability because of bronchial constriction.*

## 12.

Which of the following illnesses result from infection and will most likely cause respiratory distress in pediatric patients?

Select the three correct answer options.

**RSV**

**Croup**

**Epiglottitis**

Asthma

*Croup is a viral infection of the upper airway. Epiglottitis is swelling of the epiglottis that results from an upper respiratory infection. RSV (respiratory syncytial virus) is a common respiratory viral infection. All these are likely to cause respiratory distress in pediatric patients.*

*Asthma is a reactive airway disease and is not caused by an infection. It will also likely cause respiratory distress in pediatric patients.*

**13.**

You are on-scene with a 15-year-old male patient with difficulty breathing and possible airway burns from an accidental ingestion of a caustic material. As his spontaneous respirations and level of consciousness continue to decrease, you quickly note he still has an intact gag reflex.

Fearing he may not be able to control his own airway, which airway control device would be most appropriate for use with this patient?

**Nasopharyngeal airway (NPA)**

King LTD airway

Esophageal-Tracheal airway (Combitube)

Oropharyngeal airway (OPA)

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*Correct answer: Nasopharyngeal airway (NPA)*

*NasoPharyngeal Airways (NPAs) are used to maintain an open airway in unconscious patients or in patients who may have an altered level of consciousness to the point of not being able to appropriately control their own airway. It is an appropriate temporary airway device for use in patients who may have acquired airway burns with or without caustic substances. In the event of airway burns, the patient's airway may swell shut unexpectedly. Many of the advanced airway techniques and devices are not intended for use on patients who may have airway burns associated with caustic material. In this case, a temporary airway is better than no airway, and a nasal airway is the best choice.*

*A King LTD and an esophageal-Tracheal airway (Combitube) are airway devices indicated for use on patients who would benefit from tracheal intubation, but either it is not possible or the patient is conscious/semi-conscious without an active gag reflex. They are also contraindicated in patients who may have caustic airway burns.*

*An OroPharyngeal Airway (OPA) is used to keep the airway out of the posterior airway. It is contraindicated in patients with active gag reflex or possible airway burns. Therefore, the best option for this patient is to insert an NPA.*

**14.**

Your adult patient was involved in an accident with a truck hauling organophosphate chemicals. If the patient was exposed to a potentially toxic amount of inhaled organophosphates, which of the following is most likely to occur?

**Respiratory and heart rate decrease due to cholinergic stimulation**

Respiratory and heart rate increase due to anticholinergic stimulation

Decrease in level of consciousness and pulmonary edema due to fluid shift

A decrease in lacrimation, sweating, urination and inability to focus on objects in field of vision

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*Correct answer: Respiratory and heart rate decrease due to cholinergic stimulation*

*Organophosphate agents and some nerve agents inhibit the effects of acetylcholinesterase, which causes a cholinergic overdrive or crisis to occur. This disrupts normal nerve transmissions in the central and peripheral nervous system and causes a decrease in heart rate and blood pressure and an increase in tear production and excessive saliva as well as other signs and symptoms.*

*The cholinergic overstimulation caused by organophosphate poisoning causes a decrease in heart rate and respiratory rate, not an increase.*

*A decrease in level of consciousness is possible with low to moderate exposure; however, the patient is not likely to present with pulmonary edema initially.*

*Patients exposed to organophosphate agents are likely to experience excessive tear production, saliva, and sweating and increased urination, not a decrease in fluids. They do not often present with visual disturbances other than excessive watery eyes.*

**15.**

Which of the following are correct steps in placing an orogastric tube in an unresponsive patient that has been intubated?

Select the 3 answer options which are correct.

**Position the head in a slightly flexed position**

**Lubricate the tube with water-soluble gel**

**Measure from mouth to ear to xiphoid process**

Position the head in a chin down position

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*The steps for placing an orogastric tube in an unresponsive patient are as follows:*

1. *Position the head in a slightly flexed position*
2. *Measure from mouth to ear to xiphoid process*
3. *Lubricate the tube with water-soluble gel and introduce the tube at the midline; advance it gently into the oropharynx, continuing into the stomach*
4. *Confirm placement*
5. *Apply suction to the tube*
6. *Secure the tube in place*

*The chin down position may be helpful in placing the nasogastric tube, not an orogastric tube, in a conscious patient.*

**16.**

You are on scene with a patient in respiratory arrest. After intubating the patient using the endotracheal route, you note the presence of adequate breath sounds on the right side, but you auscultate decreased breath sounds on the left side of the patient's chest.

What should you do at this point in the intervention?

**Deflate the cuff, pull the ET tube back 2-3 cm, re-inflate the cuff, and reassess breath sounds for presence and quality**

Deflate the cuff, pull the ET tube out completely, assess the tube for defects, and reattempt visualized intubation with a new tube if needed

Deflate the cuff, advance the ET tube 1-2 cm, reinflate the cuff, and reassess breath sounds for presence and quality

Inflate the cuff with another 10 mL of air to ensure the cuff does not allow the air to leak around the tube and trachea, reassess breath sounds

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*Correct answer: Deflate the cuff, pull the ET tube back 2-3 cm, re-inflate the cuff, and reassess breath sounds for presence and quality*

*If breath sounds are decreased in the left lung compared to the right lung after intubating the patient, it is more than likely caused by the ET tube being advanced too far. This normally causes the tube to end up in the right mainstem bronchus due to its natural slope. The best intervention is to deflate the cuff, pull the ET tube back 2-3 cm, re-inflate the cuff, and reassess breath sounds for presence and quality. If the breath sounds are clear and equal, continue confirmation techniques before securing the tube and beginning ventilations.*

*It would not be appropriate to deflate the cuff and pull the ET tube out completely if there were breath sounds present in the right lung, and you witnessed the tube passing the vocal cords when it was inserted initially. The presence of right lung sounds indicates the tube is in the right place; it has just been advanced a little too far.*

*Never deflate the cuff on an ET tube and advance it further into the lung when right lung sounds are present, but left lung breath sounds are diminished. The unequal breath sounds are likely caused by the tube being advanced too far in the first place.*

*It is never appropriate to add more than 10 mL of air to the cuff of an adult ET tube. It could cause the cuff to rupture and become ineffective as a seal, or it could cause*

*tissue necrosis around the site of the balloon cuff.*

**17.**

What is the best airway adjunct to quickly establish a clear means of air entry for a spontaneously breathing patient who has an intact gag reflex?

**A nasopharyngeal airway (NPA)**

An oropharyngeal airway (OPA)

A laryngeal mask airway (LMA)

An esophageal-tracheal Combitube

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*Correct answer: A nasopharyngeal airway (NPA)*

*A NasoPharyngeal Airway (NPA) is the least invasive airway adjunct. It does not truly help maintain or establish an open airway, but it does keep a clear passage for air to the hypopharynx. It is useful in conscious or unconscious patients with an intact gag reflex. It is also useful if the patient will possibly require a nasogastric tube inserted. An NPA is the only airway adjunct that does not irritate a patient's gag reflex if it is still intact regardless of whether the patient is conscious.*

*OroPharyngeal Airways (OPA) are useful in unconscious patients or patients in cardiac arrest to help keep the patient's tongue out of the hypopharynx. However, they are not indicated for conscious patients because most conscious patients will have an active gag reflex.*

*For an Laryngeal Mask Airway (LMA) to be indicated, the patient must be unresponsive without an active gag reflex. It is often indicated when intubation is needed, but access to the patient or a possible spinal cord injury prevents successful intubation. LMAs are considered supra-glottic airways.*

*A Combitube is often used for patients who require ventilatory assistance and airway control. It has two tubes that enter both the esophagus and trachea. Combitube is indicated when intubation is needed but difficult or impossible. However, like most advanced airway control devices, the patient must be unconscious/unresponsive with an absent gag reflex.*

**18.**

Which of the following airway procedures are contraindicated for use when a patient has a potential basilar skull fracture?

**Nasotracheal intubation**

Orotracheal intubation

Laryngeal mask airway (LMA)

Optical intubation

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*Correct answer: Nasotracheal intubation*

*Nasotracheal intubation is contraindicated in patients who are apneic, who have midface or nasal fractures, or who are suspected of having a basilar skull fracture. The fracture may allow the tip to enter the cranial vault.*

*Orotracheal intubation is the approved route of intubation when patients with suspected basilar skull fracture need definitive airway control. Caution should be used and ventilation kept at a slow, even rate. Hyperventilating the patient can worsen the cerebral edema while hyperoxygenation can reduce edema.*

*A  Laryngeal Mask Airway (LMA) is approved for advanced airway control when orotracheal intubation cannot be accomplished after two attempts. It is safe to use on patients who have potential head injuries when proper stabilization is provided.*

*Optical intubation is the premier method of intubation. It uses video and cameras to optimize visualization of the cords and tube passing through them. It is safe for the orotracheal intubation of basilar skull fracture patients, but its use in the pre-hospital setting is still very rare.*

**19.**

What is the best way to increase a conscious and alert, dyspneic patient's lung volume and improve her vital capacity while reducing the venous return to the heart and her overall work of breathing?

**Place the patient in the sitting position with her legs dependent and apply oxygen**

Assist ventilations using a bag-valve-mask and supplemental oxygen

Place the patient supine with the head and foot of the stretcher elevated 10 degrees while applying oxygen

Administer a nebulized albuterol treatment with supplemental oxygen

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*Correct answer: Place the patient in the sitting position with her legs dependent and apply oxygen*

*A dyspneic patient is suffering from air hunger and is in need of supplemental oxygen as well as a better lung environment for gaseous exchange. The best way to accomplish this in a conscious and alert patient is to sit the patient up and have her legs hanging dependently, which will improve her overall lung volume and capacity while diminishing the work of breathing and venous return to the heart.*

*It will not improve the patient's lung volume or capacity if a paramedic attempts to ventilate a conscious and alert patient. This would also not be helpful in reducing venous return or reducing the work of breathing because the patient is likely to fight the bag-valve-ventilation attempt.*

*It is not an acceptable patient positioning technique to raise the head of the stretcher and the foot of the stretcher ten degrees. An EMS professional should either raise one or the other, never both ends of the stretcher. In this case, neither the head nor the foot elevated would help improve lung and vital capacity or reduce venous return.*

*A nebulized albuterol treatment may be effective in improving the quality of a patient's spontaneous respirations by inducing bronchodilation to the constricted air passages, but it does not affect the lung volume and capacity as well as venous return to the heart.*

**20.**

You are assessing a 70-year-old patient for mild shortness of breath. She is breathing 28 times per minute with an SpO2 of 90% on room air. What can you expect the patient's partial pressure of oxygen (PO2) to do at this point?

**Decrease to 60 mmHg**

Increase to 80 mmHg

Increase to 40 mmHg

Decrease to 27 mmHg

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*Correct answer: Decrease to 60 mmHg*

*As a dyspneic patient's blood oxygen saturation (SpO2) drops to 90%, the paramedic can expect the patient's partial pressure of oxygen at the cellular level to decrease from normal to 60 mmHg.*

*As a dyspneic patient's blood oxygen saturation decreases to 90%, the partial pressure of oxygen also decreases. Therefore, it is not acceptable to assume that if the SpO2 decreases the PO2 will increase. As O2 saturation decreases to 90%, the patient remains well-ventilated and perfusion continues adequately. However, it is not appropriate to assume the patient's partial pressure of oxygen will rise to a level that is considered extremely low.*

*If the partial pressure of oxygen dropped to 27 mmHg, the oxygen saturation is reduced to 50%, not 90%.*

**21.**

A diabetic patient experiencing diabetic ketoacidosis presents with Kussmaul respirations. What is the body's purpose for initiating this type of spontaneous breathing pattern?

**Kussmaul respirations are initiated by the body in an attempt to blow off high levels of carbon dioxide that have accumulated**

Kussmaul respirations are initiated by the body in an attempt to increase the amount of available oxygen for the tissues of the periphery

Kussmaul respirations are caused by the overstimulation of the sympathetic nervous system during diabetic ketoacidosis; it does not have a purpose

Kussmaul respirations are the body's way of attempting to correct respiratory acidosis

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*Correct answer: Kussmaul respirations are initiated by the body in an attempt to blow off high levels of carbon dioxide that have accumulated*

*Patients experiencing diabetic ketoacidosis are likely to present with deep and labored respirations called Kussmaul respirations. This breathing pattern is created by the body in an attempt to blow off dangerous amounts of carbon dioxide that has accumulated in the respiratory system due to the depletion of blood glucose (hypoglycemia).*

*Kussmaul respirations are not the body's way to increase the amount of available oxygen for the tissues of the periphery. Low oxygen levels initiate an increase in the rate and depth of regular respirations in this event.*

*Overstimulation of the sympathetic nervous system does not cause Kussmaul respirations. A stimulated sympathetic nervous system would likely increase the rate of respiration rather than cause a labored, irregular respiratory pattern of varying rate and depth.*

*Kussmaul respirations are not the body's way of correcting respiratory acidosis, which would be caused by a low respiratory rate.*

## 22.

You have an adult patient with respiratory insufficiency whose respirations are shallow and irregular at six times per minute. Their SpO2 is 76%, and you anticipate carbon dioxide retention due to the decreased respiratory effort. Which of the following should you suspect?

**Respiratory acidosis**

Respiratory alkalosis

Metabolic alkalosis

Metabolic acidosis

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*Correct answer: Respiratory acidosis*

*Respiratory acidosis is caused by the direct retention of carbon dioxide and the subsequent increase in partial pressure of carbon dioxide. Ineffective respirations are the most common cause of respiratory acidosis.*

*Respiratory alkalosis is caused by an increased respiratory or ventilatory rate. This causes a direct decrease in the available $CO_2$. Hyperventilation syndrome and overaggressive BVM ventilation are the most common causes of respiratory alkalosis in the prehospital setting.*

*Metabolic alkalosis is a rare condition that results from a direct loss of hydrogen ions. This is most often caused by excessive nausea/vomiting and diarrhea and is not associated with ineffective respiration.*

*Metabolic acidosis is caused by an increase in acids or a decrease in base and is not caused by ineffective respiratory effort.*

**23.**

Which of the following are internal factors that can affect respiration?

Select the 2 answer options which are correct.

**Pneumonia**

**Heart failure**

Carbon monoxide (CO) poisoning

High altitudes

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*Gas exchange in the lungs and tissues is known as respiration. Factors that affect respiration can be categorized as internal or external. Pneumonia causes the alveoli to become saturated with fluid and debris, reducing the surface that is available for gas exchange. It is considered an internal factor. Heart failure causes a backup of fluid in the lung, leading to alveolar collapse. This reduces the area for gas exchange and is considered an internal factor.*

*Carbon monoxide (CO) is a colorless, odorless, tasteless gas that is caused by incomplete combustion. It has a higher affinity for hemoglobin than oxygen and blocks oxygen binding. This interferes with gas exchange and causes hypoxia. CO is not produced in the body and must be inhaled, so it is considered an external factor.*

*At high altitudes, the percentage of oxygen remains the same, but the total atmospheric pressure decreases. This can significantly increase the work of breathing and reduce gas exchange. It is an external factor.*

**24.**

After intubating your adult patient, you quickly auscultate decreased breath sounds on the left side and breath sounds on the right are clear. Which of the following is most likely to cause this to occur?

**A right mainstem intubation**

A left mainstem intubation

Tip of the tube against the carina

The patient is elderly and likely suffered a pneumothorax during the event

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*Correct answer: A right mainstem intubation*

*When an endotracheal tube is advanced too far into the trachea, it will most likely end up in the right mainstem bronchus in adults. This is because of the natural slope involved in the branching of the two main bronchi. This becomes evident when initial breath sounds reveal unequal breath sounds and expansion. The patient can be expected to have decreased breath sounds on the left side of the chest due to the blocking of air entering the lung by the ET tube itself. The patient will have right-sided breath sounds with adequate expansion due to the tube directly ventilating the right lung only.*

*The tip of endotracheal tubes does not normally end up in the left mainstem bronchus when the tube is initially advanced too far during intubation, but it is possible. The key finding in the event of a left mainstem bronchus intubation is decreased breath sounds on the right side and adequate breath sounds with normal or hyper-expansion on the left side of the chest.*

*If the tip of the tube is advanced to the point of lying against the carina of the lungs, the patient would most likely present with equal but diminished breath sounds. The key finding is a patient that is hard to bag after intubation with a tube that may be advanced past the 23-cm mark.*

*It is not appropriate to initially assume that your newly-intubated patient suffered a pneumothorax during the intubation. Training tells us to confirm the proper placement of an ET tube after intubation as well as any time the patient is moved. Diminished breath sounds should quickly point the paramedic to the probability of a mainstem intubation.*

**25.**

Which of the following are contraindications for using a supraglottic airway such as a King LT or LMA?

Select the three correct answer choices.

- **The patient has a gag reflex**
- **The patient has known esophageal disease**
- **The patient has ingested a caustic substance**
- Intubation attempts have failed
- The patient is apneic

---

*Having an intact gag reflex or known esophageal disease are contraindications for all supraglottic airway devices. Ingestion of caustic substances is also a known contraindication of King Airways.*

*An apneic patient or failed intubation are indications for using a supraglottic device such as a King LT (laryngeal tube) or LMA (laryngeal mask airway).*

**26.**

You are preparing to initiate rapid sequence intubation on a pediatric patient who is exhibiting a borderline hypotensive state. Which medication would be indicated as the first paralytic given, following sedation of the patient for the procedure?

**Succinylcholine**

Ketamine

Lidocaine

Atropine

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*Correct answer: Succinylcholine*

*Succinylcholine is a powerful paralytic usually administered as the first medication following sedation to paralyze the conscious patient's airway and gag reflex to make intubating the patient possible without a laryngeal spasm.*

*Ketamine is a sedative often used to sedate patients who are about to be intubated. It is often the medication of choice when the patient's blood pressure may be lower than normal, as it achieves sedation without lowering the blood pressure.*

*Lidocaine is not a paralytic agent; it is given during rapid sequence intubation to help prevent an increase in intracranial pressure.*

*Atropine is not a paralytic but is administered in some cases before the administration of a paralytic or neuromuscular blocking agent to prevent bradycardia.*

**27.**

All the following are indications that artificial ventilation is adequate except:

**$ETCO_2$ levels are above 45 cm/$H_2O$**

The pulse returns to a normal rate

Adequate chest rise and fall

SpO2 rises from 88% to 94%

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*Correct answer: $ETCO_2$ levels are above 45 cm/$H_2O$*

*$ETCO_2$ levels can be an indicator of adequate ventilations. Normal $ETCO_2$ levels are 35–45 cm/H20, so a level above 45 would most likely indicate that ventilations are not adequate.*

*Artificial ventilations are indicated for a patient with insufficient breathing. Using a bag-valve mask is the most effective way to deliver artifical ventilations. Indications that ventilations are effective include adequate chest rise and fall, oxygen saturation level increases, and the pulse returning to a normal rate. Another indication would be if lung sounds can be auscultated during ventilations.*

**28.**

Which of the following would not increase the $FiO_2$ level on a non-breathing, ventilated patient?

Select the 3 answer options which are correct.

**Increase the rate of ventilation**

**Decrease expiratory time**

**Decrease respiratory rate**

Increase oxygen flow rate

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*Changing the ventilation rate, inspiratory time, or expiratory time will not affect the $FiO_2$.*

*$FiO_2$ levels stands for Fraction of Inspired Oxygen. The most effective way to increase the amount of oxygen inspired is to increase the oxygen flow rate on a ventilator. If you need to increase oxygen saturation on a ventilated patient, increasing the $FiO_2$ may be necessary.*

**29.**

Which of the following medical conditions or injuries is most likely to cause problems with both the internal and external processes of normal respiration?

**Emphysema**

Congestive heart failure

Lung cancer

Chronic hypertension

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*Correct answer: Emphysema*

*Emphysema is an obstructive airway disease that progresses over years. Patients with emphysema have problems with getting inspired air into their lungs due to decreased lung compliance (external respiration) and problems with the oxygen/carbon dioxide exchange at the tissue level. This interferes with internal respiration or gaseous exchange (internal respiration).*

*Patients with congestive heart failure have problems exchanging oxygen/carbon dioxide at the tissue level (internal respiration) due to the presence of pulmonary edema and fluid shift. However, they do not have problems with the actual process of breathing (external respiration).*

*Patients with lung cancer have diffusion problems in the lungs making the normal exchange of oxygen and carbon dioxide impossible at the cellular/tissue level (internal respiration). Lung CA patients without COPD (emphysema, asthma, chronic bronchitis), do not have problems with the actual inspiratory/expiratory phase of respiration (internal respiration).*

*Patients with chronic hypertension may have problems with proper oxygen/carbon dioxide exchange at the cellular/tissue level (internal respiration) due to the high pressure involved. However, chronic hypertension patients without COPD do not have problems with the actual act of breathing (external respiration).*

**30.**

Which of the following oxygen delivery devices and the concentration of oxygen provided by that device are listed accurately?

Select the 3 answer options which are correct.

**Nasal cannula 24%–44%**

**Non-rebreather 80%–90%**

**Bag valve with oxygen reservoir 90%–100%**

Venturi mask 100%

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*Oxygen concentrations may vary based on the flow rate selected. The higher the flow rate, the greater the $O_2$ concentration delivered. Generally, a nasal cannula delivers 24-44% $O_2$. A non-rebreather delivers up to 90% $O_2$. A bag valve mask with oxygen reservoir can deliver nearly 100% $O_2$.*

*Depending on the adapter used, a venturi mask can deliver 24, 28, 35, or 40% O2. However, no adapter allows a venturi mask to deliver 100% $O_2$.*

**31.**

You are intubating a 26-year-old who is apneic. Once the endotracheal tube passes through the vocal cords, how much farther should the endotracheal tube be advanced before inflating the cuff and confirming proper placement?

**1-2.5 cm (0.5 to 1 inch)**

2.5-6.4 cm (1 to 2.5 inches)

3 cm

Less than 1 cm

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*Correct answer: 1-2.5 cm (0.5 to 1 inch)*

*After viewing the tip of the endotracheal tube passing through the vocal cords, the tube itself should be carefully advanced another 1 to 2.5 cm or 0.5 to 1 inch. This places the tip of the tube about halfway between the cords and the carina. This positioning allows for a little more movement without dislodging the tube.*

*1 to 1.25 inches or 2 to 3 centimeters would most likely place the tip of the tube either against the carina or in the right mainstem bronchus. This is evident by decreased breath sounds with difficulty ventilating or left-sided diminished breath sounds.*

*Advancing the tube only 1 cm past the cords would not be acceptable. This would place the intubation and ventilation at risk.*

**32.**

You are assessing a 22-year-old patient with difficulty breathing. She has itching, urticaria, and hives after a bee sting. During the possible allergic reaction, what is occurring at the cellular level?

**The mast cells have degranulated, releasing serotonin and histamines into the general circulation**

The mast cells are retaining the vasoactive amines, resulting in a localized response to the sting

The cells begin a hypermetabolic state associated with the patient's increased activity level after the sting

An anaerobic metabolism has begun at the local level and is now moving into the vasculature

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*Correct answer: The mast cells have degranulated, releasing serotonin and histamines into the general circulation*

*When the tissue is injured, as in a sting from a bee or hornet, the mast cells discharge their granules (degranulation) as part of the inflammatory response. This response results in a hypersensitivity reaction (commonly referred to as an allergic reaction).*

*During an allergic reaction, the mast cells are not responsible for retaining the vasoactive amines resulting in an allergic reaction. It causes a histamine/serotonin release.*

*The increased activity of the sympathetic nervous system is not associated with the release of histamine and serotonin at the cellular level in response to the antigen.*

*Anaerobic metabolism is not a factor in the initial stages of an allergic reaction. The cells are responding to the release of histamine and serotonin.*

**33.**

Which of the following effectively measures the amount of carbon dioxide in a patient's exhaled air?

**EtCO2**

CPAP

PEEP

BiPAP

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*Correct answer: EtCO2*

*Capnography, known as EtCO2 or PetCO2, measures carbon dioxide concentrations in a patient's exhaled air. It is often used as a secondary means of endotracheal tube placement confirmation.*

*Continuous Positive Airway Pressure (CPAP) is an adjunct to airway support that transmits positive pressure into the lower airways of spontaneously breathing patients throughout the respiratory cycle. It does not measure carbon dioxide levels in the exhaled air.*

*PEEP is Positive End-Expiratory Pressure. It is an airway support adjunct that maintains a degree of positive pressure at the end of exhalation, not throughout the respiratory cycle like with CPAP.*

*BiPAP is Biphasic Positive Airway Pressure. It is an airway support adjunct that combines partial ventilatory support and continuous positive airway pressure; it allows the pressure to vary during each breath cycle.*

**34.**

Which of the following are signs of respiratory distress in the pediatric patient?

Select the 3 answer options which are correct.

**Nasal flaring**

**Retractions**

**Inspiratory stridor**

Jugular vein distention

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*Signs of pediatric respiratory distress include:*

- *Nasal flaring*
- *Retractions*
- *Inspiratory stridor*
- *Irritability*
- *Tachypnea*
- *Grunting*
- *Abdominal breathing*

*Jugular vein distention is a sign of pediatric heart failure, not respiratory distress.*

**35.**

While assisting a full-term pregnant female in delivering her newborn, at what point should the paramedic consider suctioning the infant's nose and mouth?

**When the newborn's head is delivered**

Only if there is meconium staining on the newborn's head once it delivers

The newborn's nose and mouth should only be suctioned after the entire delivery is complete

After the newborn has been dried and stimulated

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*Correct answer: When the newborn's head is delivered*

*It is recommended that the nose/mouth be suctioned as soon as the head delivers. Suctioning should occur with a bulb syringe. The mouth should be suctioned first and then the nose.*

*It is no longer acceptable to suction the nose/mouth of a newborn before the entire body delivers in cases of newborns with meconium staining on the head and face. It may be appropriate if the staining is accompanied by obvious obstruction or compromise. It is, however, acceptable to suction the nose/mouth of a newborn once the head delivers in cases of obvious obstruction or the need for mechanical ventilatory support.*

*It is not recommended to wait until after drying and stimulation occurs before suctioning the mouth.*

**36.**

Your adult apneic patient is becoming increasingly difficult to ventilate using a bag-valve mask due to changes in thoracic and inspiratory pressures. What are these changes known as?

**Decreased compliance**

Fick principle

Atelectasis

Bohr effect

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*Correct answer: Decreased compliance*

*Compliance is the ease with which the lungs and thorax expand during pressure changes. The greater the compliance, the easier the lung expansion. One example is when an apneic patient is being ventilated using a bag-valve mask (regardless if the patient is intubated or not), and it becomes increasingly difficult to ventilate the patient. It indicates a higher than normal intrathoracic pressure, making it more difficult to ventilate the patient or a decrease in compliance.*

*The Fick principle does not refer to intrathoracic pressures. It deals with the assumption that the amount of oxygen delivered to a cell is the amount of oxygen that the cell will use, each and every time.*

*Atelectasis is an abnormal condition characterized by the collapse of lung tissue preventing the proper exchange of respiratory gases. It does not refer to the ease at which the lungs expand.*

*The Bohr effect describes the property of hemoglobin in relation to oxygen and carbon dioxide. It does not refer to the effects of pressure on the normal expansion of the lungs.*

**37.**

When using a laryngeal mask airway (LMA), how does the paramedic know when the device is successfully inserted?

**When the cuff is inflated, the LMA will move slightly upward approximately 0.5–0.75 inch**

When the tube cannot be advanced any farther

When the 21-centimeter mark on the tube is located at the patient's chin

When you visualize the tube passing the vocal cords

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*Correct answer: When the cuff is inflated, the LMA will move slightly upward approximately 0.5–0.75 inch*

*When the tube has been successfully inserted, the black line marked on the Laryngeal Mask Airway (LMA) rests midline between the patient's upper and lower lips. When the cuff is inflated, the LMA will move slightly upward approximately 0.5–0.75 inch. This is the best indicator, other than assessing lung sounds, that it is inserted correctly.*

*It is not appropriate to advance an LMA until it cannot be advanced any further. This would put the tube too deep and likely cause irritation at the glottic opening and an ineffective airway.*

*There are no centimeter markings located on an LMA. Also, 21 cm would place the tube tip well below the glottic opening. In the adult patient, it is located 19–21 cm deep.*

*An LMA is not advanced through the vocal cords; only an endotracheal tube passes the cords.*

**38.**

Which of the following are the results of hypoventilation?

Select the 3 answer options which are correct.

- **Hypercapnia**
- **Minute volume reduction**
- **Atelectasis**
- Respiratory alkalosis

---

*Hypercapnia is high carbon dioxide ($CO_2$) and results from ineffective removal of $CO_2$ from the body by the lungs. Hypoventilation is the most common cause. Minute volume is Respiratory Rate (RR) x the Tidal Volume (VT). Hypoventilation is a reduction in the respiratory rate and reduces minute volume. Atelectasis is the collapse of the alveoli. Loss of surfactant and hypoventilation are common causes of atelectasis.*

*Respiratory alkalosis is a raising of the body's pH caused by excessive loss of carbon dioxide from hyperventilation.*

**39.**

In rare cases, intubation will be required to manage the airway of a patient suffering from a severe asthma attack. Immediate intubation should always be initiated in asthma patients who are apneic and should be considered at other times.

Which of the following conditions should cause the paramedic to consider intubating an asthma patient?

**Patient's $PO_2$ is less than 50 mmHg**

Patient's $PCO_2$ is less than 50 mmHg

Patient is in known respiratory alkalosis

Patient does not respond to bronchodilator therapy and is conscious

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*Correct answer: Patient's $PO_2$ is less than 50 mmHg*

*The paramedic should at least consider intubating an asthma patient who has a $PO_2$ level of less than 50 mmHg with supplemental oxygen therapy being administered. The low $PO_2$ with oxygen being applied is a sign of impending respiratory failure.*

*The paramedic should consider intubating asthma patients who have a $PCO_2$ of greater than 50 mmHg. A reading of less than 50 mmHg would be closer to the normal values and not indicate impending respiratory failure.*

*The paramedic should consider intubating an asthma patient who is known to have acidosis (not alkalosis) after oxygen therapy.*

*If a patient fails to respond to bronchodilators, it is not an indication that intubation should be considered. It would likely indicate a beta-agonist such as epinephrine be injected IM or SC.*

**40.**

You are called to assist a 23-year-old suffering a severe asthma attack. On arrival, the patient is extremely dyspneic with audible inspiratory and expiratory wheezing. His wife states his inhaler failed to prevent the escalation of today's asthma attack, so she called for help. His vital signs are R 33, HR 130 and regular, and BP 128/64. He is cyanotic around his nail beds and diaphoretic.

Which of the following medications, routes of administration, and dosage range would be most appropriate after epinephrine fails to relieve the severe bronchospasm?

**Albuterol via oxygen-powered nebulizer at 6 liters per minute with 5 mg of medication mixed in 6 mL of normal saline (5 mg/6 mL)**

Albuterol via oxygen-powered nebulizer at 3 liters per minute with 2.5 mg of medication mixed in 1 mL of normal saline (2.5 mg/1 mL)

Albuterol via a metered-dose inhaler, 1–2 inhalations will deliver 90–180 micrograms of medication to the patient every hour as needed

Albuterol via endotracheal route once patient is intubated at 2.5 mg of medication mixed in each mL of normal saline

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*Correct answer: Albuterol via oxygen-powered nebulizer at 6 liters per minute with 5 mg of medication mixed in 6 mL of normal saline (5 mg/6 mL)*

*Albuterol is a powerful bronchodilator that effectively reverses bronchoconstriction in cases of asthma and allergic reactions in the pre-hospital setting. An adult asthma patient who is prescribed Proventil or other asthma medications for the emergency treatment of bronchoconstriction may experience a prolonged or medication-resistant attack of bronchoconstriction that would require the repeated administration of epinephrine and a stronger-than-normal dose of albuterol to be given via nebulizer. The recommended dose of albuterol to be given via a nebulizer for a severe adult asthma attack is 5 mg of medication mixed in 6 milliliters of normal saline (0.9% NaCl). The medication is delivered using 6–8 liters of oxygen to help the medication reach the lower airways and air sacs (alveoli).*

*It would not be appropriate to administer an albuterol solution that contains 2.5 mg of albuterol and only 1 mL of normal saline, as the concentration of medication is too high. Also, attempting to create complete aerosolization of the medication and deliver it to the lower airways could not be accomplished using only 3 liters of oxygen. At least 4–6 and sometimes as high as 8 liters per minute of oxygen are needed to effectively create aerosolization and deliver medication to the lower airways where it is needed most.*

*Administering albuterol via a Metered-Dose-Inhaler (MDI) is not recommended for the emergency treatment of an asthma attack in the pre-hospital setting. However, if no other option is available, it is acceptable to administer four inhalations containing 90 micrograms of medication in each puff. This is better than no medication and can help reverse the bronchoconstriction associated with the attack. It would not be helpful, however, to administer only one or two puffs from the MDI every hour as needed. This would not deliver an adequate amount of medication to help reverse the bronchoconstriction.*

*It is not acceptable to administer albuterol via the endotracheal route in the pre-hospital setting in an attempt to reverse bronchoconstriction. It may be administered to an intubated patient via aerosolization and a nebulizer but not directly down the ET tube as is the case with some emergency medications. Remember, N.A.V.E.L (Narcan, Atropine, Valium, Epinephrine, Lidocaine).*

**41.**

You are on-scene with a bedridden stroke patient who developed a sudden onset of pleuritic chest pain that worsens when they attempt to take a breath. The patient's breath sounds are diminished in the lower lobes bilaterally, but the patient has equal expansion and a SpO2 of 84.

Which of the following conditions is most likely causing his presentation?

**Pulmonary embolism**

Spontaneous pneumothorax

Tension pneumothorax

Foreign body aspiration

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*Correct answer: Pulmonary embolism*

*Pulmonary Embolism (PE) is a blockage of the pulmonary arteries supplying blood to the lungs from a blood clot that originated elsewhere and traveled to the lungs. It causes sudden-onset chest pain and dyspnea. It can be minor or life-threatening, depending on the amount of lung tissue being deprived of blood from the embolus. PE is a common finding in patients who are bedridden after long immobility such as travel and/or recent lower leg injuries or surgeries. The diminished lung sounds are most likely normal due to the patient's bedridden status and inability to maximize alveolar recruitment due to positioning.*

*Patients with Spontaneous Pneumothorax (SP) are more likely to present with sudden-onset chest pain with dyspnea and unequal breath sounds due to the lung collapse. The breath sounds and chest wall expansion do not usually remain equal. SP is more likely to present in tall, thin, young adult men or patients with COPD.*

*A tension pneumothorax occurs after a pneumothorax allows air to escape the lung but becomes trapped in the chest cavity. As more air enters the chest, the pressure within the chest rises until it impedes normal heart function and shifts vital organs away from the affected side. It is evidenced by increased dyspnea, tracheal shift, and unequal breath sounds. It does present suddenly and allows equal chest wall expansion.*

*Patients with foreign body aspiration are more likely to present with a non-productive, muffled cough that may present with unequal expansion depending on the size of the*

*aspirated material. They do not typically present with sudden-onset pleuritic chest pain.*

**42.**

Which of the following are considered lower airway infections?

Select the 3 answer options which are correct.

- **RSV**
- **Bronchiolitis**
- **Pneumonia**
- Cystic fibrosis

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*Respiratory Syncytial Virus (RSV), bronchiolitis, and pneumonia are considered lower airway infections.*

*Cystic fibrosis is a disease that affects the lower airways and is caused by genetic factors, not an infection.*

**43.**

Which of the following medical conditions is most likely to cause enlarged airspace beyond the terminal bronchioles with collapse and destruction of the alveoli?

**Emphysema**

Asthma

Pneumonia

Bronchitis

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*Correct answer: Emphysema*

*COPD patients often breathe on hypoxic drive; other than this coincidence, the triad of breathing disorders that make up COPD are asthma, bronchitis, and emphysema. Emphysema is a condition characterized by the destruction of the alveoli due to dead space air and other factors. Emphysema causes abnormal enlargement of the air spaces beyond the terminal bronchioles with collapse and destruction of the alveoli.*

*Asthma is characterized by wheezing due to bronchospasm. The wheezing associated with asthma is caused by airflow through restricted airways. It does not cause an enlargement of the air spaces beyond the terminal bronchioles with collapse and destruction of the associated alveoli.*

*Pneumonia is caused by an infection that causes an acute inflammatory process of the bronchioles and alveoli. It does not cause airspace enlargement or destruction of the alveoli.*

*Bronchitis is characterized by inflammatory changes with excessive mucus production. It does not cause airspace enlargement with alveolar destruction.*

**44.**

You are on-scene with an elderly female; bystanders report she suddenly collapsed while walking through the mall. She is pulseless and apneic and showing pulseless electrical activity on the monitor. When attempting to ventilate and intubate the patient, it is apparent she has a laryngeal spasm, and the ventilations are not getting into her lungs.

At this point, what should you do to manage the patient's airway?

**Use a forcefully upward pull on the lower jaw while ventilating with a bag-valve mask**

Insert an oral airway and ventilate the patient using a bag-valve mask

Attempt cricoid pressure maneuver while forcefully ventilating with a bag-valve mask

Attempt nasal intubation

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*Correct answer: Use a forcefully upward pull on the lower jaw while ventilating with a bag-valve mask*

*A patient with laryngeal spasm is best managed initially by having a rescuer pull upward on the lower jaw while another rescuer attempts to ventilate the patient using forceful ventilations. The pulling upward on the jaw may not relieve the spasm but may allow an opening at the vocal cords adequate to get air in and out until intubation can be accomplished.*

*Inserting an oral airway will not help relieve laryngospasm; it might actually worsen it and can further irritate the area around the vocal cords where the spasm is located.*

*Sometimes, placing the tip of the ET tip against the vocal cords with slight pressure is enough to relieve the spasm just enough to insert the tube. However, it is not likely you will have the time to wait for this to work when there is no oxygen getting in at all; pulling the jaw upward and controlled forceful ventilation should be attempted first. Attempting to ventilate or intubate the patient through the nares will not help get air in or relieve the spasm at the vocal cords. Nasal intubation is not warranted when the patient has a laryngeal spasm.*

*Attempting a cricoid pressure maneuver will make the laryngeal spasm worse.*

**45.**

Which of the following would not be a common complication of sedating a patient prior to intubation?

Select the two answer options which are correct.

**Tachycardia**

**Paralysis**

Amnesia

Hypotension

*Sedatives can cause respiratory depression or even arrest but none cause paralysis. Bradycardia is more likely to result from sedatives and the intubation attempt than tachycardia.*

*Most sedatives have some effect on blood pressure, so hypotension should be anticipated. Amnesia is a frequent side effect of sedatives and is actually beneficial in these situations.*

**46.**

Which of the following can be used in the management or treatment of asthma?

Select the 3 answer options which are correct.

**Leukotriene modifiers**

**Electrolytes**

**Corticosteroids**

Beta 2 antagonists

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*Leukotriene modifiers such as montelukast (Singulair), the electrolyte magnesium sulfate, and corticosteroids such as methylprednisolone may be used in the management and treatment of asthma.*

*Beta 2 antagonists such as metoprolol are not used in the management of asthma; they would be appropriate in the management of hypertension or heart disease. Beta 2 agonists such as albuterol are the most widely used medications to treat acute asthma exacerbations.*

**47.**

All of the following can result from positive pressure ventilation except:

**Increased blood pressure**

Decreased preload

Decreased cardiac output

Gastric distention

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*Correct answer: Increased blood pressure*

*Positive pressure ventilation causes an increase in intrathoracic pressure. This would create a pressure gradient that the heart must pump blood against, which causes an increase in afterload. High intrathoracic pressure from positive pressure ventilation can squeeze the heart and vena cava, which will cause a decrease in preload, blood pressure, and cardiac output. Gastric distention occurs because of the force of volume and rate.*

**48.**

If the number of erythrocytes in a patient's blood drops, the patient may report shortness of breath with mild exertion. What causes this to occur?

**Decreased oxygen molecules being delivered to the lungs and tissues**

Increased albumin causes the blood to thicken, making oxygen exchange difficult

Increases the amount of fibrinogen in the lungs, blocking the uptake of oxygen molecules

Increased carbon dioxide levels reduce the affinity of oxygen molecules

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*Correct answer: Decreased oxygen molecules being delivered to the lungs and tissues*

*The primary function of erythrocytes (red blood cells) is to carry oxygen from the lungs to the various tissues of the body. It is also responsible for carrying carbon dioxide from the tissues back to the lungs for excretion. So, if the number of available erythrocytes is low, then the amount of oxygen reaching the tissues is decreased. This becomes most evident with mild exertion.*

*Albumin is a protein in the plasma portion of the blood. It does not involve oxygen transport or erythrocytes (red blood cells). Decreased erythrocytes in the blood do not cause an increase in the plasma protein fibrinogen.*

*Fibrinogen is a key protein involved in blood clotting and does not play a role in oxygen transport or affect lung oxygen uptake directly. It's a critical component of the clotting cascade, which helps to stop bleeding by forming a fibrin clot.*

*Erythrocytes deliver carbon dioxide from the cells to the lungs for reoxygenation and elimination of the carbon dioxide through ventilation. So, a decrease in erythrocytes would cause an increase in carbon dioxide levels dissolved in the plasma. Conditions such as acidosis or temperature can affect the affinity of oxygen molecules, but increased carbon dioxide levels do not.*

**49.**

You are called to an unknown medical call. On arrival, a bystander points out your patient who is about twenty yards away. The patient is sitting upright and leaning forward with their hands on their knees and only able to speak in short sentences. At first glance, which of the following medical conditions would you suspect?

**Chronic obstructive pulmonary disease exacerbation**

Acute myocardial infarction

Nausea and vomiting

Migraine headache

---

*Correct answer: Chronic obstructive pulmonary disease exacerbation*

*On EMS arrival, patients with COPD exacerbation will be in acute respiratory distress. The first sign of this emergency condition for the paramedic is the patient is often sitting upright, leaning forward, and speaking through pursed lips in short-word sentences.*

*The patient experiencing an Acute Myocardial Infarction (AMI) may present in many different ways depending on the size of the infarction as well as the area and other systems affected. If the AMI causes difficulty breathing, the patient will likely be sitting upright and leaning forward. However, the tripod position is the universal sign of respiratory distress.*

*Patients with nausea and vomiting are likely to present in the sitting position, but they lean forward splinting or guarding their abdomen; some will present in the fetal position.*

*Patients with migraine headaches often present with severe head pain they describe as intense, stabbing, blinding, and others. The key finding with a migraine patient is they will likely know they have the condition and want the area as dark and silent as possible.*

**50.**

Why should you choose an uncuffed endotracheal tube for a six-year-old child who is apneic?

**Children under eight years old have a natural narrowing at the level of the cricoid cartilage**

Balloon cuffs can cause significant tissue necrosis in this age group

The proper-sized ET tube has a significantly larger diameter and does not leave enough room for a balloon cuff in this age group

The balloon cuff would not allow the exhalation of carbon dioxide and would cause air-trapping

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*Correct answer: Children under eight years old have a natural narrowing at the level of the cricoid cartilage*

*Infant and pediatric tubes are available with and without balloon cuffs. Children under the age of eight have a natural narrowing at the level of the cricoid cartilage that will function as an ET tube cuff. Therefore, it is best to choose an ET tube that does not have the cuff when intubating a child under the age of eight.*

*Balloon cuffs can cause tissue necrosis in cases where the cuff is overinflated. However, a properly inflated cuff is not likely to cause tissue necrosis. The main reason to choose a non-cuff tube is because of the natural narrowing of the airway seen in children under the age of eight years. The proper-sized tube does not have a larger internal diameter for children than other tubes for adults. The balloon cuff does not block the exhalation of any gases. It is meant to block the passage of the stomach contents into the airway, not for gas exchange.*

**51.**

All the following are parts of the pediatric assessment triangle except:

**Awareness**

Circulation

Appearance

Work of breathing

---

*Correct answer: Awareness*

*The pediatric assessment triangle has been developed to help EMS providers form a from the doorway general impression of pediatric patients. It is composed of appearance, work of breathing, and circulation to skin. Awareness is not part of the pediatric assessment triangle.*

**52.**

You have witnessed the endotracheal tube tip pass through the vocal cords of your apneic adult patient. After advancing the tube the proper distance, how much air should be used to inflate the balloon cuff that seals the perimeter of the tube?

**5–10 mL of air**

2–5 mL of air

15–20 mL of air

20–30 mL of air

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*Correct answer: 5–10 mL of air*

*After the tube tip is witnessed passing through the vocal cords, advance the tube another 1 to 2.5 cm to ensure a good equal distance between the cords and the carina. The cm marking for most average adults is 21–22 cm to the teeth. Then, to secure the tube properly, insert 10 mL of air with a 10-cc syringe into the balloon cuff to ensure a good seal around the tube and help hold it in place.*

*2–5 mL of air is not enough to provide an adequate aspiration seal between the esophagus and the lungs. Less than 5 mL of air could result in aspiration in an adult patient.*

*Ensure a good seal with up to 10 mL of air with a 10-cc syringe in all orotracheal intubated adults, unless conditions warrant a different inflation amount.*

*Using 20 to 30 mL of air is too much and could cause necrosis to the tissue that the cuff comes in contact with. Injury can result from cuff over-inflation.*

**53.**

Your 49-year-old COPD patient is unconscious and exhibiting ineffective respirations. You quickly decide to attempt to control their airway and provide positive pressure ventilation. Which airway adjunct has a large distal end with an inflatable cuff that presses against the patient's esophageal sphincter while the proximal border of the airway device rests against the patient's tongue?

**Laryngeal Mask Airway (LMA)**

Esophageal-Tracheal Combitube

King LTD airway

Nasotracheal intubation

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*Correct answer: Laryngeal Mask Airway (LMA)*

*A Laryngeal Mask Airway (LMA) is an airway device that has a large distal end with an inflatable cuff on one end that presses against the patient's esophageal sphincter while the proximal border of the airway device rests against the patient's tongue. It is often used when intubation is indicated but not practical or is impossible.*

*A Combitube is an effective airway device when intubation is not possible. It has double tubes: one for the esophagus and one for the trachea. It does not rest against the esophageal sphincter.*

*A King LTD is an airway device that is almost as effective as orotracheal intubation. However, a King LTD does not press against the patient's esophageal sphincter while the proximal border of the airway device rests against the patient's tongue.*

*A nasotracheal ET tube is a single tube with a single cuff at the distal end. The distal end of the tube enters the vocal cords and seals the airway to prevent aspiration.*

**54.**

If a patient is suffering from pulmonary edema, which of the following will be helpful in increasing the patient's lung volume and vital capacity while reducing venous return to the heart and helping to diminish the overall work of breathing without affecting blood pressure?

**Placing the patient in a sitting position with legs dependent**

Administering 0.04 mg of nitroglycerin sublingually

Administering 2 mg of morphine sulfate intravenously

Placing the patient on the left side and ventilating at a fast rate with BVM

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*Correct answer: Placing the patient in a sitting position with legs dependent*

*The paramedic should place the patient with pulmonary edema in a sitting position with their legs dependent. This position increases the patient's lung volume and vital capacity. It also directly reduces venous return and the work of breathing.*

*Nitroglycerin is a powerful vasodilator; it is not effective in increasing lung volume or capacity.*

*Morphine is a narcotic analgesic effective in reducing venous return and reducing work of breathing but does not increase lung volume or vital capacity.*

*Placing the patient on the left side will not decrease venous return to the heart, BVM may help increase ventilation but not the vital capacity or volumes without risk of barotrauma.*

**55.**

After being unable to clear a foreign body obstruction from the airway of your now unconscious adult patient using the Heimlich maneuver, which of the following interventions would be the most appropriate?

**Initiate chest compressions**

Supine abdominal thrusts

Direct laryngoscopy and Magill forceps

Blind finger sweeps

---

*Correct answer: Initiate chest compressions*

*If a conscious patient, becomes unconscious while attempting supine abdominal thrusts, immediate chest compressions are indicated.*

*Supine abdominal thrusts should have already been attempted when the Heimlich maneuver was being attempted. Therefore, repeating the abdominal thrust is not likely to produce results.*

*Magill forceps and direct laryngoscopy are not recommended until after chest compressions.*

*Blind finger sweeps would not be appropriate when attempting to clear the obstruction, especially after employing the use of a laryngoscope. Use Magill forceps to remove any visible foreign matter only.*

**56.**

Your trauma patient is combative with a decreased level of consciousness and GCS less than 8. His spontaneous respirations are between 26 and 30/minutes, and his heart rate is 130 bpm with a blood pressure of 90 mmHg/systolic. Which of the following medications may be used to sedate the patient prior to attempting intubation?

**Etomidate**

Lidocaine

Succinylcholine

Lorazepam

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*Correct answer: Etomidate*

*Sedation is sometimes indicated prior to an intubation attempt in patients who are combative from trauma or conscious with an active gag reflex. A widely used induction agent is etomidate, as it is a hypnotic agent and will sedate the patient, the first sequence in a rapid sequence induction intervention.*

*Lidocaine is often indicated prior to intubation of patients with known traumatic brain injury. In the case of pediatric patients, atropine should also be administered prior to intubation to prevent vasovagal bradycardia.*

*Succinylcholine is a powerful paralytic agent used during rapid sequence intubation; it is not indicated for sedation.*

*Lorazepam is a benzodiazepine often indicated for seizure activity. It is not used for pre-intubation sedation of combative patients.*

**57.**

Which of the following best describes or defines bronchiolitis?

**A viral infection caused by RSV that affects children between 6 and 18 months old**

A viral infection of the upper airway caused by influenza affecting children between 1 and 2 years old

A bacterial infection that afflicts children over 3 years old from an unknown cause

An inflammatory disease causing restrictive airway compromise in infants 1 to 5 months old

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*Correct answer: A viral infection caused by RSV that affects children between 6 and 18 months old*

*Bronchiolitis is a viral infection of the lower airways that occurs primarily in infants under the age of 18 months. It is characterized by expiratory wheezing, respiratory distress, inflammation, and obstruction at the level of the bronchioles. It is not considered an inflammatory disease and does not cause reactive airway disease. Bronchiolitis is commonly mistaken for reactive airway disease/asthma. One key finding to help differentiate asthma from bronchiolitis is the presence of a fever.*

**58.**

While assessing the respiratory function of an ill five-year-old child, you note the presence of inspiratory stridor, even though the patient appears to have adequate oxygenation. Since the stridulous respirations are inspiratory only, what area of the child's respiratory system do you suspect the adventitious breath sounds are originating?

**In the upper airway immediately above the glottic opening**

Within the alveoli

Just superior to the carina in the lower airway

Within the right or left bronchus

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*Correct answer: In the upper airway immediately above the glottic opening*

*Stridor results from foreign body aspiration, infection, swelling, disease, or trauma within or immediately above the glottic opening. Stridor produces a loud, high-pitched sound that is typically heard during the inspiration phase.*

*Expiratory stridor results from narrowing of the lower airway/trachea due to an illness, injury, or obstruction. Stridor during both inspiratory and expiratory phases of respiration are good indicators of significant airway obstruction at the level of the vocal cords. Stridulous respirations are not often heard in the alveoli due to the depth of the air sacs within the lungs. Often fluid and copious secretions are auscultated in the alveoli.*

*If stridor is heard at the level of the carina, it normally causes expiratory stridor due to the depth of the carina.*

*Foreign body airway obstruction often finds its way into the main stem bronchus and wind up in the right main bronchus due to the anatomy. However, stridulous respirations at this level are normally heard on the expiratory phase of respiration.*

**59.**

You are preparing to intubate an unresponsive 9-kg infant. Which laryngoscope blade would be most appropriate in this case?

**A number 1 Miller**

A number 1 Macintosh

A number 3 Miller

A number 2 Macintosh

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*Correct answer: A number 1 Miller*

*A 9-kg infant is very small and has an even smaller airway. To successfully intubate a 9-kg infant, it would be appropriate to use a small size 0-1 straight blade such as a Miller number 1.*

*A curved blade is not recommended for intubating an infant.*

*A number 3 Miller Blade (straight) would be more suited for use on a larger toddler or child. It would likely be too large to use appropriately in a 9-kg infant and is more suited for a 20- or 30-kg child.*

*A number 2 straight blade may be appropriate if it is all that is available. A number 2 Macintosh is not indicated as curved blades are not recommended in infants.*

**60.**

You are called to assist a 66-year-old complaining of dyspnea. On arrival at the patient's residence, what is the first visual indicator you have of the level of her respiratory distress?

**Tripod positioning**

Pulmonary edema

Presence of home oxygen therapy

Presence of respiratory medications

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*Correct answer: Tripod positioning*

*Tripod positioning is commonly the first visual sign a paramedic is likely to see in a patient struggling to breathe.*

*Pulmonary edema may be present in a respiratory distress patient, but it is not the first indicator of the level of her distress. Pulmonary edema is a finding that suggests the cause of her distress, not the presence of distress.*

*It is a good idea to get a quick visual as you enter a scene for the appearance of medications and equipment that could suggest some medical history, but it is not an indicator of her present level of distress.*

**61.**

Which of the following are indicators of lower airway obstruction?

Select the 3 answer options which are correct.

**Rales**

**Rhonchi**

**Wheezing**

Stridor

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*Wheezing is associated with bronchospasm, indicating lower airway obstruction. Rales, also known as crackles, are associated with fluid in the alveoli and indicate a lower airway issue. Rhonchi are sounds caused by mucus or other secretions in the larger airways, indicating lower airway obstruction.*

*Stridor is a high-pitched, wheezing sound caused by disrupted airflow, typically indicating an upper airway obstruction.*

**62.**

You are on-scene with an eight-year-old drowning victim who is pulseless and apneic. Chest compressions are being conducted by fellow rescuers while you prepare to intubate the patient. Which of the following endotracheal tube sizes and styles would be most appropriate to intubate the patient orally?

**Uncuffed 6-mm ET tube**

Cuffed 8-mm ET tube

Cuffed 5-mm ET tube

Uncuffed 4-mm ET tube

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*Correct answer: Uncuffed 6-mm ET tube*

*Pediatric ET tubes are available with or without ballooned cuffs. Children up to eight years old have a circular narrowing at the level of the cricoid cartilage. This natural narrowing serves as a functional cuff for the ET tube. Therefore, infant and children up to the age of eight or nine may be intubated successfully with ET tubes that do not have ballooned cuffs. ET tube sizes can be estimated for pediatric patients over the age of one by dividing the patient's age in years by four and adding four to the total. Therefore, an eight-year-old child would require a 6-mm ET tube without a functional cuff on the distal end.*

*Eight-year-old children are not normally intubated with ballooned cuffs on the tube, and a size eight ET tube is indicated for an adult male, not a child.*

*The eight-year-old may be intubated successfully with a little smaller 5-mm ET tube; however, it is not necessary to have a ballooned cuff on the ET tube.*

*A size 4-mm ET tube without the ballooned cuff would be more appropriate for a two-year-old child rather than an eight-year-old one.*

**63.**

You are performing endotracheal intubation and visualize the tube passing through the cords. What is your next step in tube placement confirmation?

**Auscultating over the epigastric region**

Auscultating for the presence of bilateral breath sounds

Witnessing the tube pass through the vocal cords

End-Tidal Carbon Monoxide Detector (ETCO2)

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*Correct answer: Auscultating over the epigastric region*

*Visualization of the cords is the first and primary tube confirmation technique. Next, confirm proper tube placement by auscultating over the epigastric region. Auscultation should then be used over the midaxillary region and the anterior chest line on the right and left sides of the chest. Auscultating the epigastric region first is the quickest way to determine a misplaced ET tube. If the tube is in the esophagus, a bubbling or air sound may be heard over the epigastric region.*

*It is appropriate to listen for bilateral breath sounds to confirm the proper placement of the tube. However, auscultating the lung fields on each side is more useful after the initial or primary confirmation. Auscultating right and left lung sounds becomes useful when determining the exact tip placement. Due to the natural shape of the bronchioles, an ET tube advanced too far will likely end up in the right mainstem bronchus, occluding airflow to the left lung.*

*Witnessing the tube passing the vocal cords is not a primary confirmation means. Once it passes the cords, advance the tube another 1–2.5 cm.*

*End-Tidal Carbon Monoxide Detector (ETCO2) is not a primary confirmation means. It is, however, a secondary means of confirmation. It is used after primary confirmation and securing the tube. An ETCO2 detector determines the presence of CO and aids in confirming the tube placement.*

**64.**

You are inserting a nasopharyngeal airway in a patient with an altered level of consciousness when they begin to gag. Which of the following may be helpful in this case?

**Gently pull the nasal airway back 0.5 to 1 cm and slowly reinsert the airway**

Pull the airway out and attempt to use an oral airway

Rotate the nasal airway 180 degrees while applying cricoid pressure

Apply Sellick's maneuver to stop the gagging while the patient's body gets used to the airway

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*Correct answer: Gently pull the nasal airway back 0.5 to 1 cm and slowly reinsert the airway*

*After insertion, the nasal airway rests in the posterior pharynx behind the tongue. If the patient begins to gag as the airway is being advanced into the nasopharynx, it may be caused by the tip of the airway touching the floor of the posterior pharynx. It may be necessary to pull the nasal airway out slightly and reinsert it slowly.*

*It is not common practice to replace the nasal airway with an oral airway if gagging is present. Oral airways are traditionally more of a gag-reflex threat than a nasal airway.*

*It is not appropriate to apply cricoid pressure on a patient's cricoid membrane for inserting a nasal airway, as this is not likely to diminish the gag reflex and could cause aspiration to occur.*

*It is not appropriate to apply Sellick's maneuver in a patient who is actively gagging during the insertion of a nasal airway; this could cause aspiration to occur.*

**65.**

What is the most appropriate way to provide airway suctioning of a patient intubated with an ET tube?

**Gently rotate the suction catheter between your fingers while withdrawing the catheter with 80 to 120 mmHg suction applied**

Insert suction tubing without a catheter attached to the end of the ET tube

Insert the soft suction catheter with 80 mmHg suction applied into the tube until resistance is felt

Hyperventilate the patient with the Ambu-bag and 100% oxygen prior to and after the procedure

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*Correct answer: Gently rotate the suction catheter between your fingers while withdrawing the catheter with 80 to 120 mmHg suction applied*

*When suctioning an intubated patient, it is appropriate to insert the soft suction catheter down the tube after properly oxygenating the patient. Once suction is applied at between 80 mmHg and 120 mmHg, depending on the nature of the secretions to be suctioned, gently rotate the suction catheter between your fingers while withdrawing the catheter with 80 to 120 mmHg suction applied.*

*It is never appropriate to insert suction tubing into an ET tube.*

*Never apply suction while inserting a suction catheter. Suction should be applied at 80 to 120 mmHg on the way out only.*

*It is not appropriate to hyperventilate an intubated patient. The patient should be pre-oxygenated with normal ventilation for several minutes prior to suction being applied, never hyperventilated.*

**66.**

You are performing orotracheal intubation on an average-sized, apneic adult. At what depth marking should the airway be properly positioned 2 to 3 cm above the carina?

**19 to 23 centimeters**

9 to 13 centimeters

32 to 36 centimeters

29 to 32 centimeters

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*Correct answer: 19 to 23 centimeters*

*The paramedic must check the depth markings on the ET tube during intubation. In an average-sized adult, the tube is properly positioned when the patient's teeth are between 19 and 23 cm. The carina is usually located within 27 cm, so inserting the tube to the 19 to 23 cm mark will place the tube about 2 to 3 cm above the carina.*

*The distance from the teeth to the carina is around 27 cm in the average adult. Therefore, it would not be appropriate to stop at the 9 to 13 cm mark. The tube would not be in the trachea or esophagus at that depth.*

*Inserting the ET tube to 29 to 36 cm would most likely put the tip of the tube into the left mainstem bronchus, occluding airflow to the right lung.*

**67.**

What is the drug of choice for an adult asthma patient who cannot tolerate nebulized beta-agonist treatments and is experiencing severe dyspnea with wheezing from bronchoconstriction?

**Epinephrine**

Albuterol

Methylprednisolone

Aminophylline

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*Correct answer: Epinephrine*

*If a patient is unable to tolerate nebulized medications, subcutaneous or intramuscular epinephrine may be indicated to treat the bronchoconstriction. Epinephrine is effective in causing bronchodilation in times of airway constriction due to bronchospasm.*

*Albuterol is a beta-agonist and may be indicated for continuous nebulized administration during transport to the hospital in patients experiencing severe bronchoconstriction but only if nebulized beta-agonist treatments can be tolerated by the patient.*

*Methylprednisolone is a corticosteroid and is not indicated for the pre-hospital treatment of bronchoconstriction caused by an asthma attack.*

*Aminophylline is a leukotriene modifier sometimes prescribed for the long-term treatment of patients with COPD. It is not a first-line emergency medication.*

**68.**

You are assessing an adult patient experiencing sudden-onset chest pain and dyspnea. She quickly exhibits jugular vein distension and cool, clammy skin. Her trachea is midline, but there are palpable air pockets under the skin on her upper chest on the left side that feel as though they pop or vanish when you palpate them.

What is this abnormal finding?

**Subcutaneous emphysema**

Ascites

Atelectasis

Pitting edema

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*Correct answer: Subcutaneous emphysema*

*Subcutaneous emphysema is sometimes seen in patients suffering from a pneumothorax, especially closed pneumothorax. It occurs when air escapes the lung and enters the subcutaneous tissue. Once it is trapped in the tissue, it can be palpated under the skin and feels as if the patient has "Rice Krispies" under their skin.*

*Ascites is the accumulation of fluid in the abdominal cavity; it does not refer to air escaping the lungs.*

*Atelectasis is a condition in which the alveoli in the lungs collapse after the end of exhalation.*

*Pitting edema occurs when fluid leaves the vascular space and accumulates in the tissues. In most cases, it is most evident in the hands and feet.*

**69.**

You are on-scene with an adult male who appears to have a partially obstructed airway. Bystanders state he is choking on pizza. He is slightly cyanotic around his mouth and nose as well as his nail beds. He is obviously struggling to breathe with diminished inspiratory/expiratory wheezing in all lobes and an ineffective cough.

What would be the most appropriate intervention at this point?

**Initiate a rapid, safe transport and encourage him to cough in an attempt to expel the foreign body**

Have him bend over slightly and perform finger sweeps to clear the foreign body from his upper airway

Bend the patient over slightly and administer back blows between his shoulder blades until the foreign body is expelled or he loses consciousness

Initiate safe transport and lay him supine before beginning abdominal thrusts to clear his airway of the foreign body obstruction

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*Correct answer: Initiate a rapid, safe transport and encourage him to cough in an attempt to expel the foreign body*

*If a patient has a partially obstructed airway but is still able to adequately move air in and out of his lungs, it is recommended to provide a supportive rapid, safe transport to the hospital for intervention if the patient is not able to cough it out. If the cyanosis becomes worse or the patient's respirations become less effective, the appropriate next step would be abdominal thrusts, followed by further airway management if needed.*

*It is never appropriate to perform blind finger sweeps on a patient with a partially obstructed airway, especially if he is breathing effectively.*

*It is not appropriate to attempt to clear a partially obstructed airway when good air exchange is occurring.*

*It is not appropriate to lay a conscious patient with a partially obstructed airway on their back to deliver abdominal thrusts.*

**70.**

You quickly control the airway of an unconscious patient using a Combitube. During transport to the hospital, the patient regains consciousness and begins to resist the tube. What should you do at this point?

**Begin rapid sequence induction to sedate the patient and control the gag reflex**

Hyperventilate the patient prior to removal to ensure adequate oxygenation during the removal process, then quickly deflate cuff 2 and remove in a single smooth step on exhalation

Quickly deflate the pharyngeal cuff and remove the cuff with the patient sitting up and leaning forward

Try to reassure the patient and lay them flat to reduce irritation and continue ventilating the patient

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*Correct answer: Begin rapid sequence induction to sedate the patient and control the gag reflex*

*Once an intervention has been used to control the airway, removing the airway should only be done as a last resort if issues arise. The complications that may arise from pharmacologically controlling the patient's gag reflex and level of consciousness are generally far lower than attempting to remove an advanced airway, which could cause damage to the patient's airway, further damage in a trauma patient due to muscle contractions from gagging, and aspiration of vomit into the patient's lungs.*

*It is not appropriate to hyperventilate a now-breathing, conscious patient through a Combitube. It is not appropriate to deflate the cuff and quickly remove the tube from the patient while they are sitting up and leaning forward; this position is likely to induce vomiting.*

*It is not appropriate to lay a conscious, breathing patient flat to remove a Combitube, as this greatly increases the chance of aspiration if the patient vomits. If needed, the best technique if the tube needs to be removed is to have the patient lay on their side and slowly remove the tube.*

**71.**

You are orally intubating a patient experiencing spasmodic closure of the vocal cords from laryngeal spasm. What is the best way to get the cords to allow the passage of the ET tube in this situation?

**A forceful upward pull of the jaw to reposition the airway**

Applying a copious amount of lubrication on the tube and vocal cords

Allow the tip of the stylet to exit the end of the tube to serve as a guide through the narrow opening

Apply steady cricoid pressure throughout the intubation

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*Correct answer: A forceful upward pull of the jaw to reposition the airway*

*Laryngeal spasm is best managed with aggressive ventilation and a forceful upward pull on the jaw. In rare cases and RSI, muscle relaxants are used to relieve the spasm.*

*Applying a large amount of lubrication to the tube is not likely to help the ET tube pass through the vocal cords when the laryngeal spasm is occurring.*

*Never allow the tip of the stylet to exit the end of an ET tube. This will cause direct trauma and will not help the tube pass through the spasm.*

*Cricoid pressure helps line up the trachea and the ET tube during normal intubation. It is not likely that cricoid pressure would help relieve a laryngeal spasm to allow the passage of the ET tube.*

**72.**

You are treating a patient who has a history of congestive heart failure, who is conscious and breathing and presented with acute pulmonary edema. What is the best way to ensure adequate ventilation?

**Place the patient on CPAP**

Ventilate the patient fast and hard with a bag valve mask to ensure oxygen delivery

Lay the patient supine with head slightly elevated

Use a bag valve mask to deliver slow and deep respirations

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*Correct answer: Place the patient on CPAP*

*CPAP is a continuous positive airway pressure device that attaches to the bag-valve-mask device. It transmits positive pressure into the airways of a spontaneously breathing patient. It does this to help keep the patient's alveoli open at the end of expiration. This allows for better gas exchange at the cellular level.*

*COPD, congestive heart failure, and other conditions can cause the alveoli to collapse after the pressure is exhaled by the patient. CPAP helps by ensuring a small amount of air stays behind to keep the alveoli open until the next ventilation expands the air sacs again.*

*Ventilating a patient fast and hard is not going to help keep the alveoli open at the end of the respiration. It is not appropriate to ventilate a patient fast and hard in an attempt to prevent atelectasis (alveolar collapse). CPAP can accomplish the task easily. However, use caution and start at low-pressure settings to prevent problems with respiratory exchange.*

*A patient who is conscious and in need of ventilatory assistance, regardless if atelectasis is present, is not going to tolerate being laid supine when they are already struggling to breathe.*

*It is impossible to keep the reservoir bag full at all times because the bag will partially empty when a ventilation is delivered with it. Even if you could keep the bag full of oxygen, it would not help keep the alveoli open; only CPAP can assist with that in the prehospital setting.*

**73.**

You are on-scene with a 30-year-old patient with dyspnea, fever, and pleural friction rub. You suspect the patient may be experiencing a pulmonary embolus. However, you are unable to establish the possibility of an embolus from other conditions with similar signs and symptoms.

Which of the following contributing factors may lead you to confirm a pulmonary embolus in this case?

**History of recent pelvic or lower extremity fracture**

History of spontaneous pneumothorax

Recent food-borne illness such as E. coli

Recent abdominal illness history such as cholestasis

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*Correct answer: History of recent pelvic or lower extremity fracture*

*Patients with a Pulmonary Embolus (PE) may present with dyspnea, cough, hemoptysis, pain, hypotension, diaphoresis, tachypnea, tachycardia, fever, and JVD as well as many other signs and symptoms depending on the area and size of the pulmonary embolus. PE patients often present with signs and symptoms associated with several other pulmonary and/or cardiac conditions. However, some distinguishing factors can help the paramedic determine the probability of an embolus. Patients with a history of a recent pelvic/lower limb fracture or surgery, recent prolonged travel or immobility as well as other conditions point to the probability of an embolus.*

*Spontaneous pneumothorax is not a usual cause of a pulmonary embolus. Spontaneous pneumothorax is most often associated with a ruptured bleb (weak spot of lung tissue) or coughing against a closed epiglottis, while a PE is a blood clot within the lung vasculature.*

*Patients with recent food-borne illnesses, such as E. coli, botulism, and/or listeria, are not naturally predisposed to the possibility of developing a pulmonary embolus.*

*Conditions that affect the digestive system, such as cholestasis, do not typically cause blood coagulation problems that can lead to the development of a pulmonary embolus.*

**74.**

Once a paramedic visualizes the endotracheal tube pass through the vocal cords, how far should the tube be advanced before inflating the cuff and assessing the proper placement of the tube?

**1 to 2 cm**

2 to 2.5 inches

At least 5 cm

At least 3.5 inches

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*Correct answer: 1 to 2 cm*

*After viewing the tip of the tube pass through the vocal cords, advance the tube another 1 to 2 cm. This places the tip of the tube halfway between the vocal cords and the carina.*

*The tip of the tube would likely end up in the right mainstem bronchus if the tube is advanced more than 2 cm past the cords. This would be evident by decreased breath sounds on the left side and can cause serious lung problems from atelectasis.*

**75.**

Your adult patient is overweight and is a former pack-a-day smoker. They report shortness of breath and a productive cough and appear slightly cyanotic around the lips and nail beds. During auscultation of the lung fields, you note the presence of coarse rhonchi making it apparent the patient is experiencing resistance during inspiration and expiration.

Which of the following medical conditions do you suspect is causing this presentation?

**Chronic bronchitis**

Asthma

Emphysema

Cystic fibrosis

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*Correct answer: Chronic bronchitis*

*Patients with chronic bronchitis are typically overweight and complain of mild dyspnea most of the time. They often present with a productive cough and coarse rhonchi during auscultation of the lung fields. Chronic bronchitis patients have resistance to airflow and are the most likely COPD patient to present with cyanosis, especially of the nail beds.*

*Asthma patients present with no cough and inspiratory and expiratory wheezing due to bronchospasm. Rhonchi associated with bronchitis is caused by inflammation. Also, most asthma patients do not present with cyanosis unless the bronchospasm or laryngospasm becomes life-threatening. Patients with emphysema usually present with barrel chest and a non-productive cough. Emphysema patients are often pink and breathe through pursed lips. Cystic fibrosis patients have extreme difficulty breathing and may present cyanotic. However, breath sounds are more likely to be very diminished if the patient is not already on ventilatory assistance.*

**76.**

COPD patients may present with electrocardiogram changes due to chronic hypoxemia. Which of the following EKG changes would you expect to see in an end-stage COPD patient with right atrial enlargement?

**Tall, peaked P waves**

Tall, tented T waves

Inverted P waves

A prolonged PR interval

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*Correct answer: Tall, peaked P waves*

*End-stage Chronic Obstructive Pulmonary Disease (COPD) patients in the late stages of decompensation may present with cyanosis, clubbed fingers, and electrocardiogram abnormalities. Cardiac dysrhythmias or signs of right atrial enlargement may be present. The main sign of right atrial enlargement is evident by tall, peaked P waves in leads II and III.*

*Tall, tented T waves are more indicative of hyperkalemia and would not be caused by end-stage COPD.*

*Inverted P waves indicate an electrical variance and could indicate a low-level AV block. However, an inverted P wave is not associated with end-stage COPD.*

*A prolonged PR interval that is constant is more likely to indicate a first-degree atrioventricular block and not right atrial enlargement from COPD.*

**77.**

After intubating your apneic patient, what tube placement confirmation means should be assessed first?

**Auscultate over the epigastric region for the presence or absence of breath sounds**

Auscultate each lung field for the presence of breath sounds

Attach an end-tidal carbon dioxide detector

Attach capnography to determine the presence of ventilatory waveform

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*Correct answer: Auscultate over the epigastric region for the presence or absence of breath sounds*

*The initial confirmation means for determining the proper placement of the endotracheal tube during the intubation process is to auscultate with a stethoscope over the epigastric region in the area of the stomach. If the ET tube inadvertently entered the esophagus instead of the trachea, a gurgling sound (that does not resemble normal bowel sounds) can be heard in the stomach.*

*It is appropriate to auscultate over each lung field only after listening for the presence of gurgling in the stomach. The quickest way to determine esophageal intubation is to listen (auscultate) over the epigastric region first. Attaching an end-tidal CO detector is appropriate after first ensuring the patient is intubated properly. This is first achieved by auscultating over the stomach to ensure the tube is not in the esophagus, followed by listening to each lung field to ensure the presence of adequate breath sounds. Capnography can be used in conscious and breathing patients or intubated patients in cardiac arrest. It is also useful in determining ET tube placement; however, it is a secondary means of confirmation that should not take the place of auscultating the epigastric region and lungs first. It is also useful to determine chest compression effectiveness and bronchoconstriction.*

**78.**

What is the medication type of choice for relieving bronchospasm associated with COPD in the pre-hospital setting?

**Beta-agonists**

Steroids

Anticholinergics

Sympathomimetics

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*Correct answer: Beta-agonists*

*The medications used in the pre-hospital setting to relieve bronchospasm and reduce constriction of the lower airways are the beta-agonist agents such as albuterol and levalbuterol.*

*Other medication types such as steroids may be prescribed for the patient after ER physician evaluation. Steroids include medications such as methylprednisolone.*

*Nebulized anticholinergics are often prescribed after physician evaluation to help relieve bronchoconstriction that has not improved with beta-agonists and steroids.*

*Sympathomimetic medications have both alpha and beta effects and are often prescribed by the patient's physician. They are not often ordered in the pre-hospital setting due to the higher incidence of side effects.*

**79.**

Your patient developed sudden-onset difficulty breathing and diaphoresis and has a past history of atherosclerosis and a recent hip replacement surgery. Which of the following should be suspected until proven otherwise?

**Pulmonary embolus**

Air embolus

Pulmonary aspiration

Deep vein thrombosis

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*Correct answer: Pulmonary embolus*

*A Pulmonary Embolus (PE) is a sudden blockage of a pulmonary artery by a clot that formed elsewhere and traveled to the lungs before becoming lodged in the lung. Most PEs originate in the lower extremities in patients with histories including high cholesterol, atherosclerosis, and other venous disease processes. The paramedic should suspect a PE in any patient who presents with sudden-onset difficulty breathing that cannot be easily ruled out by the presence of pneumothorax or other obvious cause. PE should especially be suspected when the patient has a history of high cholesterol, atherosclerosis, or another venous disease.*

*An air embolus is usually a result of improper IV catheter or hemodialysis treatment that allows air to enter the venous system. It is not usually associated with high cholesterol, atherosclerosis, or another venous disease.*

*Pulmonary aspiration would cause difficulty breathing but would also be accompanied by extreme irritation and coughing due to the stomach contents now irritating the lung tissue and epiglottis.*

*Often a PE starts as a deep vein thrombosis, normally in the lower extremities. The thrombosis or clot breaks off and travels through the right side of the heart before lodging in a pulmonary artery. Then the signs, symptoms, and problems begin for the patient.*

**80.**

According to the Bohr effect, if a patient's capillary blood pH is lower than normal, what does this tell the paramedic about the patient's overall respiratory status?

**The patient has an increased carbon dioxide level, and the hemoglobin affinity for oxygen is now reduced**

The patient's blood has a decreased carbon dioxide level, and the hemoglobin affinity for oxygen is decreased

The patient's blood has an equal number of oxygen and carbon dioxide molecules competing for the available hemoglobin

The patient's blood has both a decreased oxygen and carbon dioxide affinity for the available hemoglobin molecules

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*Correct answer: The patient has an increased carbon dioxide level, and the hemoglobin affinity for oxygen is now reduced*

*The response of hemoglobin to changes in the blood's pH balance is called the Bohr effect. The way a patient's lungs are ventilated can change the pH of the blood. It can also enhance or hinder oxygenation at the tissue level (capillary beds). For example, if the carbon dioxide levels are high, the pH of the capillary blood would drop (low ph = increased acid). This would cause a direct decrease in the oxygen affinity for hemoglobin. However, if the carbon dioxide levels are lower than normal, the pH will rise (high pH = decreased acid), causing an increased oxygen affinity for the hemoglobin molecule.*

*If the patient's blood has decreased carbon dioxide levels, it would have an increased affinity for the oxygen molecule, not a decreased affinity.*

*If a patient's capillary blood pH is lower than normal, it would not mean there is an equal number of oxygen and carbon dioxide molecules competing for the same hemoglobin molecule. It would mean there is a higher carbon dioxide level than O2 in the blood.*

*If a patient's capillary blood pH is decreased, it would not mean the patient has a low affinity for both carbon dioxide and oxygen at the hemoglobin. It would simply mean carbon dioxide is high, and the oxygen affinity is reduced.*

**81.**

You are preparing for medication-assisted intubation of a 29-year-old patient. Which of the following medications and doses are appropriate for paralysis?

Select the three correct answer options.

**Rocuronium (Zemuron) 1 mg/kg**

**Vecuronium (Norcuron) 0.1 mg/kg**

**Succinylcholine (Anectine) 1 mg/kg**

Pancuronium (Pavulon) 1 mg/kg

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*Standard adult drug dosages for medication-assisted intubation paralytics are succinylcholine (Anectine) 1–2 mg/kg, vecuronium (Norcuron) 0.1–0.2 mg/kg, rocuronium (Zemuron) 0.6–1.2 mg/kg, and pancuronium (Pavulon) 0.06-0.1 mg/kg.*

*1 mg/kg of pancuronium bromide would be ten times the standard adult dose.*

**82.**

Which of the following respiratory patterns is most likely to be present with an adult patient suffering the adverse effects of diabetic ketoacidosis?

**Kussmaul respirations**

Cheyne-Stokes respirations

Central neurogenic hyperventilation

Bradypnea

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*Correct answer: Kussmaul respirations*

*Kussmaul respiratory pattern is characterized by an abnormally deep, very rapid sighing respiratory pattern. It is most often seen in patients with diabetic ketoacidosis and other forms of metabolic acidosis.*

*Cheyne-Stokes respirations are characterized by a periodic pattern of breathing with equal periods of apnea followed by a period of crescendo-decrescendo sequence of respirations. It is not associated with acidosis.*

*Central neurogenic hyperventilation is a rapid pattern of breathing that is most often regular and at a rate of 25 breaths per minute. Increasing rates indicate an injury at the cortical level of the brain. It is not associated with diabetes or any type of acidosis.*

*Bradypnea is a persistent respiratory rate of less than 12 per minute. It is often seen in patients with chest wall injury and narcotic overdose patients. Painful respiration is a common voluntary cause of bradypnea. It is not often seen with any type of acidosis (including ketoacidosis). Patients with most forms of metabolic acidosis, including ketoacidosis, will present with increased respirations, not decreased respirations.*

**83.**

You are assessing a critical patient and considering the possibility of a reversible cause of their symptomatic slow heart rate. Which of the possibilities is most likely to cause a patient to present with a slow heart rate and associated signs/symptoms of bradycardia?

**Hypoxia**

Hypovolemia

Pulmonary embolus

Cardiac tamponade

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*Correct answer: Hypoxia*

*Hypoxia is a condition that occurs when a patient is not able to properly breathe. This causes a decrease in available oxygen at the tissue level, and hypoxia ensues. If not quickly corrected, the patient may begin to show signs of hypoperfusion, impending cardiac/respiratory arrest, and multi-system failure. This would include symptomatic bradycardia. Reversing the hypoxia by providing airway management and ventilation to restore oxygenation will improve the symptomatic bradycardia.*

*Patients experiencing hypovolemia will have an initial increase in heart rate following blood loss as the body attempts to maintain viable blood pressure with a decreased blood volume.*

*Patients with cardiac tamponade are more likely to present with increased heart rates due to the body's attempt to pump blood against the force applied to the heart by the tamponade.*

*Patients with a Pulmonary Embolus (PE) are suffering from hypoxia associated with the infarcted lung tissue.*

**84.**

Which of the following are nondepolarizing neuromuscular blocking agents used for Rapid Sequence Intubation (RSI)?

Select the 3 answer options which are correct.

**Vecuronium bromide (Norcuron)**

**Pancuronium bromide (Pavulon)**

**Rocuronium bromide (Zemuron)**

Succinylcholine (Anectine)

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*Rocuronium bromide (Zemuron), pancuronium bromide (Pavulon) and vecuronium bromide (Norcuron) are nondepolarizing neuromuscular blocking agents used in Rapid Sequence Intubation (RSI).*

*Succinylcholine (Anectine) is the only depolarizing neuromuscular blocking agent used for RSI. Use succinylcholine with caution; it causes muscle fasciculations and may have contraindications.*

**85.**

You are called to assist an adult at a local bar for an unknown reason. On arrival, you are met by a man who has his arms crossed, grasping at his throat with both hands, and unable to speak to you. What should you do at this point to assist your patient?

**Perform abdominal thrusts while he remains conscious**

Lay him supine, and perform chest compressions until the obstruction is relieved

Deliver five back blows and five abdominal thrusts until the obstruction is relieved

Encourage him to cough, and initiate a safe, rapid transport to the hospital for definitive care

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*Correct answer: Perform abdominal thrusts while he remains conscious*

*The best treatment for a patient who is conscious and exhibiting signs and symptoms of an obstructed airway should receive abdominal thrusts as quickly and effectively as possible before he becomes unconscious and the obstruction becomes harder to clear.*

*It is not appropriate to perform chest compressions when a conscious adult has an obstructed airway.*

*Back blows may be effective in a child or adult, but the initial procedure for a conscious adult involves performing abdominal thrusts while he remains conscious.*

*Encouraging the patient with a completely obstructed airway to cough is an ineffective use of time that should be directed at clearing the obstruction by administering the Heimlich maneuver.*

**86.**

Overaggressive ventilation with a bag-valve-mask device may complicate a respiratory failure situation and can cause which of the following?

Select the three correct answer options.

**Gastric distention**

**Vomiting**

**Barotrauma**

Hypercapnia

Hypertension

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*Overaggressive ventilation with a bag-valve-mask device can cause barotrauma from too much tidal volume or excessive pressure in the airway. Other causes are gastric distension, which can lead to vomiting and aspiration. Hypocapnia, an excessive loss of carbon dioxide, is also common in overaggressive ventilation due to high minute volumes.*

*Too much carbon dioxide, or hypercapnia, is common in airway obstruction or low respiratory drive states such as narcotic overdose and would not generally be a result of overaggressive ventilation.*

*Positive pressure ventilation increases intrathoracic pressure, resulting in a decrease in cardiac output. Because of this, hypotension is likely with aggressive ventilation, rather than hypertension.*

**87.**

Your adult patient is experiencing laryngeal spasms, making it impossible to effectively establish an open airway. What is the best way to initially manage the airway of a patient suffering from laryngeal spasms?

**Aggressive ventilation and a forceful upward pull on the lower jaw**

Forceful ventilation following needle cricothyrotomy

Rapid, deep ventilation while using the modified jaw thrust maneuver

Cricothyrotomy with Trans-jet ventilation

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*Correct answer: Aggressive ventilation and a forceful upward pull on the lower jaw*

*Laryngeal spasm is best managed in the pre-hospital setting by initially attempting to pull up forcefully on the lower jaw and ventilating the patient aggressively, not forcefully. If this fails to open the airway and allow ventilation, then muscle relaxants may be required. Sometimes, placing the ET tip against the vocal cords and applying gentle pressure on the cords will allow the passage of the tube.*

*It is never appropriate or recommended to forcefully ventilate a patient with or without a laryngeal spasm. Nor would it be appropriate to initially manage laryngeal spasm with an aggressive procedure such as trans-jet ventilation without first attempting to establish an airway with an aggressive upward pull on the lower jaw. Trans-jet ventilation is a last-ditch effort, not a primary intervention. Using a modified jaw thrust maneuver with rapid, deep ventilation is not likely to open an airway when the patient is suffering laryngeal spasm. More aggressive means would likely be needed. It is not appropriate to perform a cricothyrotomy for a laryngeal spasm in the pre-hospital setting. Trans-jet ventilation would be the most invasive airway procedure allowed in most regions of the country as a last-ditch effort to save a life.*

**88.**

Your adult asthma patient is experiencing a severe attack characterized by inspiratory and expiratory wheezes with potential airway compromise due to laryngospasm. Which of the following interventions would be most appropriate after oxygen therapy is applied?

**2.5 to 5 mg of albuterol solution mixed with 3 mL of 0.9 normal saline and nebulized with 6–8 lpm of oxygen**

0.31 mg of levalbuterol nebulized with 6–8 lpm of oxygen

0.3-0.5 mL (1:1000) of epinephrine delivered IM/SC; repeat in 15 minutes if needed

Rapid sequence intubation with sedation

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*Correct answer: 2.5 to 5 mg of albuterol solution mixed with 3 mL of 0.9 normal saline and nebulized with 6–8 lpm of oxygen*

*During a severe adult asthma attack, the potential exists for the patient to die due to laryngospasm and bronchospasm. Therefore, asthma emergencies in the pre-hospital setting must be treated aggressively with albuterol. It is a fast-acting beta-agonist that stimulates beta-adrenergic receptors. This causes rapid bronchodilation to occur. The proper adult dosage is 2.5 to 5 mg mixed in 3 mL saline and nebulized with 6–8 lpm of oxygen.*

*0.31 mg of nebulized Levalbuterol is the pediatric dose, not an adult dose. Also, in most regions of the US, nebulized albuterol is the treatment of choice for adult asthma attacks in the pre-hospital setting. 0.3 to 0.5 mL of epi-delivered IM or SC would be the adult dose for anaphylaxis or severe allergic reaction with bronchospasm. It may be effective in reducing bronchospasm but is not the drug of choice for asthma attacks in the pre-hospital setting. Rapid sequence intubation (RSI) would be appropriate if the patient continued to deteriorate and pending laryngospasm threatened to close the airway altogether.*

**89.**

While assessing the respiratory effort of a non-intubated adult COPD patient using capnography, you note the presence of a shark fin waveform on the monitor. Which of the following is most likely the cause of this finding?

**Bronchospasm**

Laryngeal spasm

Vasoconstriction

Hyperventilation

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*Correct answer: Bronchospasm*

*Capnography can be used in the pre-hospital setting to assess the respiratory effort and efficiency of a COPD patient but should never be substituted for auscultation and inspection. The presence of a waveform on the monitor that resembles a shark fin is an indicator of bronchospasm. The patients have elevated expiratory upstroke (above 45 mmHg), shortened respiration interval, and elevated plateau phase on the monitor screen caused by the turbulent airflow flow through the bronchioles.*

*Laryngeal spasm is more likely to cause a shortened capnography waveform (less than 35 mmHg) due to the inability for air to get into the lower airways.*

*Vasoconstriction refers to blood vessel diameter and is not going to be evident on the capnography monitor.*

*Hyperventilation would cause more of shortened, rapid squared-off waveform than a shark fin on the monitor.*

**90.**

Your 23-year-old diabetic patient was found unresponsive with increased respirations, hypotension, and bradycardia. Family members state the patient recently had a tooth pulled and was prescribed Vicodin. The medication has been taken as prescribed. Which of the following is most likely to cause the patient's presentation?

**Ketoacidosis**

Metabolic alkalosis

Myasthenia gravis

Narcotic overdose

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*Correct answer: Ketoacidosis*

*A known diabetic who presents unconscious with increased respirations is likely experiencing deep, rapid breathing known as Kussmaul respirations. Kussmaul respirations, or tachypnea, in the presence of a diabetic history most likely points to diabetic ketoacidosis. Blood glucose levels should be assessed as soon as possible to confirm the presence of diabetic ketoacidosis.*

*A patient with metabolic alkalosis would present with slow, shallow respirations due to CO2 retention.*

*Myasthenia gravis is an autoimmune disorder that affects the muscles. It causes muscles to tire and weaken easily, which may lead to a decrease in respiratory effort, not an increase in depth and rate. Patients found unconscious with rapid respirations who have a diabetic history of any type should be suspected of experiencing ketoacidosis, even when the possibility of a narcotic overdose is possible.*

*A narcotic overdose would likely cause a decrease in respiratory effort, not an increase in depth and rate as seen in ketoacidosis. Blood sugar analysis is essential in this case.*

**91.**

Which of the following are considered supraglottic airway devices available for EMS use?

Select the 2 answer options which are correct.

**i-Gel**

**LMA**

Shiley

Endotracheal tube

*The i-Gel and Laryngeal Mask Airway (LMA) are all considered supraglottic airway devices and are available for EMS use, depending on local protocols.*

*The Shiley is a tracheostomy tube placed in a surgical opening of the trachea that is referred to as a stoma. It is not a supraglottic airway available for EMS use. An endotracheal tube is placed directly into the glottic opening and is not considered a supraglottic airway.*

**92.**

Which of the following medication types are used to decrease the workload of the heart by blocking sympathetic stimulation of receptors that work on the SA node and myocardial cells, thus decreasing the force of myocardial contraction and directly reducing a patient's heart rate?

**Beta-blockers**

Calcium-channel blockers

Sodium-channel blockers

Alpha-adrenergic agents

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*Correct answer: Beta-blockers*

*Beta-blockers are a group of cardiac medications that effectively reduce heart rate by blocking sympathetic stimulation of the beta receptors that stimulate the SA node and other myocardial cells. They effectively decrease the force of the myocardial contractions, causing a direct reduction in heart rate. Examples of beta-blocking agents include metoprolol, labetalol, sotalol, and propranolol.*

*Calcium-channel blockers work by relaxing smooth muscles to provide vasodilation as well as reducing heart rate and stroke volume of the heart. They do not effectively block the beta-receptors on the SA node. Examples include diltiazem (or Cardizem), verapamil, and nicardipine.*

*Sodium-channel blockers work by impairing conduction of sodium ions through sodium channels used in the treatment of cardiac dysrhythmias. They do not effectively block the sympathetic stimulation of the beta-cells that work on the SA node. An example of this type of agent is lidocaine.*

*Alpha-adrenergic blockers are used to lower blood pressure by dilating peripheral blood vessels, causing a decrease in peripheral vascular resistance. They do not block the beta-cells nor do they slow heart rate. Common examples include Cardura, Minipress, and Flowmax.*

**93.**

Which abnormal respiratory pattern is associated with brainstem herniation characterized by irregular, cluster-type respirations?

**Ataxic respiratory pattern**

Kussmaul's respiratory pattern

Bradypnea respiratory pattern.

Tachypnea respiratory pattern

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*Correct answer: Ataxic respiratory pattern*

*An ataxic respiratory pattern is a name for cluster type, which are irregular respirations commonly seen in patients with brainstem herniation.*

*Kussmaul's respirations are regular, rapid, and deep. This pattern is associated with metabolic acidosis conditions such as diabetic ketoacidosis. Bradypnea is slow, regular respirations, with a regular pattern; it is associated with opioid intoxication or similarly depressed mental status circumstances. Tachypnea is fast, regular respirations and is associated with hypoxia, shock, and anxiety,*

**94.**

Which of the following statements are false regarding partial airway obstructions in a responsive patient?

Select the three correct answer options.

**Allowing a patient to drink something will clear most partial airway obstructions**

**A patient can't clear a partial airway obstruction on their own**

**You should discourage a patient from coughing if they have a partial airway obstruction**

Performing the Heimlich maneuver may create a complete airway obstruction

Do not allow a patient to eat or drink anything if you suspect a partial airway obstruction

Coughing may help the patient clear a partial airway obstruction

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*If a possible choking patient is coughing or can speak, it is considered a partial airway obstruction. If the patient is unable to speak and not coughing, consider it a complete airway obstruction. The abdominal thrust maneuver (Heimlich) is the most effective method of dislodging a complete airway obstruction in a conscious patient.*

*Do not attempt the Heimlich maneuver on a partial airway obstruction, as it may worsen the patient's condition by causing the object to shift downward into the airway. The best treatment is to reassure the patient and encourage them to try to cough it out. Allowing the patient to drink something is not recommended for this situation.*

**95.**

Your adult patient is found unconscious with decreased respirations. Which of the following medical conditions is most likely to cause a direct decrease in a patient's respiratory effort and/or breathing rate?

**Metabolic alkalosis**

Metabolic acidosis

Aspirin poisoning

Central nervous system lesion involving the pons

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*Correct answer: Metabolic alkalosis*

*Metabolic alkalosis is a disorder that results from a significant loss of body acid or a condition that causes an increase in base bicarbonate characterized by a direct decrease in respiratory effort and rate.*

*Metabolic acidosis is a disorder that results from an excess of acid within the body. It can also occur when something causes an increased loss of base bicarbonate.*

*Aspirin poisoning is most likely to cause metabolic acidosis due to the high acidity of aspirin. Therefore, respiration can be expected to increase as the body attempts to blow off the acid.*

*Central nervous system lesions that affect the pons are likely to cause an increase in respiration due to the stimulation of the respiratory centers in the pons.*