# Healthcare
# NREMT-I85
## EMT Intermediate 85 (NREMT-I85)

# Latest Version: 6.0

## Question: 1

Cancer-causing agents are known as which of the following?

A. cardiotoxins
B. hemotoxins
C. carcinogens
D. corrosives

**Answer: C**

Explanation:
Cancer-causing agents are known as carcinogens. These substances are involved in causing cancer by altering cellular metabolism or damaging DNA in our cells, which interferes with biological processes and induces uncontrolled, malignant growth. Carcinogens can be found in a variety of substances, including certain chemicals, industrial compounds, and some natural products.
Carcinogens can be classified into different categories based on their origin and nature. Chemical carcinogens include substances such as asbestos, tobacco smoke, arsenic, and certain dioxins. Physical carcinogens involve ultraviolet rays and radioactive materials. Biological carcinogens include certain viruses, bacteria, and parasites.
The mechanism of action of carcinogens can vary. Some directly damage DNA, causing mutations that can lead to cancer. Others may increase the rate of cell division, which can indirectly lead to cancer if it results in increased opportunities for mutation. Additionally, some carcinogens can cause changes to the cellular environment that promote growth of cancerous cells or impair the function of DNA repair mechanisms.
It is important to note that not all exposure to carcinogens will lead to cancer. The likelihood of developing cancer depends on several factors, including the type and amount of the carcinogen, the duration of exposure, and an individual's genetic background. Some people may be more susceptible to the effects of carcinogens due to genetic predispositions or other health factors.
In summary, carcinogens are a diverse group of cancer-causing agents that include chemicals, physical agents, and biological organisms. Understanding the sources and mechanisms of carcinogens helps in developing preventive measures and treatment strategies for various types of cancer.

## Question: 2

You are treating patients who have been involved in a major explosion. One of your patients, who was not situated in the immediate vicinity of the explosion, has injuries caused by the flying debris. This injury falls into which of the following categories?

A. primary blast injuries
B. secondary blast injuries
C. tertiary blast injuries

D. quaternary blast injuries

**Answer: B**

Explanation:
The correct answer to the question regarding the type of injury sustained by a patient who was hit by flying debris from an explosion is "secondary blast injuries." To understand this categorization, it's important to know the different types of injuries associated with explosions. Here's a breakdown of these categories:
Primary blast injuries: These injuries are a direct result of the high-pressure shock wave generated by the explosion. The most common organs affected are air-filled structures like the lungs, ears, and gastrointestinal tract. Examples include tympanic membrane rupture, lung contusion, and bowel perforation.
Secondary blast injuries: These injuries occur when the explosion causes objects in the environment to become projectiles that can cause harm. This includes injuries from flying glass, metal, wood, and other debris that strike individuals. The injuries sustained can be penetrative or blunt force in nature. In the scenario described in the question, the injuries caused by flying debris are classified as secondary blast injuries.
Tertiary blast injuries: These injuries result from individuals being thrown by the blast wind and impacting against the ground or other objects. These can include fractures, traumatic amputations, and head injuries.
Quaternary blast injuries: This category encompasses all other injuries not covered by the first three categories. It includes burns, respiratory injuries from dust or smoke, and exacerbation or complications of existing conditions.
In summary, secondary blast injuries are specifically caused by the impact of debris and shrapnel propelled by the force of an explosion. Understanding these categories helps in the appropriate assessment and treatment of patients affected by explosive events. In the given scenario, where the patient was injured by flying debris without being close to the explosion, the injuries are classified as secondary blast injuries.

## Question: 3

In terms of electrical burn injuries, the type of injury that occurs when a person is close enough to a high-voltage source that the current between two contact points near the skin overcomes the resistance in the air, passing the current to the bystander is which of the following?

A. direct contact burn
B. flash burn
C. arc injury
D. flame burn

**Answer: C**

Explanation:
An arc injury, a specific type of electrical burn, occurs under a unique set of conditions involving high-voltage power sources. This injury does not require direct contact with the electrical source. Instead, it

happens when a person is within proximity to a high-voltage area and the electrical current is able to bridge the air gap – a phenomenon often referred to as an "electrical arc."
Electrical arcs are extremely dangerous because they can generate and release massive amounts of energy in the form of heat, light, and sound. The temperatures in an electrical arc can reach between 2000°C to 4000°C (3632°F to 7232°F), which is hot enough to severely burn human skin, ignite clothing, and even melt certain metals. The intense heat produced in an arc flash is primarily due to the energy released when the electrical resistance of air is overcome and a conductive plasma channel is formed.
The distance over which an arc can travel is also significant, potentially extending up to 10 feet or more depending on the voltage and surrounding conditions. This ability to jump across distances makes arc injuries particularly hazardous, as individuals do not need to be touching or even near the electrical source to be harmed.
It's important to differentiate arc injuries from other types of electrical burns such as direct contact burns, where the person must be in physical contact with the electrical source, or flash burns, which are typically caused by exposure to intense ultraviolet radiation from an electrical explosion or arc but without the electric current passing through the body.
Prevention of arc injuries involves strict adherence to safety protocols when working near or with high-voltage equipment. This includes the use of appropriate personal protective equipment (PPE), maintaining safe distances, and ensuring that electrical systems are properly maintained and guarded. Understanding the conditions that lead to such dangerous arcs can significantly reduce the risk of injury in environments where electrical sources are present.

## Question: 4

In terms of the 12-lead electrocardiogram, how many electrodes are used?

A. 12
B. 10
C. 8
D. 6

## Answer: B

Explanation:
The term "12-lead electrocardiogram" can be misleading for those unfamiliar with the procedure. Despite the reference to 12 leads, the setup actually involves the use of only 10 electrodes placed on the patient's body. These electrodes are strategically positioned to capture electrical signals from the heart. There are six electrodes placed on the chest, known as precordial leads, and four electrodes placed on the limbs. Each limb electrode is positioned on the wrists and ankles and not directly on the chest.
The magic of the 12-lead ECG lies in its ability to offer 12 distinct views of the heart's electrical activity, despite only using 10 electrodes. This is achieved through a combination of direct readings from the electrodes and calculated leads. The six chest electrodes provide the V1 through V6 leads, which are direct readings. The limb electrodes contribute to the formulation of six additional views: leads I, II, and III are direct measurements, while aVR, aVL, and aVF are derived mathematically from the limb electrodes. This combination of direct and calculated leads allows clinicians to obtain a comprehensive 3-dimensional view of the heart's electrical activity, facilitating accurate diagnosis of various heart conditions.

Understanding the function and placement of these electrodes is crucial for accurate ECG interpretation. Each lead looks at the heart's electrical activity from different angles, which is essential for diagnosing conditions like myocardial infarctions (heart attacks), arrhythmias, and other cardiac abnormalities. The system's ability to provide multiple perspectives from a limited number of electrodes is a key feature of the electrocardiogram's design, making it both efficient and comprehensive as a diagnostic tool.

## Question: 5

Which of the following is least likely to be a maternal change during pregnancy?

A. The vaginal mucosa decreases in thickness and vaginal secretions decrease.
B. Uterine size increases from 70 g to 1000 g by term.
C. The vagina develops a violet color.
D. Increased uterine blood volume and lymphatic fluid cause pelvic congestion and edema.

**Answer: A**

Explanation:
During pregnancy, a woman's body undergoes numerous physiological adaptations to accommodate the growing fetus and prepare for childbirth. One of the crucial changes occurs in the vaginal region. Contrary to the assertion that the vaginal mucosa decreases in thickness and vaginal secretions decrease, the opposite is true. During pregnancy, the vaginal mucosa actually thickens. This is primarily due to increased levels of estrogen, which stimulates the growth and vascularization of the vaginal walls. As a result, the mucosa becomes more robust and better supplied with blood.
Additionally, vaginal secretions increase during pregnancy. These secretions, primarily composed of mucus, are augmented by higher estrogen levels and greater blood flow to the vaginal area. The increase in secretions helps to maintain a healthy vaginal environment and reduce the risk of infections, which is crucial during pregnancy. The secretions also become more acidic, providing an additional protective mechanism against pathogens.
Other changes in the vaginal area during pregnancy include the development of a violet coloration known as Chadwick's sign. This is a common early indication of pregnancy and results from increased vascularization and blood flow to the region. Furthermore, the uterus undergoes significant changes, notably an increase in size from approximately 70 grams to about 1000 grams by the term. This growth accommodates the developing fetus, placenta, and amniotic fluid.
It's also worth noting that during pregnancy, there is an increase in uterine blood volume and lymphatic fluid, leading to pelvic congestion and edema. These changes are part of the body's adaptation to ensure adequate blood flow and nutrients to the placenta and developing fetus.
Therefore, the correct answer to the question is that the statement "The vaginal mucosa decreases in thickness and vaginal secretions decrease" is the least likely to be a maternal change during pregnancy. In reality, both the thickness of the vaginal mucosa and the volume of vaginal secretions increase as part of the body's preparation for childbirth and to protect both mother and fetus during this crucial time.

## Question: 6

Hematocrit is a blood test that measures the proportion of blood volume occupied by red blood cells. The normal values are about:

A. 38% for women and 32% for men
B. 38% for women and 46% for men
C. 32% for women and 46% for men
D. 38% for both men and women

**Answer: B**

Explanation:
Hematocrit is a clinical test that measures the percentage of red blood cells (RBCs) in the total blood volume. This test is crucial for diagnosing and monitoring various medical conditions, such as anemia, dehydration, and polycythemia. The hematocrit value is presented as a percentage, indicating how much of the blood's volume is made up of red blood cells.
The normal hematocrit values can vary based on several factors, including age, sex, and altitude where a person lives. Generally, men tend to have higher hematocrit levels compared to women. The typical normal range for men is about 42% to 54%, whereas for women, it is approximately 38% to 46%. These differences are primarily due to hormonal variations and the impact of testosterone, which tends to stimulate red blood cell production.
Red blood cells are essential for transporting oxygen from the lungs to various parts of the body and returning carbon dioxide back to the lungs for exhalation. Approximately 98% of the oxygen carried in the blood is bound to a protein in red blood cells called hemoglobin. The hematocrit level is therefore a vital indicator of the body's ability to transport oxygen effectively.
In clinical practice, a hematocrit test is performed using a blood sample, typically drawn from a vein. The sample is placed in a centrifuge, which spins the blood at high speed to separate its components based on density. Red blood cells, being denser, settle at the bottom, and their proportion is measured against the total blood volume.
Understanding the hematocrit levels helps healthcare providers diagnose and manage conditions that affect blood volume and red blood cell count. For instance, a high hematocrit value may indicate dehydration or polycythemia vera, a condition that results in excessive production of red blood cells. Conversely, a low hematocrit might suggest anemia, a condition characterized by insufficient red blood cells or hemoglobin, impacting the blood's ability to carry oxygen efficiently.
In summary, the hematocrit test is a fundamental blood test used to assess the proportion of blood volume occupied by red blood cells. Normal values are typically about 38% for women and 46% for men, reflecting the essential role of red blood cells in oxygen transport and overall health. Monitoring these levels can provide critical information for diagnosing and managing various health conditions.

## Question: 7

The gas that remains in the lungs after forced expiration is known as which of the following?

A. expiratory reserve volume
B. inspiratory reserve volume
C. residual volume
D. tidal volume

**Answer: C**

Explanation:
Residual volume refers to the amount of air that remains in the lungs after a person has exhaled as forcefully as possible. This volume of air cannot be voluntarily expelled from the lungs because it is required to keep the alveoli (the tiny air sacs in the lungs) open and prevent lung collapse. Maintaining these air sacs in an open state is critical for ongoing gas exchange between the lungs and the bloodstream, even between breaths.
The typical range of residual volume is between 1000 to 1200 milliliters (mL) in a healthy adult, though this can vary based on factors such as age, sex, and body size. For instance, it tends to be lower in children and higher in adults, and can be influenced by the overall health and lung capacity of an individual.
It's important to differentiate residual volume from other lung volumes and capacities. For example, expiratory reserve volume is the additional air that can be forcibly exhaled after the end of a normal tidal exhalation. Inspiratory reserve volume, on the other hand, is the extra amount of air that can be inhaled with maximum effort after a normal inhalation. Tidal volume is the amount of air inhaled or exhaled during normal breathing without any extra effort. Each of these volumes plays a crucial role in overall lung function and respiratory health, but residual volume is specifically key to preventing lung collapse and ensuring that gas exchange continues efficiently at all times.

## Question: 8

Which of the following types of seizure is caused by an elevated body temperature that is not associated with a central nervous system infection?

A. febrile seizure
B. absence seizure
C. atonic seizure
D. clonic seizure

**Answer: A**

Explanation:
A febrile seizure, also known as a fever-induced seizure or febrile convulsion, is a convulsive event in young children triggered by a spike in body temperature, often from an infection outside the central nervous system (CNS). These episodes are not caused by an infection of the CNS, such as meningitis or encephalitis, but are rather a response to a rapid increase in temperature, typically above 38°C (100.4°F).
Febrile seizures are most common in children between the ages of 6 months and 5 years, with the peak incidence occurring in toddlers around 18-24 months of age. The risk of experiencing these seizures starts to decline after the age of 5. It is important to note that these seizures are relatively common, affecting 2% to 5% of children in the U.S. and Europe. Boys are slightly more prone to febrile seizures than girls.
The exact mechanism behind febrile seizures is not fully understood, but it is believed to involve the immature brain's response to fever. Young children have a lower seizure threshold compared to adults, which means their brains are more susceptible to seizures in the presence of fever. Genetic factors also play a role, as having a family history of febrile seizures increases a child's risk of experiencing them.

Clinically, febrile seizures are classified into two types: simple and complex. A simple febrile seizure is short, generally lasting less than 15 minutes, and does not recur within a 24-hour period. It involves convulsions that are generalized and affect both sides of the body. On the other hand, a complex febrile seizure may last longer than 15 minutes, occur more than once within 24 hours, or be focal, affecting only one part of the body.
Febrile seizures, although alarming for parents, are generally benign and do not lead to permanent brain damage, developmental delays, or future neurological problems like epilepsy. Management primarily focuses on treating the cause of the fever and providing safety measures during a seizure to prevent injury. Regular use of antipyretics during illness to prevent fever spikes is common, although it does not necessarily prevent a febrile seizure. In some cases, preventive medication may be recommended for children with a high risk of recurrent febrile seizures.
Overall, febrile seizures are a relatively common pediatric condition linked with high fevers, not CNS infections, and usually resolve without long-term effects. However, any first instance of a febrile seizure should prompt a medical evaluation to rule out more serious conditions and to provide guidance on managing future fevers.

## Question: 9

A tear in the posterior rim of the capsule that encloses the gelatinous center of the spinal disk is known as which of the following?

A. degenerative disk disease
B. spondylosis
C. spinal cord tumor
D. herniated intervertebral disk

## Answer: D

Explanation:
The correct answer to the question is a herniated intervertebral disk. This medical condition involves a tear in the posterior rim of the capsule that encloses the gelatinous center, known as the nucleus pulposus, of a spinal disk. The spinal disks are crucial structures located between the vertebrae (the bones of the spine) that act as shock absorbers and allow flexibility in the spine.
The nucleus pulposus inside these disks is a soft, jelly-like center that distributes pressure across the disk to reduce the impact on the spinal column during daily activities and movements. When there is a herniation, the nucleus pulposus protrudes or leaks out through a tear in the tougher, outer ring of the disk, known as the annulus fibrosus. This usually occurs in the posterior (back) side of the disk, which faces the spinal canal.
The causes of a herniated intervertebral disk can vary but often include factors such as trauma to the spine, degenerative disk disease, which is a condition that causes the disks to deteriorate with age, or improper lifting techniques that place excessive strain on the spine. Symptoms of a herniated disk can include pain, numbness, and weakness in the limbs, as well as back pain. In severe cases, it can affect nerve function due to pressure on the spinal nerves or spinal cord.
Diagnosis of a herniated disk is typically achieved through imaging studies such as MRI or CT scans, which provide detailed images of the body's internal structures, allowing healthcare providers to see the extent of disk damage and displacement. Treatment options can vary depending on the severity of the herniation and the specific symptoms experienced by the patient. Conservative treatments may include

physical therapy, medications to reduce pain and inflammation, and in some cases, corticosteroid injections. Surgical options might be considered if conservative treatments fail to relieve symptoms or if there is significant nerve or spinal cord compression.
Overall, understanding the nature of a herniated intervertebral disk is crucial for effective management and treatment. This condition, while potentially painful and debilitating, often can be managed effectively with the right combination of medical interventions and lifestyle adjustments.

## Question: 10

The resistance against which the heart muscle must pump is called the:

A. stroke volume
B. myocardial contractility
C. preload
D. afterload

## Answer: D

Explanation:
The correct answer to the question regarding the resistance against which the heart muscle must pump is "afterload."
Afterload is a critical concept in cardiovascular physiology, referring specifically to the resistance that the left ventricle of the heart must overcome to circulate blood throughout the body. When the heart pumps, it must force blood out into the aorta through the aortic valve. The pressure in the aorta and the peripheral resistance the blood encounters as it flows through the circulatory system contribute to the afterload. Essentially, afterload is the load that the heart must work against during systole, the phase of the heart cycle when the heart contracts and pumps blood.
Stroke volume, another term mentioned in the question, is the volume of blood the heart ejects during each contraction. It is influenced by several factors, one of which is afterload. Higher afterload increases the workload on the heart and can reduce stroke volume if the heart muscle is unable to generate sufficient force to overcome the increased vascular resistance. In contrast, a lower afterload makes it easier for the heart to pump blood, potentially increasing stroke volume if other factors remain constant.
Myocardial contractility refers to the inherent capability of the heart muscle (myocardium) to contract. This factor is independent of heart load conditions like preload and afterload. Enhanced contractility leads to a more forceful contraction of the heart muscle, potentially increasing stroke volume by enabling the heart to pump a greater volume of blood with each beat, even against a high afterload.
Preload, yet another factor influencing stroke volume, is the volume of blood in the ventricles at the end of diastole (when the heart is filled). It represents the initial stretching of the cardiac myocytes prior to contraction. Essentially, it is the load placed on the heart before it contracts, setting the stage for how forcefully the heart needs to pump based on how much it is filled.
In summary, while preload sets the initial conditions of the heart's pump, and myocardial contractility enhances its power, afterload is the resistance that must be overcome by this power. Understanding these interrelationships is crucial for comprehending how the heart functions under various physiological and pathological conditions.

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