NEET-PG Forensic Medicine Sample Paper-10

Duration: 10 Minutes **Maximum Marks: 40**

Instructions

- This paper contains **10** Multiple Choice Questions.
- Each correct answer carries **+4** mark. Incorrect answer: **−1** marks.Only **one** correct option.
- Unattempted questions carry **0** marks.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. A 32-year-old married woman was brought dead to the emergency department with a history of recurrent domestic physical abuse by her husband's family for dowry. Her death occurred within 5 years of her marriage under suspicious circumstances. Under which section of the Bharatiya Nyaya Sanhita (BNS), 2023, must the police primarily register a case for dowry death?

(A) Section 304B

(B) Section 80

(C) Section 85

(D) Section 79

Q2. A 45-year-old industrial worker is brought to the casualty with complaints of severe abdominal colic, peripheral neuropathy manifesting as wrist drop, and a noticeable dark blue-black line along the margins of his gums. On evaluation, punctate basophilic stippling of red blood cells is noted. Which of the following chelating agents is the most appropriate first-line treatment for this patient?

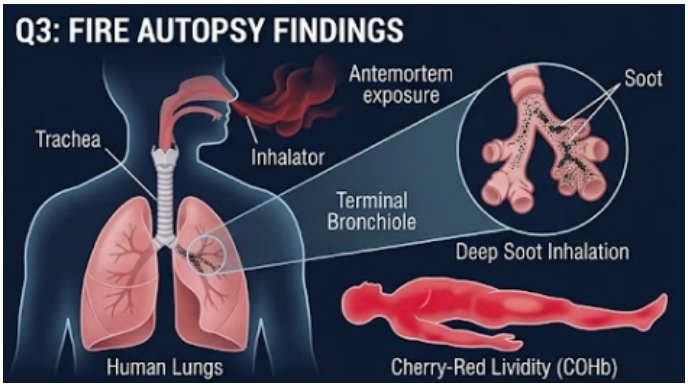
(A) British Anti-Lewisite (BAL)

(B) Desferrioxamine

(C) Penicillamine

(D) Calcium disodium EDTA

Q3. During the medicolegal autopsy of a body recovered from a house fire, the forensic pathologist observes that the soot particles are present deep inside the trachea and major bronchi. Additionally, the post-mortem lividity exhibits a distinct cherry-red discoloration. Which of the following interpretations is most accurately supported by these findings?



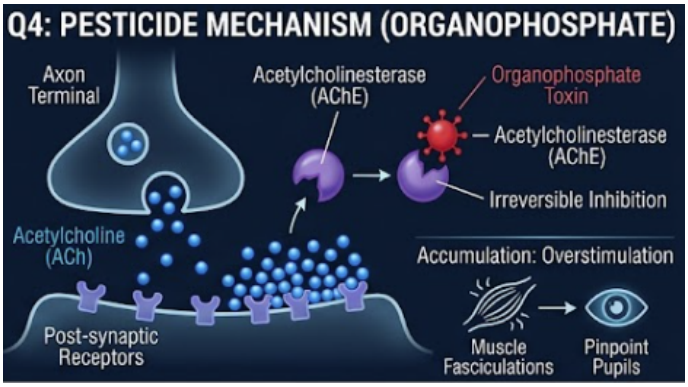
(A) The individual was dead before the fire started.

(B) The individual was alive during the fire and inhaled smoke.

(C) The cherry-red color is solely due to cold stiffening post-exposure.

(D) The death was caused by cyanide poisoning prior to the fire.

Q4. An unconscious adult male is brought to the hospital by his roommates, who state they found him next to an empty bottle of an unknown pesticide. On examination, the patient is sweating profusely, has pinpoint pupils, generalized muscle fasciculations, and a strong, distinct garlic-like odor on his breath. What is the primary mechanism of action of the toxin responsible for this clinical presentation?



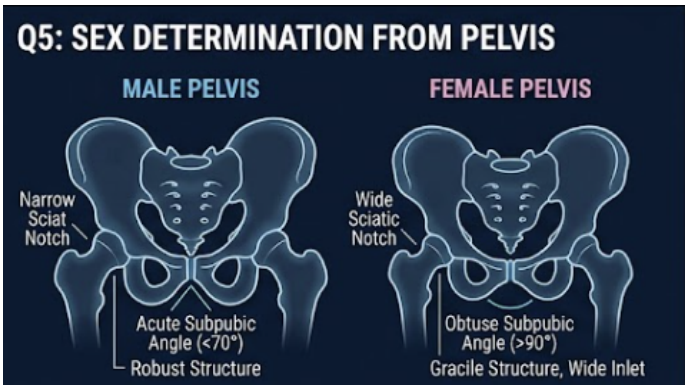
(A) Reversible inhibition of monoamine oxidase

(B) Irreversible inhibition of acetylcholinesterase

(C) Activation of voltage-gated sodium channels

(D) Competitive antagonism at muscarinic receptors

Q5. A skeletal remain is brought for forensic identification. Examination of the pelvis reveals a deep, narrow greater sciatic notch, an acute subpubic angle ($< 70°$), and an oval-shaped obturator foramen. Additionally, the skull shows prominent supraorbital ridges and a well-developed mastoid process. Based on these features, what is the most probable sex of the individual?



(A) Male

(B) Female

(C) Intersex

(D) Indeterminate due to conflicting cranial features

Q6. A judicial magistrate requests a medical practitioner to perform a body cavity examination on an accused individual under custody without an explicit written warrant, but under an urgent verbal directive during an ongoing investigation. According to the current legal provisions in India, a registered medical practitioner performing an examination of an accused at the request of a police officer must do so under which specific framework?

(A) Section 53 CrPC / Section 51 BNSS

(B) Section 164A CrPC / Section 184 BNSS

(C) Section 311 CrPC / Section 349 BNSS

(D) Section 45 Indian Evidence Act / Section 39 BSA

Q7. A 24-year-old student is brought to the emergency department in a state of acute delirium. He presents with dry, flushed skin, a rapid heart rate, dilated pupils that are unresponsive to light, and a high body temperature. His friends mention he ingested some wild seeds as an experiment. Which of the following pharmacological agents should be used as a specific antidote if the patient develops severe central nervous system toxicity?

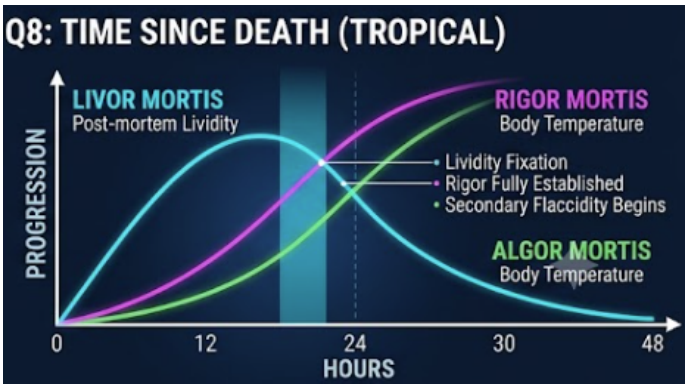
(A) Atropine sulfate

(B) Pralidoxime

(C) Physostigmine

(D) Neostigmine

Q8. A body is brought for post-mortem examination. The forensic expert notes that the hypostasis (post-mortem lividity) has become completely fixed and does not blanch upon applying digital pressure. Furthermore, rigor mortis is well-established all over the body, including the small muscles of the fingers and toes. What is the estimated time since death for this individual under average tropical environmental conditions?



(A) 2 to 4 hours

(B) 6 to 8 hours

(C) 12 to 24 hours

(D) 36 to 48 hours

Q9. A psychiatric patient is rushed to the hospital after consuming a massive overdose of his prescribed antidepressant medication. His electrocardiogram

(ECG) reveals a prolonged QTc interval and a widening of the QRS complex (> 120 ms). He subsequently develops generalized seizures. Which of the following substances is most likely responsible for this presentation?

(A) Amitriptyline

(B) Fluoxetine

(C) Lithium carbonate

(D) Diazepam

Q10. A young woman is brought to a government hospital by her family, alleging that she was subjected to sexual assault a few hours ago. As the duty medical officer, you are required to perform a medicolegal examination. Which of the following statements correctly reflects the legal and ethical guidelines for this procedure?

(A) The examination can be conducted without consent if the police request it in writing.

(B) The absence of signs of physical violence on the hymen confirms that no assault took place.

(C) Informed written consent must be obtained from the victim, or her legal guardian if she is a minor, prior to the examination.

(D) The two-finger test must be routinely performed to assess vaginal laxity and habituation.

Detailed Solutions

Q1.

Solution

Concept:

The legal framework surrounding unnatural deaths of women within 7 years of marriage involving cruelty or harassment for dowry is governed by specialized penal provisions. With the replacement of the Indian Penal Code (IPC) by the Bharatiya Nyaya Sanhita (BNS), 2023, the classic penal sections have been rearranged into a new statutory hierarchy.

Solution:

Step 1: Analyze the clinical and circumstantial data provided. The victim is a 32-year-old married woman who died under suspicious circumstances within 5 years of marriage (which is within the statutory 7-year window) with a clear, documented history of domestic physical abuse linked directly to dowry demands.

Step 2: Under the old Indian Penal Code, this offense was registered under Section 304B (Dowry Death). However, with the enforcement of the Bharatiya Nyaya Sanhita (BNS), 2023, the criminal laws have been overhauled.

Step 3: Map out the relevant sections of the new BNS, 2023. Section 79 of the BNS explicitly defines and penalizes the offense of "Dowry Death," effectively replacing Section 304B of the old IPC.

Step 4: Evaluate the other options to rule out mismatches. Section 80 of the BNS deals with abetment of suicide of a child or insane person. Section 85 of the BNS relates to cruelty by a husband or relatives of the husband (formerly Section 498A IPC). Section 304B is the legacy IPC section and is no longer the primary active section for registering new cases under the current BNS framework.

Step 5: Therefore, the primary section under which the police must register this specific case of dowry death under the modernized penal code is Section 79 of the BNS.

Final Answer: Section 79

Answer: (D)

Go Back to Question 1

Q2.

Solution

Concept:

Heavy metal toxicity manifests through specific clinical signs, such as gastrointestinal distress, neurological deficits, and hematological abnormalities. Effective management relies on selecting a specific chelating agent that possesses optimal binding affinities for the toxic metal ion, forming stable, non-toxic, water-soluble complexes that can be readily excreted by the kidneys.

Solution:

Step 1: Identify the toxic agent from the patient's presentation. The combination of severe abdominal colic (lead colic), peripheral neuropathy manifesting as wrist drop due to demyelination, a dark blue-black line along the margins of the gums (Burtonian line), and punctate basophilic stippling of red blood cells on peripheral smear is pathognomonic for chronic lead poisoning (plumbism).

Step 2: Review the specific therapeutic properties of the available chelators. For severe or symptomatic lead poisoning in adults, the primary choice is a chelating agent that effectively binds extracellular lead ions.

Step 3: Evaluate Calcium disodium EDTA ($CaNa_2EDTA$). This agent works by displacing its calcium ion for lead, forming a highly stable, soluble chelate that is excreted in the urine. It is the established first-line treatment for lead encephalopathy and severe lead poisoning in adults, often combined with BAL in extreme cases.

Step 4: Differentiate from other choices. British Anti-Lewisite (BAL) is used for arsenic, mercury, and gold poisoning, and as an adjunct in severe lead poisoning, but not typically as a standalone first-line agent when EDTA is indicated. Desferrioxamine is an iron-chelating agent used for acute iron poisoning or chronic iron overload. Penicillamine is an oral agent used primarily for copper chelation in Wilson's disease or low-level chronic lead poisoning, but is not the preferred first-line agent for acute, severe occupational presentations.

Step 5: Thus, Calcium disodium EDTA stands out as the most appropriate first-line targeted therapeutic agent for this presentation.

Final Answer: Calcium disodium EDTA

Answer: (D)

Go Back to Question 2

Q3.

Solution

Concept:

Distinguishing between an individual who was alive during a fire (antemortem exposure) and a body placed in a fire after death (postmortem exposure) is a crucial task in forensic pathology. This relies heavily on detecting active physiological processes, such as respiration and systemic circulation, which cease immediately upon death.

Solution:

Step 1: Evaluate the first major autopsy finding: the presence of soot particles deep within the lumen of the trachea and major bronchi. For soot to penetrate deeply into the lower respiratory tract, active, deep inspiratory efforts must have occurred. Postmortem passive deposition of smoke cannot reach these deeper divisions of the respiratory tree.

Step 2: Evaluate the second major autopsy finding: the distinct cherry-red discoloration of the post-mortem lividity. This coloration is due to the formation of carboxyhemoglobin (COHb), which occurs when carbon monoxide (CO) gas generated during incomplete combustion is actively inhaled and binds to hemoglobin in circulating red blood cells.

Step 3: Synthesize these observations. The combination of deep respiratory soot inhalation and systemic distribution of carboxyhemoglobin conclusively proves that the individual was alive and breathing in the smoky, toxic atmosphere of the fire.

Step 4: Exclude alternative explanations. If the individual had been dead before the fire started, the respiratory tract would be clear of soot below the vocal cords, and the carboxyhemoglobin levels would not be elevated to cause widespread cherry-red lividity. Cyanide poisoning can cause a bright pink or cherry-red discoloration, but it would not account for the inhalation of soot deep into the respiratory system.

Step 5: Therefore, these specific findings firmly indicate that the individual was alive during the fire and inhaled smoke.

Final Answer: The individual was alive during the fire and inhaled smoke.

Answer: (B)

Go Back to Question 3

Q4.

Solution

Concept:

The autonomic toxidrome resulting from agricultural pesticide exposure involves the hyper-stimulation of the parasympathetic nervous system. Understanding the biochemical target of these compounds explains the rapid onset of muscarinic and nicotinic overactivity seen clinically.

Solution:

Step 1: Analyze the patient's classic toxidrome. The clinical presentation includes profuse sweating (diaphoresis), pinpoint pupils (miosis), generalized muscle fasciculations, and a prominent garlic-like odor on the breath. These signs are highly characteristic of acute poisoning by organophosphate compounds or carbamates, which are common agricultural pesticides.

Step 2: Examine the molecular mechanism of organophosphate toxicity. Organophosphates bind to the active site of the enzyme acetylcholinesterase (AChE) at nerve synapses and neuromuscular junctions.

Step 3: This binding results in the phosphorylation and subsequent irreversible inhibition of acetylcholinesterase. As a consequence, the enzyme can no longer hydrolyze the neurotransmitter acetylcholine (ACh) into choline and acetic acid.

Step 4: The failure to degrade acetylcholine leads to its continuous accumulation within the synaptic cleft. This produces excessive and unremitting stimulation of both muscarinic receptors (causing miosis, sweating, salivation, and bradycardia) and nicotinic receptors (causing muscle twitching, fasciculations, and eventual paralysis).

Step 5: Compare with other mechanisms. It does not involve monoamine oxidase inhibition, voltage-gated sodium channel activation, or competitive antagonism at muscarinic receptors (which would cause an anticholinergic syndrome, the exact opposite of this presentation). Thus, the core mechanism is the irreversible inhibition of acetylcholinesterase.

Final Answer: Irreversible inhibition of acetylcholinesterase

Answer: (B)

Go Back to Question 4

Q5.

Solution

Concept:

Forensic anthropology utilizes specific skeletal morphology to establish biological profile components like sex, age, and stature. The pelvis and the skull provide the highest accuracy for sex determination due to the evolutionary adaptations of the female skeleton for childbirth and the greater muscular ruggedness typically found in the male skeleton.

Solution:

Step 1: Examine the provided pelvic characteristics. A deep and narrow greater sciatic notch is highly characteristic of male pelvic anatomy, whereas females present with a wide and shallow notch. An acute subpubic angle ($\theta < 70°$) is a classic male feature, contrasting with the wide, obtuse subpubic angle ($\theta > 90°$) found in females. The oval-shaped obturator foramen also aligns with male anatomy, while it tends to be more triangular in females.

Step 2: Analyze the cranial characteristics presented. Prominent, heavy supraorbital ridges (brow ridges) and a large, well-developed, blunt mastoid process are reliable indicators of male skeletal robustness, driven by testosterone-mediated bone remodeling during and after puberty.

Step 3: Correlate all findings. Both the pelvic metrics (which carry the highest diagnostic accuracy for sex determination, around 90–95%) and the cranial features consistently point in the same direction without any conflicting markers.

Step 4: Eliminate alternative options. The skeleton does not show the typical wide, spacious, and non-rugged characteristics of a female pelvis, nor are there any intermediate or contradictory features to suggest an indeterminate or intersex status.

Step 5: Conclude that based on the uniform expression of robust cranial and narrow pelvic traits, the biological sex is male.

Final Answer: Male

Answer: (A)

Go Back to Question 5

Q6.

Solution

Concept:

The legal provisions regulating the mandatory medical examination of an accused individual by a registered medical practitioner are strictly codified to protect constitutional rights while facilitating criminal investigations. With the implementation of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023, traditional sections of the Code of Criminal Procedure (CrPC) have been mapped to new equivalents.

Solution:

Step 1: Identify the nature of the legal request. The scenario involves a medical examination of an accused person conducted by a registered medical practitioner at the request of a police officer or under directive to assist an ongoing criminal investigation.

Step 2: Recall the legacy statutory provision. Under the Code of Criminal Procedure, 1973, Section 53 explicitly empowers a police officer to request a registered medical practitioner to conduct a medical examination of an accused person using reasonable force if necessary to locate evidence.

Step 3: Map this legacy section to the newly enacted Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023. Section 53 of the old CrPC has been structurally transitioned into Section 51 of the BNSS, 2023.

Step 4: Analyze alternative sections to confirm accuracy. Section 164A of the CrPC (now Section 184 of the BNSS) specifically governs the medical examination of a victim of rape, which requires explicit informed consent and follows a separate administrative protocol. Section 311 of the CrPC relates to the power of the court to summon material witnesses, and Section 45 of the Indian Evidence Act concerns expert witness testimony (now under the Bharatiya Sakshya Adhiniyam, BSA).

Step 5: Therefore, the specific legal framework governing the medical examination of an accused person at the instance of the investigating agency is Section 53 CrPC / Section 51 BNSS.

Final Answer: Section 53 CrPC / Section 51 BNSS

Answer: (A)

Go Back to Question 6

Q7.

Solution

Concept:

Toxicity from deliriant toxic plants results from competitive blockade of muscarinic acetylcholine receptors, both peripherally and centrally. Reversing severe central nervous system toxic manifestations requires a specific antidote capable of crossing the blood-brain barrier to elevate synaptic acetylcholine levels.

Solution:

Step 1: Diagnose the underlying clinical syndrome. The patient presents with classic signs: acute delirium, dry and flushed skin, tachycardia, fixed dilated pupils (mydriasis), and hyperthermia. This cluster of signs represents a classic anticholinergic toxidrome, often summarized as "mad as a hatter, dry as a bone, red as a beet, blind as a bat, and hot as a hare." This is caused by ingesting tropane alkaloids from plants like *Datura stramonium* or *Atropa belladonna*.

Step 2: Identify the therapeutic target. The toxicity is due to competitive antagonism at muscarinic acetylcholine receptors. To overcome this block in severe cases involving central manifestations like wild delirium, seizures, or coma, an acetylcholinesterase inhibitor must be utilized.

Step 3: Evaluate Physostigmine. Physostigmine is a tertiary amine structure. Because it is uncharged, it easily crosses the lipophilic blood-brain barrier. Once in the central nervous system, it inhibits acetylcholinesterase, leading to an increase in endogenous acetylcholine concentrations, which successfully outcompetes the tropane alkaloids at the central receptor sites.

Step 4: Differentiate from other choices. Neostigmine and pyridostigmine contain quaternary ammonium structures; they are permanently charged and cannot cross the blood-brain barrier, making them useless for central anticholinergic delirium. Atropine sulfate is a muscarinic antagonist and would worsen the condition. Pralidoxime is an acetylcholinesterase reactivator used specifically for organophosphate poisonings.

Step 5: Thus, Physostigmine is the specific antidote indicated for severe central nervous system anticholinergic toxicity.

Final Answer: Physostigmine

Answer: (C)

Go Back to Question 7

Q8.

Solution

Concept:

The sequential progression of post-mortem changes—specifically algor mortis, livor mortis (hypostasis), and rigor mortis—provides forensic experts with a reliable timeline to estimate the time elapsed since death. The rate of these processes depends on predictable physical and chemical alterations within body tissues post-fixation.

Solution:

Step 1: Analyze the status of post-mortem lividity (hypostasis). The prompt states that hypostasis has become completely fixed and does not blanch upon digital pressure. Post-mortem lividity typically begins within 1 to 2 hours after death, becomes fully expressed, and fixes completely between 6 to 12 hours post-mortem, as red blood cells sediment permanently and hemolyze into the surrounding dermis.

Step 2: Analyze the status of rigor mortis. The prompt indicates that rigor mortis is well-established all over the body, including both large muscles and the small muscles of the fingers and toes. Under average tropical climates, rigor mortis takes approximately 12 hours to fully develop across the entire muscular system from head to toe.

Step 3: Synthesize the timeline based on environmental context. In tropical zones, the standard rule of thumb for rigor mortis is that it takes about 12 hours to fully establish, stays fully manifest for another 12 hours (totaling 12 to 24 hours), and then begins to recede in the same order it appeared due to secondary flaccidity from autolysis.

Step 4: Since hypostasis is completely fixed (indicating $>$ 6–12 hours) and rigor mortis is fully established throughout the entire body but has not yet started to recede (indicating it is within the peak plateau phase), the most accurate timeline estimation lies between 12 and 24 hours.

Step 5: Eliminate shorter windows (2 to 8 hours) because rigor would not be fully established in the lower extremities and distal small digits, and lividity would still blanch. Windows past 36 hours can be eliminated because rigor would have entirely passed due to tissue decomposition.

Final Answer: 12 to 24 hours

Answer: (C)

Go Back to Question 8

Q9.

Solution

Concept:

Overdoses of certain psychiatric medications can result in severe cardiovascular toxicity and neurological instability. Understanding the cardiotoxic fingerprint on an electrocardiogram—specifically relating to sodium channel blockade—helps pinpoint the exact drug class involved in an acute overdose presentation.

Solution:

Step 1: Deconstruct the clinical presentation. The patient has ingested a massive overdose of an antidepressant, resulting in a prolonged QTc interval, a severely widened QRS complex (> 120 ms), and generalized tonic-clonic seizures.

Step 2: Identify the pathophysiological mechanism behind these specific ECG changes. Widening of the QRS complex in an antidepressant overdose is primarily driven by the potent inhibition of fast voltage-gated sodium channels ($Nav_{1.5}$) in the cardiac myocardium. This slows phase 0 of the cardiac action potential and delays intraventricular conduction. Prolongation of the QTc interval occurs due to blocking of the potassium efflux channels (I_{Kr}).

Step 3: Evaluate the antidepressant classes. Tricyclic Antidepressants (TCAs), of which Amitriptyline is a classic example, are notorious for this dangerous triad of toxicities: central nervous system depression/seizures, anticholinergic signs, and profound cardiotoxicity secondary to myocardial sodium channel blockade.

Step 4: Contrast with the other options provided. Fluoxetine is a Selective Serotonin Reuptake Inhibitor (SSRI) and carries a significantly wider therapeutic index; it rarely causes marked QRS widening or severe cardiotoxicity in isolation. Lithium overdose presents primarily with coarse tremors, ataxia, gastrointestinal distress, and neuromuscular irritability, but not acute, severe sodium-channel-mediated QRS widening. Diazepam is a benzodiazepine that causes generalized sedation and respiratory depression, but not conduction delays or cardiotoxicity.

Step 5: Conclude that Amitriptyline is the substance responsible for this classic cardiotoxic and neurotoxic profile.

Final Answer: Amitriptyline

Answer: (A)

Go Back to Question 9

Q10.

Solution

Concept:

The medicolegal evaluation of an alleged sexual assault victim requires strict adherence to legal statutes, medical ethics, and standard operational guidelines. Procedures must balance evidentiary collection with the human rights, dignity, and autonomy of the patient, avoiding outdated and unscientific practices.

Solution:

Step 1: Evaluate the absolute requirement for informed consent in medicolegal procedures. A medical examination of a sexual assault victim can never be legally or ethically performed without obtaining valid, informed written consent. If the victim is a competent adult, her individual consent is mandatory. If the victim is a minor or lacks capacity, consent must be obtained from a legally authorized guardian. A police request alone cannot override the requirement for personal or guardian consent.

Step 2: Examine option (B). The absence of structural physical injuries or lacerations to the hymen does not rule out sexual assault. The hymen can be naturally elastic, or the nature of the assault may not have caused mechanical tearing, meaning its integrity cannot be used to disprove an allegation of assault.

Step 3: Evaluate option (D) regarding the "two-finger test" (per vaginum examination to assess laxity). The Supreme Court of India and international medical guidelines have explicitly banned the two-finger test, declaring it unscientific, invasive, and a violation of a woman's right to privacy and dignity. It has zero diagnostic value in confirming or refuting sexual assault.

Step 4: Assess option (C). This statement aligns with forensic protocols and human rights frameworks: informed written consent must be obtained from the victim (or her legal guardian if she is a minor) prior to initiating any part of the examination or evidence collection.

Step 5: Thus, option (C) represents the correct and lawful guideline for conducting this medicolegal evaluation.

Final Answer: Informed written consent must be obtained from the victim, or her legal guardian if she is a minor, prior to the examination.

Answer: (C)

Go Back to Question 10

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	D	2	D	3	B	4	B	5	A
6	A	7	C	8	C	9	A	10	C