

NEET-PG Forensic Medicine Sample Paper-3

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 28-year-old married woman is brought dead to the emergency department with a history of acute onset severe abdominal pain and vomiting. Autopsy reveals a highly congested, hemorrhagic gastric mucosa with a distinct odor of bitter almonds emanating from the stomach contents. The forensic pathologist suspects poisoning. Under which section of the Bharatiya Nyaya Sanhita, 2023 (formerly Section 174 of the CrPC) must the police officer mandatorily forward the body for a medico-legal autopsy?

- (A) Section 194 BNS
- (B) Section 196 BNS
- (C) Section 172 BNS
- (D) Section 168 BNS

Q2. During the autopsy of an unidentified decomposed body recovered from a river, the medical examiner notes that the skin of the hands and feet is thickened, wrinkled, and white, peeling off in a glove-and-stockings fashion. No internal injuries or structural anomalies are detected. Which of the following statements regarding this post-mortem change is most accurate?

- (A) It accelerates the formation of adipocere due to the rapid influx of atmospheric oxygen.



- (B) It can reliably establish the exact time since death to within a two-hour window.
- (C) It occurs due to the imbibition of fluid into the cornified layers of the epidermis.
- (D) It is an absolute, pathognomonic indicator that the primary cause of death was drowning.

Q3. A 45-year-old agricultural worker is brought to the casualty in an altered mental state, presenting with severe miosis, muscle fasciculations, profuse sweating, and bronchorrhea. He was spraying pesticides in a field a few hours prior. He is immediately treated with intravenous atropine. Which of the following parameters is the most reliable clinical indicator to guide the titration and adequacy of further atropine therapy in this patient?

- (A) Complete reversal of pupillary constriction (mydriasis)
- (B) Drying of tracheobronchial secretions and clearance of lung crepitations
- (C) Normalization of the heart rate to above 100 beats per minute
- (D) Complete cessation of skeletal muscle twitching and fasciculations

Q4. A young woman is brought to a tertiary care hospital for a medical examination following an alleged sexual assault. The examining doctor documents the findings but fails to record the precise timing of the injuries and refuses to hand over a copy of the medical report to the survivor, citing administrative protocols. This failure to perform duty and provide documentation violates the specific mandates laid down under which section of the legal code?

- (A) Section 164A CrPC / Section 184 BNSS
- (B) Section 53 CrPC / Section 51 BNSS
- (C) Section 164 CrPC / Section 180 BNSS
- (D) Section 311 CrPC / Section 349 BNSS

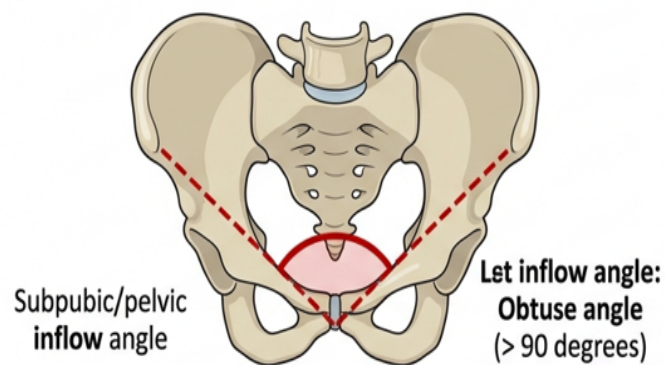
Q5. A 35-year-old male is admitted with a history of consuming a traditional herbal formulation for chronic joint pain. He presents with severe abdominal colic,



peripheral neuropathy presenting as wrist drop, and a distinct bluish-black line along the gingival margins. A peripheral blood smear demonstrates prominent basophilic stippling of erythrocytes. What is the primary mechanism of toxicity responsible for this presentation?

- (A) Inactivation of cytochrome c oxidase, halting the mitochondrial electron transport chain
- (B) Inhibition of aminolevulinic acid dehydratase (ALA-D) and ferrochelatase enzymes
- (C) Binding to sulfhydryl groups on pyruvate dehydrogenase, disrupting cellular respiration
- (D) Irreversible inhibition of acetylcholinesterase at central and peripheral nerve synapses

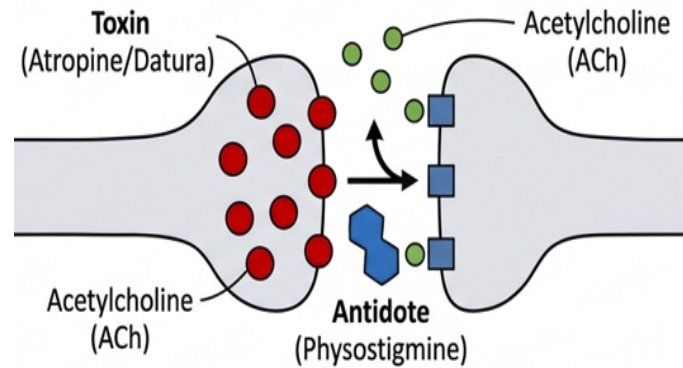
Q6. A skeletal remain consisting of a complete pelvis and skull is brought for forensic anthropological assessment to determine biological sex. On examination of the pelvis, which of the following combinations of features is most strongly indicative of a female skeleton?



- (A) Acute subpubic angle, narrow greater sciatic notch, and an elongated, narrow sacrum
- (B) Obtuse subpubic angle, wide greater sciatic notch, and a short, wide, curved sacrum
- (C) Acute subpubic angle, wide greater sciatic notch, and a long, narrow sacrum
- (D) Obtuse subpubic angle, narrow greater sciatic notch, and an elongated, flat sacrum



- Q7.** An emergency department receives a patient presenting with marked delirium, visual hallucinations, dry flushed skin, a rapid thready pulse, and dilated pupils that do not respond to light. The patient's friend mentions that they had ingested some wild seeds as part of a recreational challenge. Which of the following pharmacological agents acts as a specific antidote for this toxidrome?

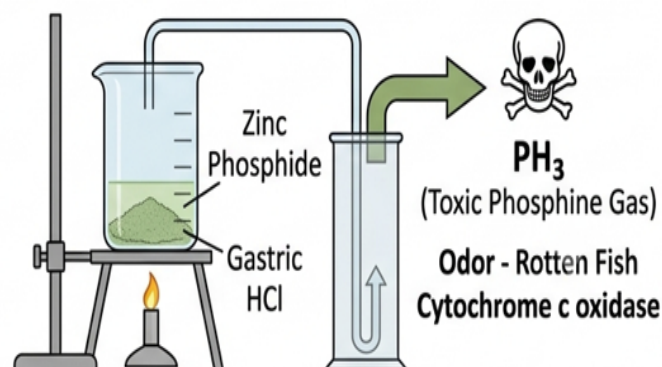


- (A) Pralidoxime
 (B) Physostigmine
 (C) Naloxone
 (D) Flumazenil
- Q8.** A medical practitioner is summoned to a Court of Session as an expert witness to testify in a homicide case. During cross-examination, the defense counsel asks a series of highly technical, hypothetical questions designed to test the witness's expertise, followed by leading questions to challenge the consistency of the post-mortem report. According to the Indian Evidence Act (and Bharatiya Sakshya Adhiniyam), during which stage of judicial examination are leading questions permitted without the prior permission of the court?
- (A) Examination-in-chief
 (B) Re-examination
 (C) Cross-examination
 (D) None of the stages; they are strictly prohibited for expert witnesses
- Q9.** During a forensic autopsy of a victim who succumbed to a fire outbreak inside an enclosed basement, the pathologist notes bright cherry-red discoloration

of the lividity, blood, and internal organs. The lungs are congested but show no significant soot deposition in the lower trachea. Which of the following analytical findings would definitively confirm that the victim was alive when the fire started?

- (A) High concentration of methemoglobin in the peripheral blood
- (B) Presence of carboxyhemoglobin saturation exceeding 10% in the blood
- (C) High levels of unburned hydrocarbons detected in the gastric aspirate
- (D) Detection of elevated cyanide levels in the vitreous humor alone

Q10. A patient presents to the emergency room in a state of shock after accidentally ingesting a rodenticide containing zinc phosphide. The patient complains of a severe burning sensation in the chest and abdomen, accompanied by vomiting that smells distinctively of rotten fish. Which of the following is the most critical initial management step, and what toxic gas is released upon reaction with gastric acid?



- (A) Gastric lavage with activated charcoal; releases Arsine gas
- (B) Gastric lavage with sodium bicarbonate; releases Phosphine gas
- (C) Gastric lavage with diluted potassium permanganate; releases Phosphine gas
- (D) Induction of emesis followed by oral N-acetylcysteine; releases Hydrogen sulfide gas



Detailed Solutions**Q1.****Solution**

Concept: Under the legal frameworks of forensic medicine, sudden, unexpected, or suspicious deaths of a married woman within 7 years of marriage must be treated with mandatory investigative procedures. For statutory medical autopsies, the police or magistrate forwards the body under specific procedural sections of the criminal code. With the replacement of the Code of Criminal Procedure (CrPC) by the Bharatiya Nagarik Suraksha Sanhita (BNSS) and the Indian Penal Code (IPC) by the Bharatiya Nyaya Sanhita (BNS), corresponding new sections govern these statutory inquests and forensic mandates.

Solution: Step 1: Analyze the clinical and historical presentation. The deceased is a 28-year-old married woman who died suddenly within a short period, showing signs of potential cyanide poisoning (distinct bitter almond odor and highly congested gastric mucosa).

Step 2: Identify the legal context. Previously, Section 174 of the CrPC governed the procedure for the police to inquire and report on suicide or sudden/suspicious deaths. Specifically, Section 174(3) CrPC made it mandatory to forward the body for an autopsy if the case involved a woman dying within 7 years of her marriage under suspicious circumstances.

Step 3: Correlate with the updated Indian penal legislations enacted recently. The provisions of Section 174 of the CrPC have been mapped directly to Section 194 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023. This section details the mandatory police inquest and forensic autopsy protocols for unnatural or suspicious deaths.

Step 4: Differentiate between the options provided to find the exact dynamic assignment. The question specifically queries the procedural framework matching the modern BNS/BNSS system that dictates how a police officer must legally mandate a medico-legal autopsy. Section 194 of the BNSS handles the physical execution of this inquest process.

Final Answer:

Answer: (A)

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Q2.

Solution

Concept: Maceration and immersion changes in water provide critical forensic clues during the autopsy of submerged bodies. When a body remains in water, passive imbibition of fluid occurs into the outermost layers of the skin, leading to a classical physical alteration known as washerwoman's hands and feet. This process is fully mechanical and relies entirely on physical fluid transport dynamics rather than vital biological tissue reactions.

Solution: Step 1: Identify the post-mortem finding described in the vignette. The skin of the hands and feet becoming thickened, wrinkled, white, and peeling off in a glove-and-stocking distribution is called "washerwoman's skin" or skin maceration.

Step 2: Evaluate the underlying pathophysiology. This physical phenomenon happens purely because of the physical imbibition of water into the thick cornified layers of the epidermis (stratum corneum), which swells and loosens from the deeper dermal layers over prolonged immersion.

Step 3: Assess the diagnostic specificity. While commonly found in cases of drowning, washerwoman's skin is not pathognomonic of drowning because it occurs uniformly in any body placed or falling into water post-mortem. Thus, it only indicates immersion, not the active physiological mechanism of drowning.

Step 4: Review chronological reliability. The timeline for skin wrinkling and peeling varies significantly based on water temperature, salinity, and movement. Therefore, it cannot be utilized to pin down the exact time since death within a rigid two-hour window.

Step 5: Review options. It does not accelerate adipocere via oxygen influx; adipocere is an anaerobic hydrolytic process. The true mechanism is purely the imbibition of fluid into the cornified layers of the epidermis.

Final Answer: It occurs due to the imbibition of fluid into the cornified layers of the epidermis.

Answer: (C)

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Q3.

Solution

Concept: Acute poisoning by organophosphates or carbamate insecticides induces a state of cholinergic crisis through the irreversible or reversible inhibition of acetylcholinesterase. This results in toxic accumulation of acetylcholine at muscarinic and nicotinic receptors. Atropine works as a competitive antagonist specifically at muscarinic receptor sites. Titrating atropine requires monitoring clinical signs of adequate muscarinic blockade.

Solution: Step 1: Identify the clinical toxidrome. The patient exhibits severe miosis, fasciculations, profuse sweating, and bronchorrhea after handling agricultural pesticides, confirming acute organophosphate toxicity.

Step 2: Determine the objective of atropinization. Atropine reverses life-threatening muscarinic overstimulation, which manifests primarily as excessive bronchial secretions (bronchorrhea) and bronchoconstriction. These respiratory complications represent the primary cause of death in these patients.

Step 3: Evaluate clinical end-points for titration. While mydriasis (pupil dilation) and tachycardia (heart rate over 100 beats per minute) are systemic effects of atropine, they occur early and do not guarantee that the excessive pulmonary secretions are controlled.

Step 4: Note that nicotinic signs, such as skeletal muscle fasciculations and twitching, are completely unaffected by atropine because atropine blocks only muscarinic receptors. Nicotinic signs are managed using oximes (like pralidoxime).

Step 5: Conclude that the clearance of lung crepitations and the thorough drying of tracheobronchial secretions serve as the most crucial and reliable parameters to establish full and effective atropinization.

Final Answer: Drying of tracheobronchial secretions and clearance of lung crepitations

Answer: (B)

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Q4.

Solution

Concept: The statutory guidelines governing the medical evaluation of sexual assault survivors impose strict legal, professional, and ethical duties on the examining medical officer. Under modern legal reforms replacing the old Code of Criminal Procedure (CrPC) with the Bharatiya Nagarik Suraksha Sanhita (BNSS), specific sections dictate the documentation timelines, mandatory recording of physical findings, and the absolute statutory right of the survivor to receive a copy of the medical report immediately.

Solution: Step 1: Analyze the specific omissions of the examining doctor. The practitioner failed to record the precise timing of injuries and refused to provide a copy of the medical report directly to the survivor.

Step 2: Recall the legacy legal provision. Under the older framework, Section 164A of the CrPC explicitly detailed the strict procedure for the medical examination of a rape victim. This included a mandate that the report must state precisely the time of commencement and completion of the exam, along with an explicit clause stating that a copy must be given to the woman immediately.

Step 3: Map the older section to the modernized BNSS framework. Section 164A of the CrPC corresponds exactly to Section 184 of the Bharatiya Nagarik Suraksha Sanhita (BNSS).

Step 4: Differentiate from other options. Section 53 CrPC (Section 51 BNSS) deals with the medical examination of an accused individual by a practitioner at the request of a police officer, which does not fit the scenario of a survivor's examination.

Step 5: Therefore, the medical practitioner's administrative refusal and documentation failures directly violate the mandates of Section 164A CrPC / Section 184 BNSS.

Final Answer:

Answer: (A)

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Q5.

Solution

Concept: Chronic heavy metal poisoning often stems from adulterated traditional medications or occupational exposure. Lead toxicity (plumbism) characteristically impairs heme biosynthesis by inhibiting crucial sulfhydryl-containing enzymes inside the biosynthetic pathway. This metabolic blockade yields classic clinical findings such as motor neuropathy, abdominal colic, gingival pigment deposition, and characteristic erythrocyte morphology.

Solution: Step 1: Identify the clinical clues. Chronic joint pain treated with alternative herbal formulations, severe abdominal colic (lead colic), wrist drop (motor neuropathy from radial nerve palsy), a bluish-black Burtonian line on the gingival margins, and basophilic stippling on a peripheral smear collectively point to chronic lead poisoning.

Step 2: Examine the biochemical mechanism of lead toxicity. Lead directly interferes with multiple steps in the production of heme. It competitively binds to sulfhydryl groups on specific essential enzymes.

Step 3: Pinpoint the target enzymes. The two principal enzymes targeted and inhibited by lead are delta-aminolevulinic acid dehydratase (δ -ALA-D) and ferrochelatase. Ferrochelatase is responsible for inserting ferrous iron into protoporphyrin IX to form heme.

Step 4: Distinguish from alternative toxic mechanisms. Cytochrome c oxidase inhibition is characteristic of cyanide toxicity. Pyruvate dehydrogenase disruption via sulfhydryl binding is classic for arsenic poisoning. Acetylcholinesterase inhibition represents organophosphate exposure. Thus, the physiological mechanism is enzyme inhibition of ALA-D and ferrochelatase.

Final Answer: Inhibition of aminolevulinic acid dehydratase (ALA-D) and ferrochelatase enzymes

Answer: (B)

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Q6.

Solution

Concept: Biological sex determination from skeletal remains is a fundamental pillar of forensic anthropology and identification. The pelvis is the most sexually dimorphic bone in the human body due to evolutionary adaptations for childbearing in females. Systematic morphometric parameters of the subpubic area, sciatic notch, and sacral structure allow high-accuracy differentiation between male and female skeletal parts.

Solution: Step 1: Review the structural modifications of a female pelvis. The female pelvis is structurally designed to facilitate a birth canal, making it wider, shallower, and roomier than the robust, narrow male pelvis.

Step 2: Assess the subpubic angle. In females, the subpubic angle is obtuse, typically measuring between 90° and 100° (resembling a wide U-shape), whereas males present with an acute subpubic angle of less than 70° (resembling a narrow V-shape).

Step 3: Analyze the greater sciatic notch. The greater sciatic notch in females is wide and shallow (forming an angle of roughly 75°), allowing for a larger pelvic capacity, while in males it is narrow and deep.

Step 4: Evaluate sacral morphology. The female sacrum is characteristically short, wide, and more curved in its lower half to increase the AP diameter of the pelvic outlet. In contrast, the male sacrum is long, narrow, and evenly curved throughout.

Step 5: Synthesize the correct combination. An obtuse subpubic angle, a wide greater sciatic notch, and a short, wide, curved sacrum form the definitive criteria for a female skeleton.

Final Answer: Obtuse subpubic angle, wide greater sciatic notch, and a short, wide, curved sacrum

Answer: (B)

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Q7.

Solution

Concept: Anticholinergic toxidromes arise from the ingestion of competitive muscarinic receptor antagonists found in toxic plants such as *Datura stramonium* or *Atropa belladonna*. Central and peripheral signs occur simultaneously due to widespread acetylcholine blockade. Reversing severe, life-threatening central anticholinergic delirium requires a tertiary amine acetylcholinesterase inhibitor that effectively crosses the blood-brain barrier.

Solution: Step 1: Diagnose the clinical syndrome. The patient presents with classic features summarized by the mnemonic phrases for anticholinergic poisoning: "blind as a bat" (dilated non-reactive pupils), "mad as a hatter" (delirium and hallucinations), "red as a beet" (flushed skin), and "dry as a bone" (anhidrosis/dry skin). This identifies *Datura* seed consumption.

Step 2: Evaluate potential therapeutic antidotes. To counteract central nervous system toxicity such as severe delirium and hallucinations, an antidote must be capable of crossing the blood-brain barrier to raise synaptic acetylcholine levels.

Step 3: Compare physostigmine and neostigmine. Physostigmine is a tertiary amine carbamate that easily crosses into the central nervous system, making it the specific antidote for severe central anticholinergic toxicity. Neostigmine and pyridostigmine are quaternary amines that carry a charge and cannot penetrate the blood-brain barrier.

Step 4: Exclude alternative choices. Pralidoxime is an acetylcholinesterase reactivator used for organophosphates. Naloxone is a pure opioid antagonist. Flumazenil reverses benzodiazepines. Thus, physostigmine is the correct agent.

Final Answer:

Answer: (B)

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Q8.

Solution

Concept: The statutory rules of evidence govern the specific stages of witness testimony inside a court of law to maintain neutral and reliable truth-seeking. Leading questions—defined as questions that suggest the specific answer which the examining party wishes to receive—are highly regulated during judicial testimonies. Their admissibility depends strictly upon the distinct phase of examination.

Solution: Step 1: Define the chronological stages of a witness examination. The three standard consecutive steps of judicial examination in a court of law are: Examination-in-chief (conducted by the calling party), Cross-examination (conducted by the opposing party), and Re-examination (conducted by the calling party to clarify points raised in cross-examination).

Step 2: Understand the legal nature of leading questions. Under the Indian Evidence Act (and preserved precisely under the updated Bharatiya Sakshya Adhinyam, BSA), leading questions must not be asked in an examination-in-chief or in a re-examination without the explicit prior permission of the judge.

Step 3: Determine the rules for cross-examination. Leading questions are explicitly permitted by statutory right during cross-examination. The law allows this because the objective of cross-examination is to test the veracity, memory, consistency, and potential bias of the witness under adversarial scrutiny.

Step 4: Apply to the medical expert witness. No special exemptions restrict this rule for expert witnesses; the defense counsel is legally entitled to pose leading questions during cross-examination to challenge the post-mortem findings.

Final Answer:

Answer: (C)

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Q9.

Solution

Concept: Differentiating antemortem fatal injuries from post-mortem artifacts or exposure is an essential task during fire-related forensic autopsies. When an individual is caught alive in a conflagration, they actively inhale ambient combustion byproducts into their systemic circulation. Determining specific biochemical thresholds of inhaled gases provides absolute evidence of vitality before death.

Solution: Step 1: Analyze the pathognomonic finding. Bright cherry-red discoloration of internal tissues, blood, and hypostasis is caused by the formation of carboxyhemoglobin (*COHb*), which happens when carbon monoxide (*CO*) binds tightly to hemoglobin.

Step 2: Understand the physiological source of carbon monoxide. Incomplete combustion in an enclosed space produces massive amounts of *CO* gas. If an individual is alive when the fire breaks out, their active respiratory efforts lead to inhalation of this gas.

Step 3: Differentiate between antemortem and post-mortem absorption. Minimal quantities of *CO* can diffuse passively through skin layers post-mortem, but this never drives systemic blood carboxyhemoglobin saturation levels significantly high.

Step 4: Establish the definitive diagnostic threshold. A blood carboxyhemoglobin saturation level exceeding 10% (and frequently climbing above 40% to 50% in fatal exposures) provides undeniable proof that the victim was actively breathing and alive at the inception of the fire.

Step 5: Note that the absence of lower tracheal soot can happen in sudden flash fires due to laryngeal spasm, but the high systemic biochemical concentration of *COHb* remains an absolute indicator of antemortem vitality.

Final Answer: Presence of carboxyhemoglobin saturation exceeding 10% in the blood.

Answer: (B)

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Q10.

Solution

Concept: Metal phosphide rodenticides, such as zinc phosphide or aluminum phosphide, are highly lethal chemical compounds frequently involved in self-harm and accidental poisonings. Upon contact with moisture and gastric hydrochloric acid, these compounds undergo rapid chemical decomposition, releasing a highly toxic gas. Treatment requires neutralizing this reactive gas and avoiding compounds that speed up its liberation.

Solution: Step 1: Identify the chemical process. Ingested zinc phosphide (Zn_3P_2) reacts directly with water and hydrochloric acid (HCl) present inside the stomach cavity. This chemical reaction liberates phosphine gas (PH_3).

Step 2: Understand the nature of phosphine gas. Phosphine is an extremely toxic protoplasmic poison that inhibits mitochondrial cytochrome c oxidase, inducing severe oxidative cellular injury and refractory cardiovascular shock. It features a characteristic odor resembling rotten fish or garlic.

Step 3: Determine the correct initial gastric decontamination strategy. Emesis must be avoided to limit the risk of aspirating toxic fumes. Standard gastric lavage with water can accelerate the chemical reaction.

Step 4: Evaluate lavage fluids. Lavage using a 1:10000 dilution of potassium permanganate ($KMnO_4$) is highly effective because it acts as a potent oxidizing agent. It chemically oxidizes toxic phosphine gas into non-toxic, stable phosphate compounds.

Step 5: Contrast with alternatives. Lavage with sodium bicarbonate is avoided because reducing gastric acidity can stabilize the compound initially but does not actively oxidize the gas, while potassium permanganate neutralizes it directly. Thus, option C represents the correct choice.

Final Answer: Gastric lavage with diluted potassium permanganate; releases Phosphine gas

Answer: (C)

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Answer Key

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

