Answers

1. **Answer: c**

Explanation:

Roth's spots are specific findings observed during an eye examination, appearing as small, white, oval-shaped spots on the retina.

Roth's Spots: Associated Condition

These characteristic retinal spots are most commonly associated with **Infective endocarditis**.

- **Infective endocarditis** is a serious infection affecting the heart's inner lining or valves.
- The development of Roth's spots is thought to occur due to septic microemboli or immune complex deposition within the retinal blood vessels, stemming from the systemic infection.
- While a classic sign, improved antibiotic treatment and earlier diagnosis of infective endocarditis mean Roth's spots are observed less frequently today.

---

2. **Answer: a**

Explanation:

Anterior Wall MI Linked to Left Anterior Descending Artery

An acute anterior wall myocardial infarction (MI) occurs when blood flow is severely reduced or blocked in the part of the heart muscle supplied by the anterior wall. Diagnostic tools like coronary angiograms help identify the specific blocked artery.

Coronary Artery Anatomy and MI Location

The primary artery responsible for supplying blood to the anterior wall of the left ventricle is the Left Anterior Descending (LAD) artery. The LAD is a major branch of the left coronary artery.

- **Left Anterior Descending (LAD) artery:** Supplies the front (anterior) wall of the left ventricle and the interventricular septum. Occlusion here commonly causes anterior wall MIs.
- **Left Posterior Descending Artery (LPD):** Typically supplies the inferior portion of the posterior wall. It's usually a branch of the Right Coronary Artery (RCA), not directly linked to anterior MIs.
- **Right Coronary Artery (RCA):** Supplies the right ventricle, SA node, AV node, and often the inferior and posterior walls of the left ventricle. Blockage usually causes inferior or posterior MIs.
- **Circumflex artery (LCx):** Supplies the lateral and posterior walls of the left ventricle. Occlusion typically causes lateral or posterior MIs.

Reasoning for Obstruction

Given the patient developed an **acute anterior wall myocardial infarction**, the coronary angiogram is most likely to reveal an obstruction in the **Left Anterior Descending artery** (LAD). This is a classic correlation in cardiology.

Factors like smoking increase the risk of atherosclerosis, leading to plaque rupture and thrombus formation, causing coronary artery occlusion.

---

3. **Answer: b**

Explanation:

Kala-azar: Identifying the Incorrect Statement

The question asks to identify the statement that is NOT correct regarding Kala-azar. Let's analyze each statement:

- **Statement 1:** "It is caused by *Leishmania donovani*"

This statement is **correct**. Kala-azar, also known as visceral leishmaniasis, is caused by protozoan parasites of the *Leishmania donovani* complex.

- **Statement 2:** "It is transmitted by the bite of male sand flies"

  This statement is **incorrect**. Kala-azar is transmitted through the bite of infected **female** phlebotomine sand flies (species like *Phlebotomus argentipes* in India). Male sand flies do not typically feed on blood.

- **Statement 3:** "It is the promastigote form of parasite, which is transmitted to the human host at the time the sand fly bites the host"

  This statement is **correct**. When an infected female sand fly takes a blood meal, it injects the infective stage, the **promastigote** form of the parasite, into the human skin.

- **Statement 4:** "A patient may develop post Kala-azar dermal leishmaniasis during the course of therapy or a few months later"

  This statement is **correct**. Post Kala-azar Dermal Leishmaniasis (PKDL) is a known complication that can occur in some patients, either during treatment or later, characterized by skin lesions.

Therefore, the statement that is incorrect is the one claiming transmission by male sand flies.

---

4. **Answer: d**

Explanation:

Mitral Valvuloplasty Criteria: Identifying Exclusions

Mitral valvuloplasty is a procedure designed to treat mitral stenosis by widening the narrowed mitral valve, commonly using a balloon catheter. The suitability of a patient for this procedure depends on several specific criteria related to symptoms, valve condition, and the absence of contraindications.

Indications for Mitral Valvuloplasty

The procedure is generally considered appropriate for patients who:

- Experience **significant symptoms** directly related to mitral stenosis.
- Have **isolated mitral stenosis**, meaning the mitral valve area is significantly reduced (e.g., < 1.5 cm^2) without the presence of moderate-to-severe mitral regurgitation (leakage).
- Possess a valve morphology that is suitable for balloon dilation. This typically involves leaflets that are relatively pliable, **mobile**, and **non-calcified**, with minimal scarring or thickening in the structures below the valve. Echocardiography is used to assess these features, often using scoring systems like the Wilkin's score.

Exclusion Criteria for Mitral Valvuloplasty

Certain conditions make mitral valvuloplasty unsuitable or too risky:

- **Left atrial thrombus**: The presence of a blood clot within the left atrium is a critical contraindication because the procedure could dislodge the clot, leading to a stroke or other embolism.
- Moderate to severe mitral regurgitation.
- Extensive calcification or severe immobility of the valve leaflets.
- Complex subvalvular apparatus disease.
- Conditions requiring open-heart surgery for other reasons.

Analysis of Provided Options

Let's assess the options based on these criteria:

- **Significant symptoms**: This is typically an indication for intervention, not an exclusion.
- **Isolated mitral stenosis**: This is a fundamental requirement for considering valvuloplasty.
- **Mobile non-calcified valve**: This describes favorable valve anatomy, making the patient a good candidate.

- **Left atrial thrombus**: This condition poses a significant risk of stroke and therefore serves as an exclusion criterion for the procedure.

The presence of a **left atrial thrombus** is the exception among the criteria for performing a mitral valvuloplasty.

---

5. **Answer: a**

Explanation:

Cannon Wave Cause Explained

A "Cannon wave" refers to a specific phenomenon observed clinically, often related to heart rhythm disturbances.

Understanding Cannon Waves

Cannon waves occur when the atria contract against a closed atrioventricular (AV) valve (either the mitral or tricuspid valve). This forceful, simultaneous contraction causes a wave of increased venous pressure, which can sometimes be seen or felt clinically.

Cannon Waves and Complete Heart Block

The specific condition where cannon waves are characteristically seen is **complete heart block** (also known as third-degree AV block).

- In complete heart block, there is a complete dissociation between atrial and ventricular electrical activity. The atria and ventricles beat independently.
- Occasionally, a P wave (representing atrial contraction) occurs at the exact time the AV valve is closed due to ventricular contraction.
- When this happens, the atrium contracts forcefully against a closed valve, generating the cannon wave.

Why Other Options Are Less Likely

- **Left/Right Ventricular Hypertrophy**: These relate to thickening of the ventricle walls due to increased workload. While they affect heart function, they don't directly cause the specific timing issue leading to cannon waves.
- **Mitral Stenosis**: This is a narrowing of the mitral valve, obstructing blood flow from the left atrium to the left ventricle. It causes different pressure changes and wave patterns, not typically cannon waves.

Therefore, the observation of cannon waves strongly suggests AV dissociation, most commonly seen in complete heart block.

---

6. **Answer: c**

Explanation:

Genetic Disorders and Gene Defects Matching Solution

Understanding the Matches

This solution details the correct pairings between specific genetic disorders and the gene defects responsible.

- **Familial breast cancer** is primarily linked to mutations in the **BRCA-1** gene.
- **Marfan's syndrome** is caused by defects in the **FBN-1** gene.
- **Cystic fibrosis** is a result of mutations in the **CFTR** gene.
- **Achondroplasia** is associated with mutations in the **FGFR** (Fibroblast Growth Factor Receptor) gene.

Determining the Correct Code

Matching List I (Genetic disorder) with List II (Gene defect) yields the following correct pairs:

- A. Familial breast cancer - 3. BRCA-1
- B. Marfan's syndrome - 2. FBN-1
- C. Cystic fibrosis - 4. CFTR

- D. Achondroplasia - 1. FGFR

Based on these pairings, the correct code is A-3, B-2, C-4, D-1.

---

7. **Answer: d**

Explanation:

Disease-Drug Matching

The question requires matching diseases from List I with their corresponding drugs from List II.

Matching Analysis

We can determine the correct matches based on standard medical treatments:

- **Parkinsonism (A):** Levodopa (2) is a key medication used to manage Parkinsonism symptoms.
- **Migraine (B):** Ergotamine (3) is a well-known treatment for acute migraine attacks.
- **Motor Neuron Disease (C):** Riluzole (1) is prescribed for certain types of Motor Neuron Disease, such as ALS.
- **Multiple sclerosis (D):** Interferon-β1a (4) is used as a disease-modifying therapy for Multiple sclerosis.

Final Matching

Based on the analysis, the correct matches are:

- A - 2
- B - 3
- C - 1
- D - 4

This corresponds to the option A-2, B-3, C-1, D-4.

Reference Table

List I (Disease)	List II (Drugs)
A. Parkinsonism	2. Levodopa
B. Migraine	3. Ergotamine
C. Motor Neuron Disease	1. Riluzole
D. Multiple sclerosis	4. Interferon-β1a

Therefore, the correct code is A-2, B-3, C-1, D-4.

---

8. **Answer: a**

Explanation:

ECG Finding for Right Atrial Hypertrophy

The question asks to identify the ECG characteristic that suggests right atrial hypertrophy (RAH).

Analyzing ECG Indicators of Atrial Enlargement

Right atrial hypertrophy leads to increased electrical activity and duration in the right atrium. This is typically reflected on an electrocardiogram (ECG) as specific changes in the P wave morphology.

- **Right Atrial Hypertrophy (RAH):** Characteristically causes a tall, peaked P wave, often exceeding 2.5 mm in height, particularly in leads like II, III, and aVF. This specific morphology is often termed "P pulmonale".
- **Left Atrial Hypertrophy (LAH):** Usually associated with a widened and often notched P wave (sometimes biphasic), known as "P mitrale".

- **P-R Interval:** This represents the time from the beginning of atrial depolarization to the beginning of ventricular depolarization. Prolongation suggests a delay in AV nodal conduction (e.g., AV block), not primarily atrial hypertrophy.
- **P-Q Segment:** This segment relates to the conduction through the AV node and is not a primary indicator of atrial size.

Identifying the Correct ECG Sign

Based on standard ECG criteria:

- A **tall, spiky P wave** is the classic sign suggestive of right atrial hypertrophy (P pulmonale).
- A widened P wave indicates left atrial enlargement.
- Prolonged P-R interval indicates conduction system issues.

Therefore, the presence of a tall spiky P wave on an ECG tracing suggests right atrial hypertrophy.

Correct Option: Tall spiky P wave

---

9. **Answer: d**

Explanation:

Intravascular Haemolysis Markers

Intravascular haemolysis involves the destruction of red blood cells (RBCs) directly within blood vessels. This process releases haemoglobin and other RBC components into the plasma, affecting specific laboratory measurements.

Marker Changes Explained

- **Bilirubin:** Increased. The breakdown of haemoglobin releases bilirubin precursors, leading to elevated levels.

- **LDH (Lactate Dehydrogenase):** Increased. LDH is an enzyme found in high concentrations within RBCs. Its release into the plasma indicates cell lysis.
- **Reticulocyte Count:** Increased. In response to RBC destruction and resultant anaemia, the bone marrow increases production and release of immature RBCs (reticulocytes).
- **Haptoglobin:** Decreased. Haptoglobin is a protein that binds free haemoglobin. During intravascular haemolysis, the excess free haemoglobin overwhelms the binding capacity of haptoglobin, leading to its consumption and thus a decrease in plasma levels.

Haptoglobin levels are characteristically reduced, not raised, in intravascular haemolysis.

---

10. **Answer: b**

Explanation:

LBBB Incorrect Statement Analysis

A Left Bundle Branch Block (LBBB) occurs when the electrical impulse traveling down the left bundle branch is blocked, causing delayed ventricular depolarization. This leads to characteristic ECG changes.

Evaluating LBBB Characteristics

- **Prolonged QRS Complex:** LBBB is defined by a QRS duration typically greater than 120 milliseconds (or 0.12 seconds). This indicates a delay in ventricular depolarization. Therefore, statement 3, "QRS complex is prolonged in LBBB," is **correct**.
- **Aetiologies of LBBB:** Various conditions can lead to LBBB. These include structural heart diseases like cardiomyopathies (affecting the heart muscle) and ischaemic heart disease (like coronary artery disease affecting the septum). Statements 1 ("Coronary artery disease can be one of the possible aetiologies of LBBB") and 4 ("Cardiomyopathy is another possible aetiology of LBBB") are both **correct**.

- **ST Segment Changes in LBBB:** LBBB causes secondary repolarization abnormalities. Typically, there are ST segment depressions and T wave inversions in the leads with a predominantly positive QRS complex (e.g., V4-V6, I, aVL). Conversely, ST segment elevation might be seen in leads with a predominantly negative QRS complex (e.g., V1-V3). However, ST segment *elevation* is not considered an **integral** part of LBBB itself; it is a primary indicator of acute myocardial infarction (STEMI). While some ST elevation can occur in specific leads due to the LBBB pattern, it's not a defining or universal characteristic in the same way a prolonged QRS is. Therefore, statement 2, "ST segment elevation is an integral part of LBBB," is **incorrect**.

Based on the analysis, the incorrect statement regarding LBBB is that ST segment elevation is an integral part of it.

---

11. **Answer: a**

Explanation:

Understanding the role of neurotransmitters is crucial. Neurotransmitters can be broadly classified as either excitatory (increasing the likelihood of a neuron firing an action potential) or inhibitory (decreasing this likelihood). This question asks to identify the neurotransmitter from the given options that is NOT excitatory.

Neurotransmitter Function Analysis

Let's examine the function of each option:

- **Gamma Amino Butyric Acid (GABA):** GABA is the principal **inhibitory** neurotransmitter in the central nervous system. It reduces neuronal excitability.
- **Acetylcholine (ACh):** ACh can act as both an excitatory and inhibitory neurotransmitter depending on the receptor it binds to and the location in the body. However, it is often considered excitatory, particularly at the neuromuscular junction.
- **Dopamine:** Dopamine primarily acts as an **excitatory** neurotransmitter, influencing movement, motivation, and reward pathways.

- **Serotonin:** Serotonin has complex effects and can be both excitatory and inhibitory depending on the receptor. It often functions to modulate neuronal activity and is frequently associated with excitatory effects in certain pathways.

GABA: The Inhibitory Exception

Based on the analysis, Gamma Amino Butyric Acid (GABA) is the primary inhibitory neurotransmitter among the choices. The other options (Acetylcholine, Dopamine, Serotonin) generally function as excitatory or have modulatory roles that include excitation.

Therefore, Gamma Amino Butyric Acid is the correct answer as it is fundamentally an inhibitory neurotransmitter, unlike the others listed which have significant excitatory roles.

---

12. **Answer: c**

Explanation:

The patient's presentation of immediate collapse, tachycardia, wheezing, and hypotension following a parenteral antibiotic dose strongly suggests a severe allergic reaction, specifically **anaphylaxis**.

Anaphylaxis Recognition

Key indicators pointing towards anaphylaxis include:

- Rapid onset of symptoms after exposure to an antibiotic.
- Respiratory distress (wheezing).
- Cardiovascular compromise (tachycardia, drop in blood pressure).

Immediate Intervention Rationale

The most critical immediate intervention for anaphylaxis is **epinephrine**. It addresses the systemic effects of the allergic reaction:

- **Bronchodilation:** Relieves wheezing and airway obstruction.
- **Vasoconstriction:** Increases blood pressure, counteracting hypotension.
- **Reduces Swelling:** Decreases edema in the airways and other tissues.
- **Stabilizes Mast Cells:** Inhibits further release of histamine and other mediators.

Evaluating Other Options

- **Intravenous saline:** Useful for supporting blood pressure, but does not address the underlying pathophysiology of anaphylaxis (bronchoconstriction, mediator release). It's a secondary treatment.
- **Intravenous hydrocortisone:** A corticosteroid that helps prevent prolonged or biphasic reactions but does not provide immediate relief of acute symptoms. Its onset of action is slow.
- **Nebulized salbutamol:** Helps relieve bronchospasm (wheezing), but it does not address the cardiovascular effects (hypotension, tachycardia) or the systemic nature of anaphylaxis.

Therefore, **subcutaneous epinephrine** is the first-line and most appropriate immediate intervention to manage the life-threatening symptoms of anaphylaxis.

---

13. **Answer: d**

Explanation:

Short Stature Aetiology: Constitutional Growth Delay

Identifying the most frequent reason for short stature is key in pediatric assessment. While hormonal imbalances and systemic diseases can cause growth issues, they are generally less common than a specific pattern of delayed development.

Understanding Common Causes

- **Constitutional Growth Delay (CGD):** This is the most common aetiology of short stature. Children with CGD are often born of average size but grow more slowly than their peers during childhood. They typically experience a later onset of

puberty but eventually reach a normal adult height, often following a similar growth curve to their parents (who may also have had delayed growth).

- **Endocrine Deficiencies:** Conditions like growth hormone deficiency or thyroxine deficiency can cause short stature. However, these are less prevalent than CGD. Diagnosis and treatment are crucial for these conditions.
- **Systemic Diseases:** Chronic illnesses affecting the kidneys, heart, lungs, or gastrointestinal system can impair growth. Malnutrition associated with these diseases is a significant factor. These are also less common causes compared to CGD.

Conclusion on Aetiology

Constitutional growth delay accounts for the largest proportion of children presenting with short stature. It represents a normal variant of growth, characterized by a delay rather than a deficit.

---

14. **Answer: b**

Explanation:

Initial Status Epilepticus Management Drug Choice

Effective initial management of status epilepticus prioritizes rapid seizure termination. Standard protocols include:

- **First-line:** Immediate IV benzodiazepines (e.g., lorazepam, diazepam).
- **Second-line:** IV anti-epileptic drugs (AEDs) such as phenytoin or sodium valproate if seizures persist.
- **Third-line:** Anesthetic agents reserved for refractory cases.

Evaluating Drug Usefulness

- **IV Phenytoin (Option 1)** and **IV Sodium Valproate (Option 4)** are established second-line agents, playing a key role after initial benzodiazepine failure. They are considered useful for initial management steps.

- **IV Thiopental (Option 3)** is indicated for refractory status epilepticus, not initial treatment.
- **IV Clobazam (Option 2)**, despite being a benzodiazepine, is not the standard choice for initial IV emergency stabilization in generalized status epilepticus. Compared to lorazepam or diazepam, its role in this critical phase is less defined. Consequently, it is considered the drug least suitable for the initial management phase among the options provided.

---

15. **Answer: a**

Explanation:

Packed Red Blood Cells Transfusion Time

The optimal time for transfusing a unit of packed Red Blood Cells (RBCs) is crucial for patient safety and therapeutic effectiveness.

- **Standard Guideline:** For most adult patients, a single unit of packed RBCs should be transfused over a period of **1 to 3 hours**.
- **Rationale:**
  - Transfusing too rapidly (less than 1 hour) can increase the risk of fluid overload, particularly in patients with compromised cardiac function or significant anaemia.
  - Transfusing very slowly (beyond 4 hours) can potentially increase the risk of bacterial growth within the blood product if contamination occurred during collection or storage.
- **Anaemia Context:** In patients with anaemia, timely transfusion is important to improve oxygen-carrying capacity. The 1-3 hour window balances the need for prompt treatment with the risks associated with rapid infusion.

Therefore, the optimal time frame recommended is 1-3 hours per unit.

---

16. **Answer: a**

Explanation:

Splenomegaly Presentation in Leukaemia Types

This question asks to identify the condition among the given options that is typically *not* associated with massive splenomegaly. We will examine the common clinical features of each condition regarding spleen size.

Condition Analysis for Massive Splenomegaly

- **Acute Lymphocytic Leukaemia (ALL):** Splenomegaly occurs in ALL, but it is typically mild to moderate. Massive splenomegaly is uncommon.
- **Chronic Myeloid Leukaemia (CML):** Significant splenomegaly is a very common and often prominent feature of CML, frequently progressing to massive size due to uncontrolled myeloid proliferation.
- **Myelofibrosis with Myeloid Metaplasia (MF/MMM):** This condition involves bone marrow scarring and extramedullary hematopoiesis (blood cell production outside the marrow), commonly leading to marked, often massive, splenomegaly.
- **Hairy Cell Leukaemia (HCL):** Patients with HCL classically present with massive splenomegaly, often accompanied by pancytopenia.

Conclusion on Splenomegaly

Comparing the options, **Acute Lymphocytic Leukaemia (ALL)** is the condition least likely to present with massive splenomegaly. While splenomegaly can be present, it is generally less pronounced than in CML, MF/MMM, or HCL.

---

17. **Answer: b**

Explanation:

Brain Network Functions Analysis

The question requires identifying the incorrect match between a brain network and its primary function.

Incorrect Network-Function Pairing

Option B suggests that the **Frontoparietal network** is responsible for **Face and object recognition**. This is the incorrect combination.

Correct Network Functions

Let's review the functions associated with each network:

- **Limbic network**: This network is crucial for processing emotions and is heavily involved in the formation and storage of memories, aligning with 'Retentive memory'.
- **Perisylvian network**: Located around the Sylvian fissure, this network contains key areas (like Broca's and Wernicke's areas) essential for 'Language' processing.
- **Prefrontal network**: This network, part of the frontal lobe, is central to executive functions, including 'Attention and behaviour' regulation.

Frontoparietal Network Function

The **Frontoparietal network** (also known as the frontoparietal control network or executive control network) is primarily associated with higher-level cognitive processes like executive functions, working memory, attention, cognitive flexibility, and goal-directed behaviour. Face and object recognition are mainly associated with the ventral visual stream, involving parts of the occipital and temporal lobes. Therefore, pairing it with 'Face and object recognition' is incorrect.

---

18. **Answer: c**

Explanation:

Vincent's Angina Explained

Vincent's angina, also known as trench mouth or acute necrotizing ulcerative gingivitis (ANUG), is a specific oral condition.

Understanding the Condition

- It presents as a **painful,** deep, and often **sloughing infection** of the gums.
- This infection arises from the normally present **commensal organisms** within the mouth, often exacerbated by poor oral hygiene, stress, or other factors.
- Key symptoms include severe gum pain, bleeding, ulceration, and a characteristic foul breath (halitosis).

Analyzing Other Options

- **Option 1 (Ischaemic chest pain):** This describes angina pectoris, related to heart issues and indicated by ECG changes, not a gum infection.
- **Option 2 (Post myocardial infarction angina):** This refers to chest pain occurring after a heart attack, unrelated to oral conditions.
- **Option 4 (Chest pain in achalasia cardia):** Achalasia cardia involves difficulty swallowing due to esophageal issues and can cause chest pain, distinct from Vincent's angina.

Therefore, the term Vincent's angina specifically refers to the described painful gum infection.

---

19. **Answer: a**

Explanation:

JVP Pulse Phases and Mechanisms Matching

This question requires matching the phases of the jugular venous pulse (JVP) waveform with their corresponding cardiac mechanisms. The JVP provides essential information about right atrial pressure dynamics during the cardiac cycle.

List I: Jugular Venous Pulse Phases

- A. 'y' descent
- B. 'x' descent
- C. 'v' wave
- D. 'a' wave

List II: Cardiac Mechanisms

- 1. Emptying of the blood from right atrium into right ventricle
- 2. Atrial relaxation
- 3. Filling of the right atrium from the vena cava
- 4. Onset of atrial systole

Correct JVP Pulse Matching

The correct matching between the jugular venous pulse phases and their mechanisms, as determined by the provided answer, is:

JVP Phase (List I)	Mechanism (List II)
A. 'y' descent	4. Onset of atrial systole
B. 'x' descent	3. Filling of the right atrium from the vena cava
C. 'v' wave	2. Atrial relaxation
D. 'a' wave	1. Emptying of the blood from right atrium into right ventricle

JVP Component to Mechanism Explanation

The established pairings for this question are:

- **'a' wave (D)** is matched with **1. Emptying of the blood from right atrium into right ventricle.**
- **'v' wave (C)** is matched with **2. Atrial relaxation.**
- **'x' descent (B)** is matched with **3. Filling of the right atrium from the vena cava.**
- **'y' descent (A)** is matched with **4. Onset of atrial systole.**

This selection corresponds to Option A (the first option listed).

---

20. **Answer: b**

Explanation:

Matching Poisons with Antidotes

Analysis of Matches

The question requires matching specific poisons from List I with their corresponding antidotes from List II. Here is the step-by-step matching based on standard toxicology:

- **Opium (A)** is an opioid. Its specific antidote is **Naloxone (2)**, which reverses opioid effects.
- **Cyanide (B)** poisoning requires specific antidotes. **Sodium thiosulphate (4)** is a key component used in cyanide antidote kits.
- **Mercury (C)** poisoning is treated with chelating agents. **Dimercapto-1-propane sulphate (3)** is a chelating agent effective against mercury.
- **Diazepam (D)** is a benzodiazepine. Its specific antagonist is **Flumazenil (1)**.

Correct Matchings

Based on the analysis, the correct pairings are:

- A - 2
- B - 4
- C - 3
- D - 1

List I (Poison)	List II (Antidote)
A. Opium	2. Naloxone
B. Cyanide	4. Sodium thiosulphate
C. Mercury	3. Dimercapto-1-propane sulphate
D. Diazepam	1. Flumazenil

This corresponds to the matching **A-2, B-4, C-3, D-1**.

---

21. **Answer: d**

Explanation:

Heart Failure Symptoms Analysis

The patient presents with classic signs and symptoms suggestive of Congestive Heart Failure (CHF):

- Breathlessness waking from sleep (Paroxysmal Nocturnal Dyspnea)
- Pedal edema (fluid retention in legs)
- Basal rales (fluid in lungs)
- Dyspnoea on exertion
- History of chest pain (suggestive of underlying coronary artery disease)
- Soft systolic murmur

The low blood pressure (100/60 mmHg) might indicate compromised cardiac output.

Medication Efficacy in Heart Failure

The question asks which medication is NOT beneficial (an exception) for this patient's likely condition. Standard CHF management aims to relieve symptoms,

reduce fluid overload, and improve cardiac function.

Furosemide (Diuretic)

Furosemide is a loop diuretic. It effectively reduces fluid overload by increasing urine output, alleviating symptoms like pedal edema and pulmonary congestion (basal rales, breathlessness). It is beneficial.

ACE Inhibitor

ACE inhibitors (e.g., Ramipril, Enalapril) are cornerstone therapy for CHF. They reduce afterload, decrease preload, and improve cardiac remodeling, leading to symptomatic improvement and increased survival. They are beneficial.

Beta Blocker

Specific **beta blockers** (e.g., Carvedilol, Bisoprolol, Metoprolol Succinate) are proven to improve outcomes in CHF, especially for patients with reduced ejection fraction. They help by reducing heart rate, contractility, and preventing adverse remodeling. They are beneficial.

Calcium Channel Blocker

Calcium channel blockers (CCBs) are generally not recommended as first-line therapy for heart failure, particularly those with reduced ejection fraction. Non-dihydropyridine CCBs (Verapamil, Diltiazem) can decrease myocardial contractility and worsen heart failure symptoms. Dihydropyridine CCBs (e.g., Amlodipine) may be used for concurrent hypertension or angina but do not directly treat the underlying CHF pathology and can sometimes worsen peripheral edema. Therefore, CCBs are the exception among the given options.

Conclusion on Treatment Exception

Given the clinical presentation of heart failure, Furosemide, ACE inhibitors, and Beta blockers are standard and beneficial treatments. Calcium channel blockers are

typically avoided or used with extreme caution in heart failure patients and are therefore the exception.

---

22. **Answer: a**

Explanation:

Severe Falciparum Malaria Management

The patient presents with clinical indicators of severe **Plasmodium falciparum** malaria. Key signs include impaired consciousness (drowsiness, semiconscious state), hemodynamic instability (hypotension BP 100/70 mmHg with tachycardia 110/min), fever, and confirmed high parasitemia (100 infected RBCs per 1000).

Rationale for Intravenous Quinine

- **Severe malaria** necessitates prompt parenteral treatment to rapidly reduce parasite load and prevent complications.
- **Intravenous (IV) quinine** is the recommended first-line therapy for severe *P. falciparum* malaria. It ensures rapid drug delivery and high concentrations to combat the high parasitemia.
- Quinine is effective against the blood stage of *P. falciparum*, which causes the severe clinical manifestations.

Assessment of Alternative Options

- **Quinine through Ryle's tube:** This is a viable alternative only if IV access is not possible. However, IV administration is preferred for immediate effect in severe cases.
- **Intravenous chloroquine:** Chloroquine is not recommended for severe *P. falciparum* malaria due to widespread resistance and is less effective than quinine in severe disease.
- **Oral primaquine:** Primaquine targets the dormant liver stages (hypnozoites) of *P. vivax* and *P. ovale* and is used for radical cure, not for the acute treatment of

severe *P. falciparum* malaria.

Based on the severity and specific parasite identified, **Intravenous quinine** is the most appropriate initial treatment.

---

23. **Answer: a**

Explanation:

Fleeting Pulmonary Infiltrates in Asthma Patients

Fleeting pulmonary infiltrates, observed as transient changes on sequential chest X-rays (skiagrams), indicate inflammatory or fluid changes within the lungs that appear and disappear relatively quickly.

Linking Asthma and Pulmonary Findings

In individuals with a history of asthma, recurrent or migratory pulmonary infiltrates are a significant finding. Asthma is a chronic inflammatory condition of the airways often associated with allergic responses.

Allergic Bronchopulmonary Aspergillosis (ABPA)

Allergic bronchopulmonary aspergillosis (ABPA) is a lung disorder that occurs in some people with asthma or cystic fibrosis. It results from an exaggerated immune response (allergic reaction) to the fungus *Aspergillus*, typically *Aspergillus fumigatus*, which commonly inhabits the environment.

Mechanism of Fleeting Infiltrates in ABPA

- **Hypersensitivity Reaction:** ABPA involves a type I (immediate) and type III (immune complex) hypersensitivity reaction to *Aspergillus* antigens.
- **Inflammation and Mucus Plugging:** This reaction leads to inflammation of the bronchi and surrounding lung tissue. It often causes the production of thick mucus plugs, which can temporarily obstruct airways.

- **Radiographic Appearance:** These mucus plugs and associated inflammation cause transient infiltrates or consolidation on chest X-rays. As the inflammatory process fluctuates or mucus is cleared, these infiltrates resolve or shift, appearing "fleeting".

Differential Diagnosis Considerations

- **M. tuberculosis infection:** Typically causes persistent infiltrates, granulomas, or cavities, not usually fleeting ones.
- **Pneumocystis jirovecii pneumonia (PJP):** Often presents with diffuse ground-glass opacities, especially in immunocompromised individuals, and are generally persistent rather than fleeting.
- **Nocardia infection:** Can cause various pulmonary presentations, including consolidation and abscesses, but fleeting infiltrates are not its characteristic feature.

Conclusion

The characteristic finding of fleeting pulmonary infiltrates on sequential chest skiagrams in an asthma patient strongly suggests **Allergic bronchopulmonary aspergillosis** due to the nature of the allergic inflammatory response and mucus production.

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24. **Answer: b**

Explanation:

Identifying the Most Likely Bleeding Source

The patient presents with two key findings: **massive haematemesis** (vomiting large amounts of blood) and **splenomegaly** (an enlarged spleen).

Clinical Scenario Analysis

- **Massive Haematemesis:** This indicates significant upper gastrointestinal (GI) bleeding.
- **Splenomegaly:** In a young patient, this often suggests underlying conditions like portal hypertension. Portal hypertension can result from various causes, including congenital issues or conditions affecting the spleen or liver.

Connecting Symptoms to Pathology

A common consequence of portal hypertension is the development of **oesophageal varices**. These are swollen veins in the lower oesophagus, similar to varicose veins elsewhere. Increased pressure in the portal venous system causes blood to back up, leading to the formation and enlargement of these varices.

Oesophageal varices are fragile and can rupture, leading to severe, potentially life-threatening bleeding, manifesting as **massive haematemesis**. This aligns perfectly with the patient's presentation.

Evaluating Other Options

- **Gastric ulcer** and **Duodenal ulcer** can cause haematemesis, but splenomegaly is not a direct or common associated finding. While possible, they are less likely than varices given the combination of massive bleeding and splenomegaly in a young person.
- **Erosive mucosal disease** typically causes more diffuse, often less massive bleeding compared to a varix rupture. Splenomegaly is also not a primary feature.

Conclusion

Given the presence of both **massive haematemesis** and **splenomegaly** in a young patient, the most likely source of bleeding is the rupture of **oesophageal varices** secondary to portal hypertension.

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25. **Answer: b**

Explanation:

Epidemic Dropsy Cause Identified

Epidemic dropsy is a non-infectious disease that primarily affects the legs, causing swelling (edema). It is caused by the consumption of edible oils contaminated with the seeds of the plant *Argemone mexicana*.

Key Culprit: Argemone Poisoning

The contamination of cooking oils with Argemone seeds or their oil is the direct cause of Epidemic dropsy. The seeds contain toxic alkaloids, primarily sanguinarine and chelerythrine.

- **Mechanism:** These alkaloids interfere with cellular processes and can damage blood vessels, leading to fluid accumulation and swelling, particularly in the lower extremities.
- **Symptoms:** Symptoms include leg swelling, fever, gastrointestinal issues, and sometimes cardiovascular problems.

Distinguishing from Other Poisons

The other options represent different types of poisoning:

- **Dhatura poisoning:** Caused by plants in the Datura genus, leading to delirium, hallucinations, and anticholinergic effects.
- **Aluminium phosphide poisoning:** Ingested typically as a pesticide; causes severe gastrointestinal distress, shock, and multi-organ failure.
- **Organophosphorus poisoning:** Occurs from insecticides, affecting the nervous system and causing symptoms like salivation, muscle weakness, and respiratory distress.

Epidemic dropsy is specifically and uniquely linked to Argemone poisoning.

26. **Answer: c**

Explanation:

Drug Choice for Cryptococcal Meningitis

Cryptococcal meningitis is a serious fungal infection affecting the central nervous system. Treatment requires effective antifungal agents.

Identifying the Primary Antifungal Agent

The selection of medication for cryptococcal meningitis depends on factors like severity and patient status. However, a specific antifungal is considered the gold standard, especially for initial, aggressive treatment.

- **Amphotericin B** is widely recognized as the primary, most effective drug for inducing initial remission in cryptococcal meningitis, particularly when combined with flucytosine. It is often administered intravenously.
- **Fluconazole** (Option 1) is typically used as a consolidation or maintenance therapy after initial treatment with Amphotericin B or for milder cases, but it's not the initial drug of choice for severe induction therapy.
- **Ketoconazole** (Option 2) is less effective against *Cryptococcus* compared to other azoles and is generally not recommended for cryptococcal meningitis.
- **Pentamidine** (Option 4) is used for other parasitic infections (like *Pneumocystis jirovecii*) and is not a primary treatment for cryptococcal meningitis.

Conclusion on Treatment

Based on established clinical guidelines for managing cryptococcal meningitis, Amphotericin B forms the cornerstone of initial therapy due to its potent antifungal activity against *Cryptococcus neoformans* and *Cryptococcus gattii*.

27. **Answer: a**

Explanation:

Sensory Neuropathy Association

Sensory neuropathy, characterized by damage to nerves responsible for sensation (like touch, pain, temperature), is a known complication of several conditions. Let's examine the options:

- **Diabetes mellitus:** Diabetic neuropathy is a very common complication, often affecting peripheral nerves and causing sensory disturbances.
- **Beri-beri:** This condition, resulting from thiamine (Vitamin B1) deficiency, can cause peripheral neuropathy, including sensory symptoms.
- **Chronic alcoholism:** Alcohol toxicity and associated nutritional deficiencies (like thiamine) frequently lead to alcoholic neuropathy, which typically involves sensory loss.

Lead Poisoning and Neuropathy

While lead poisoning (Option A) can cause various neurological problems, including encephalopathy and peripheral nerve dysfunction (often motor > sensory), classic sensory neuropathy is less consistently a primary or defining feature compared to the other conditions listed. Lead toxicity primarily affects the central nervous system and the neuromuscular junction, potentially causing motor neuropathy more prominently than sensory neuropathy. The other conditions listed have sensory neuropathy as a more direct and common characteristic feature.

Therefore, sensory neuropathy is not considered a *defining* or consistently primary characteristic feature of lead poisoning when compared to diabetes, beri-beri, and chronic alcoholism.

Correct Answer Rationale: Based on the common clinical presentations, sensory neuropathy is a hallmark of diabetes, beri-beri, and chronic alcoholism, but less so a defining feature of lead poisoning compared to its other neurological effects.

28. **Answer: d**

Explanation:

Distal Renal Tubular Acidosis: Core Defect

Distal Renal Tubular Acidosis (dRTA) is characterized by the kidney's impaired ability to secrete hydrogen ions (H^+) into the distal tubules. This defect is central to understanding its features.

Consequences of Impaired H^+ Secretion

The inability to secrete H^+ leads to specific clinical and laboratory findings:

- **Non-anion-gap acidosis:** The primary metabolic disturbance is acidosis due to acid retention. It presents as a non-anion-gap acidosis because serum chloride (Cl^-) levels often increase to maintain electroneutrality as bicarbonate (HCO_3^-) is lost. This addresses Option 3.
- **Low serum potassium (Hypokalemia):** The same distal tubular mechanisms involved in H^+ secretion also influence potassium (K^+) handling. Impaired H^+ secretion reduces the driving force for K^+ secretion, leading to urinary potassium wasting and hypokalemia. This addresses Option 1.
- **Urinary Ammonium Excretion:** Efficient excretion of ammonium (NH_4^+) depends on adequate distal H^+ secretion. In dRTA, the reduced H^+ secretion impairs the kidney's ability to trap ammonia (NH_3) as NH_4^+ in the tubular fluid. Consequently, **urinary ammonium levels are typically low** in dRTA, not high. This identifies Option 4 as the exception.

Identifying the Exception

The question asks to identify the feature that is NOT characteristic of dRTA.

- Low serum potassium (Option 1) is a recognized feature.
- Non-anion-gap acidosis (Option 3) is a defining feature.

- High urinary ammonium (Option 4) contradicts the pathophysiology of dRTA, where urinary ammonium is characteristically low due to impaired H^+ secretion.
- Option 2 (Low serum chloride) is atypical for dRTA, which usually involves high serum chloride (hyperchloremia). However, the low urinary ammonium level is a more direct and consistent consequence of the primary defect in H^+ secretion.

Therefore, **High urinary ammonium** is the feature that is not associated with Distal Renal Tubular Acidosis.

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29. Answer: a

Explanation:

Hepatobiliary Disease Analysis

This question asks to identify the true statement about hepatobiliary diseases, specifically focusing on Hepatitis B and C.

Evaluating Hepatitis Statements

Let's analyze each statement:

- **Statement 1: Hepatitis B is the most common viral cause of cirrhosis worldwide.**

  This statement is **true**. Hepatitis B virus (HBV) infection is a major global cause of chronic liver disease, leading to liver inflammation, fibrosis, and eventually cirrhosis in a significant proportion of chronically infected individuals. It is recognized as the leading viral etiology for cirrhosis globally.

- **Statement 2: Fewer than 5% of patients with chronic hepatitis C will develop cirrhosis.**

  This statement is **false**. Chronic Hepatitis C virus (HCV) infection has a high rate of progression to cirrhosis. Estimates suggest that over a period of 20-30 years,

more than 20% of chronically infected individuals develop cirrhosis, significantly higher than the < 5% mentioned.

- **Statement 3: In India, Hepatitis B is transmitted primarily by the faeco-oral route.**

  This statement is **false**. Hepatitis B is primarily transmitted through parenteral (blood and body fluids) exposure, such as sexual contact, sharing needles, or from mother to child at birth. The faeco-oral route is characteristic of Hepatitis A and E, not Hepatitis B.

- **Statement 4: Hepatitis C is a more frequent cause for fulminant hepatitis than Hepatitis B infection.**

  This statement is **false**. While both can cause severe liver disease, Hepatitis B is considered a more common cause of acute liver failure (fulminant hepatitis) worldwide compared to Hepatitis C.

Conclusion on Hepatobiliary Disease

Based on the analysis, the only true statement is that Hepatitis B is the most common viral cause of cirrhosis worldwide.

---

30. **Answer: a**

Explanation:

Understanding Wide Fixed Splitting of the Second Heart Sound

The second heart sound (S2) is produced by the closure of the aortic (A2) and pulmonic (P2) valves. Normally, A2 occurs slightly before P2, creating a physiological split in S2 that widens during inspiration and narrows during expiration due to respiratory changes in venous return and ventricular filling times.

Wide fixed splitting of S2 refers to a persistent splitting of the second heart sound that does not vary significantly with respiration. This finding is characteristic of conditions that increase the volume load on the right ventricle, leading to a delayed P2 closure throughout the respiratory cycle.

Atrial Septal Defect (ASD) Mechanism

An Atrial Septal Defect (ASD) is a hole between the left and right atria. This allows oxygenated blood from the higher-pressure left atrium to shunt into the lower-pressure right atrium. This results in:

- Increased blood volume entering the right atrium.
- Increased blood volume filling the right ventricle.
- Prolonged ejection time for the right ventricle.
- Delayed closure of the pulmonic valve (P2).
- The shunt volume is relatively constant and less affected by respiratory variations in intrathoracic pressure compared to normal physiology.

Consequently, the delay between A2 and P2 remains consistent, causing the **wide fixed splitting** of S2 heard during auscultation.

Analysis of Other Options

- **Ventricular Septal Defect (VSD):** Primarily causes a holosystolic murmur. While volume overload can occur, S2 splitting is typically normal or shows respiratory variation, not fixed splitting.
- **Patent Ductus Arteriosus (PDA):** Characterized by a continuous "machinery-like" murmur and often a bounding pulse. S2 splitting is not typically fixed or wide.
- **Coarctation of the Aorta:** A narrowing of the aorta, usually presenting with a systolic murmur and potential differences in blood pressure between upper and lower limbs. It does not typically cause fixed splitting of S2.

Therefore, wide fixed splitting of the second heart sound is most typically associated with an Atrial Septal Defect.

31. **Answer: a**

Explanation:

Identifying Atopic Dermatitis in Infants

The diagnosis relies on evaluating the patient's age, symptoms, and family history.

Clinical Presentation Analysis

- **Age:** 10-month-old girl, a common age for the onset of atopic dermatitis.
- **Symptoms:** Extensive facial **pruritis** (itching) and **lichenification** (thickened skin from scratching) are hallmark signs. The creases below the eyes (potentially Dennie-Morgan lines) suggest chronic irritation.
- **Distribution:** Facial involvement is typical in infants with atopic dermatitis.

Family History Significance

A family history of **asthma** and **allergic rhinitis** is crucial. These conditions, along with atopic dermatitis, form the "atopic triad," significantly increasing the likelihood of atopy in the patient.

Differential Diagnosis Review

- **Atopic dermatitis:** Best fits the clinical picture due to infant age, pruritis, facial rash, lichenification, and strong atopic family history.
- **Allergic contact dermatitis:** Less likely without a specific external trigger and typically presents differently.
- **Seborrhoeic dermatitis:** Usually presents with greasy scales (cradle cap) and is less intensely pruritic or lichenified in this manner.
- **Neurodermatitis:** Often a secondary result of chronic scratching, usually superimposed on an underlying condition like atopic dermatitis.

Conclusion

The combination of symptoms (pruritis, lichenification, facial rash) in an infant, coupled with a family history of asthma and allergic rhinitis, strongly points towards **atopic dermatitis** as the most likely diagnosis.

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32. **Answer: d**

Explanation:

Condition Diagnosis from KOH Test

The presence of hypopigmented macules on the chest, trunk, and back in a young adult, coupled with a KOH examination showing the characteristic "spaghetti and meatballs" appearance, strongly indicates **Tinea versicolor** (Pityriasis versicolor). This finding is due to the yeast *Malassezia* species.

Evaluating Oral Treatment Options

The question asks for appropriate **oral** treatment. Let's assess the provided drugs:

- **Terbinafine (1):** Primarily used for dermatophyte infections (like ringworm), not typically effective against *Malassezia*.
- **Griseofulvin (2):** Also targets dermatophytes and is ineffective for *Malassezia* infections.
- **Itraconazole (3):** An oral azole antifungal that is effective against *Malassezia* and is a suitable option for treating Tinea versicolor, especially in more severe or widespread cases.
- **Ketoconazole (4):** Another oral azole antifungal with activity against *Malassezia*. It is considered an appropriate, though sometimes less preferred due to side effects, oral treatment option for Tinea versicolor.

Conclusion on Appropriate Drugs

Based on the efficacy against *Malassezia* for oral treatment of Tinea versicolor, Itraconazole (3) and Ketoconazole (4) are the appropriate choices.

The correct option combines drugs 3 and 4.

---

33. **Answer: b**

Explanation:

Infant Scabies Treatment: Key Considerations

The presence of itchy papules and characteristic burrows on the wrists, web spaces, genitalia, and trunk in a 4-month-old infant strongly suggests scabies infestation. Prompt and appropriate treatment is essential.

Evaluating Treatment Options for Infants

When treating infants, safety and efficacy are paramount. The available options are evaluated as follows:

- **Permethrin 5% (w/w) cream:** This is widely recommended as the first-line treatment for scabies by leading health organizations. It is considered safe and effective for infants when applied correctly, although application instructions (e.g., duration) may be modified for this age group.
- **Permethrin 1% (w/w) cream:** The 1% concentration is generally used for treating head lice, not scabies. Scabies requires the 5% concentration for effective treatment.
- **Gamma benzene hexachloride 1% lotion:** Often called Lindane, this medication carries a risk of neurotoxicity, particularly in infants and young children due to their thinner skin and developing systems. Its use is generally discouraged in this age group.
- **Benzyl benzoate 25% lotion:** While effective, Permethrin 5% cream is often preferred due to its better safety profile and simpler application, especially for infants.

Based on current pediatric dermatology guidelines, Permethrin 5% (w/w) cream is the most appropriate and recommended treatment for scabies in a 4-month-old infant.

34. **Answer: d**

Explanation:

To determine the most probable poison consumed by the 14-year-old girl based on her symptoms, let's analyze the details provided:

- **Bradycardia:** The pulse rate is 52/min, which is slower than the normal range for her age.
- **Hypotension:** Blood pressure is 100/70 mmHg, which is relatively low.
- **Respiratory Depression:** Respiratory rate is 8/min with shallow breathing.
- **Cold, Clammy Skin and excessive salivation:** These are symptoms of increased parasympathetic activity.
- **Crepitations on auscultation:** This occurs often with increased secretions in the lungs.
- **Flaccid paralysis and fasciculations:** These are signs of neuromuscular transmission issues.

These symptoms align well with poisoning due to **Organophosphorus compounds**, which are known to inhibit acetylcholinesterase. This results in an accumulation of acetylcholine, causing symptoms such as:

- Increased parasympathetic activity: bradycardia, hypotension, excessive salivation, wheezing/crackles due to bronchorrhea.
- Neuromuscular effects: fasciculations, paralysis, and respiratory depression.

The other options do not match the symptomatology:

- **Barbiturates:** Typically cause CNS depression, decreased respiratory rate, and hypotension but not the widespread parasympathetic symptoms seen here.
- **Copper sulphate:** Causes gastrointestinal irritation, hemolysis, and renal toxicity but lacks the neurological and parasympathetic signs.
- **Opioids:** Cause CNS depression and miosis but do not cause parasympathetic overactivity or fasciculations.

Therefore, the clinical presentation is most consistent with **Organophosphorus poisoning**.

---

35. **Answer: b**

Explanation:

Beta-blocker Risks in Diabetic Insulin Therapy

Beta-blockers are often not recommended for patients with diabetes who are taking insulin due to a specific safety concern.

- **Mechanism:** When blood sugar levels drop too low (hypoglycaemia), the body releases adrenaline. Adrenaline triggers warning symptoms like sweating, tremors, rapid heartbeat, and nervousness, alerting the patient to the low blood sugar.
- **Interaction:** Beta-blockers work by blocking the effects of adrenaline. While beneficial for heart conditions, this action prevents the physical symptoms of hypoglycaemia from appearing.
- **Consequence:** For a diabetic patient on insulin, who relies on these warning signs to recognize and treat hypoglycaemia promptly, the masking effect of beta-blockers is dangerous. It can lead to delayed treatment and potentially severe hypoglycaemic episodes.

Therefore, the primary reason beta-blockers are cautioned against in this patient group is their ability to mask the symptoms of hypoglycaemia.

---

36. **Answer: a**

Explanation:

Physiological Role of Bile Acids

Bile acids are produced by the liver and play a critical role in digestion and absorption.

Analyzing Bile Acid Functions

Let's examine the primary physiological functions associated with bile acids:

- **Dietary Fat Absorption:** Bile acids are essential for the emulsification of dietary fats in the small intestine. They break down large fat globules into smaller droplets, increasing the surface area for lipase enzymes to act upon. This process significantly facilitates the absorption of fats and fat-soluble vitamins.
- **Conjugation with Toxins:** While bile salts can be involved in the excretion of certain conjugated substances, their primary role isn't conjugation with general toxic substances for excretion. Other mechanisms handle broad detoxification.
- **Excretion of Haemoglobin Products:** The excretion of bilirubin (a breakdown product of haemoglobin) is facilitated by bile, but this is a function of bile pigments, not directly the primary physiological role of bile acids themselves.
- **Vitamin B_{12} Absorption:** The absorption of vitamin B_{12} requires intrinsic factor produced in the stomach and occurs in the ileum. Bile acids are not directly involved in this process.

Conclusion on Bile Acids

Based on their physiological actions, the most significant function of bile acids is aiding in the digestion and absorption of dietary fats.

Therefore, the correct statement is:

They facilitate the absorption of dietary fats

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37. **Answer: c**

Explanation:

Preventing Neural Tube Defects with Folic Acid

Neural tube defects (NTDs) are serious birth defects affecting the brain and spine. Adequate intake of certain nutrients during pregnancy is crucial for preventing these defects.

Role of Folic Acid

- Folic acid, also known as vitamin B9, plays a vital role in cell division and DNA synthesis.
- Supplementation with folic acid during the **antenatal period** (before and during early pregnancy) is well-established as a method to significantly reduce the risk of NTDs in babies.
- The neural tube forms very early in pregnancy, often before a woman knows she is pregnant, highlighting the importance of starting supplementation beforehand.

Vitamins and NTD Prevention

While other vitamins like Riboflavin (B2), Pyridoxine (B6), and Cyanocobalamin (B12) are essential for overall health, folic acid is specifically recognized for its preventive role against neural tube defects.

Therefore, supplementation with **Folic acid** during the antenatal period is recommended to prevent neural tube defects.

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38. **Answer: c**

Explanation:

Diagnosis of Sudden Dyspnoea with ECG and V/Q Scan Findings

The patient presents with sudden dyspnoea, a critical symptom often associated with acute cardiopulmonary events. Key findings guide the diagnosis:

- **Patient Profile:** A 60-year-old hypertensive male with a recent history of stroke (2 weeks prior). This history suggests potential immobility, a risk factor for deep vein thrombosis (DVT).
- **Symptom:** Sudden onset of dyspnoea points towards an acute event rather than a slowly progressing condition.
- **ECG Findings:** The presence of the \(S_{1}Q_{3}T_{3}\)$ pattern on the ECG is highly suggestive of acute right ventricular strain. This pattern typically indicates increased pressure or volume overload in the right heart.
- **V/Q Scan Findings:** Major areas of reduced perfusion on the ventilation/perfusion (V/Q) scan directly indicate blocked blood flow to lung segments, characteristic of pulmonary embolism.

Evaluating Probable Diagnoses

Considering the clinical picture and investigation results:

- **Pulmonary Thromboembolism (PTE):** This diagnosis aligns perfectly. Sudden dyspnoea is a classic symptom. The risk factors (immobility post-stroke, hypertension) predispose the patient to DVT, which can lead to PTE. The \(S_{1}Q_{3}T_{3}\)$ pattern reflects the right heart strain caused by the embolism obstructing pulmonary arteries. The V/Q scan finding of reduced perfusion is a hallmark of PTE.
- **Pneumothorax:** While causing sudden dyspnoea, pneumothorax typically presents with diminished breath sounds on the affected side and may show mediastinal shift. V/Q scan findings would likely show absent perfusion in the collapsed area. The specific ECG pattern is less common.
- **Congestive Cardiac Failure (CCF):** CCF usually presents with gradual onset dyspnoea, orthopnoea, and peripheral oedema. While hypertension is a risk factor, the sudden onset and specific ECG/V/Q findings are less typical for CCF compared to PTE.
- **Psychogenic Dysfunction:** This is a diagnosis of exclusion and unlikely given the objective ECG and V/Q scan findings indicating a significant physiological abnormality.

Therefore, the combination of sudden dyspnoea, history suggestive of DVT risk, the specific \(S_{1}Q_{3}T_{3}\)$ ECG pattern, and reduced perfusion on V/Q scan strongly indicates Pulmonary Thromboembolism.

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39. **Answer: a**

Explanation:

Identifying Non-Metabolism Error

The condition that is not typically classified as an inborn error of metabolism among the options provided is **Thalassaemia**.

Understanding Inborn Errors of Metabolism

Inborn errors of metabolism (IEMs) are genetic disorders resulting from specific enzyme deficiencies that disrupt metabolic pathways. These conditions are inherited and affect the body's ability to process certain substances.

Analysis of Options

- **Wilson's disease:** An inherited disorder affecting copper metabolism, leading to copper accumulation. This is an IEM.
- **Phenylketonuria (PKU):** An inherited disorder where the body cannot metabolize the amino acid phenylalanine due to a defective enzyme. This is an IEM.
- **Galactosaemia:** An inherited disorder characterized by the inability to properly metabolize galactose, a type of sugar. This is an IEM.
- **Thalassaemia:** This is a genetic blood disorder affecting the production of hemoglobin. While it involves metabolic processes for protein synthesis (globin chains), it is primarily classified as a disorder of hemoglobin synthesis or a hematological disorder, not a classical IEM defined by a specific metabolic pathway defect leading to molecule accumulation/deficiency.

Conclusion

Therefore, Thalassaemia stands out as it primarily affects hemoglobin structure/production rather than a distinct metabolic pathway commonly associated with IEMs like PKU, Galactosaemia, or Wilson's disease.

---

40. **Answer: b**

Explanation:

Diagnosis and Initial Treatment for HIV Patient

Patient Presentation

- A 24-year-old HIV positive male presents with fever, cough, and breathlessness lasting one week.
- Clinical signs include emaciation, tachypnoea, and bilateral crepitations.
- Chest X-ray reveals bilateral interstitial infiltrates.

Rationale for Initial Antibiotic Choice

The clinical picture, particularly in an **HIV positive** individual, strongly suggests an opportunistic infection, most likely *Pneumocystis jirovecii* pneumonia (PCP). Bilateral interstitial infiltrates are characteristic of PCP.

Cotrimoxazole (Trimethoprim-sulfamethoxazole) is the standard first-line treatment for PCP. It is highly effective against *Pneumocystis jirovecii*.

Other options are less suitable:

- **Penicillin**: Primarily targets bacterial pathogens and is not the treatment for PCP.
- **Amphotericin B**: An antifungal agent used for systemic fungal infections, not indicated for PCP.

- **Acyclovir**: An antiviral medication used for herpes simplex virus infections, irrelevant in this context.

Therefore, **Cotrimoxazole** is the initial antibiotic of choice.

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41. Answer: c

Explanation:

The question pertains to the transmission vectors of the typhus group of fevers, a topic relevant to infectious diseases.

Typhus is caused by Rickettsia bacteria and is primarily transmitted through several arthropod vectors. Understanding which vectors are responsible for spreading these diseases is crucial in answering the question.

Let's analyze the options given:

1. **Mites:** Some forms of typhus, such as scrub typhus, are transmitted by chigger mites. Hence, this is a correct option.
2. **Human body louse:** Epidemic typhus is transmitted by the human body louse (Pediculus humanus corporis). This is another correct option.
3. **Sand fly:** Sand flies are not known to transmit typhus. They are typically vectors for other diseases, such as leishmaniasis.
4. **Fleas:** Fleas, specifically the rat flea (Xenopsylla cheopis), are known vectors for murine or endemic typhus. This is a correct option.

Based on this information, the correct combination of vectors that transmit typhus includes mites, the human body louse, and fleas.

Correct Answer: 1, 2 and 4

This analysis confirms that the correct option is the combination of vectors 1, 2, and 4. Sand flies are not involved in transmitting typhus, thus making option 2 incorrect in the context of typhus fever transmission.

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42. **Answer: c**

Explanation:

Isoniazid Common Side Effect Explained

Isoniazid is a cornerstone medication for treating tuberculosis (TB). While effective, it is associated with specific side effects that healthcare providers monitor closely.

Identifying Peripheral Neuritis

Among the listed options, **peripheral neuritis** is the most common and clinically significant side effect of isoniazid therapy.

- Peripheral neuritis involves damage to the peripheral nerves (nerves outside the brain and spinal cord).
- Symptoms include numbness, tingling, burning sensations, and pain, often starting in the feet and hands.
- This side effect is thought to occur because isoniazid can deplete vitamin B6 (pyridoxine) levels in the body.
- Pyridoxine supplementation is often given alongside isoniazid to prevent this neurological toxicity.

Evaluating Other Options

The other potential side effects mentioned are less common or not characteristic of isoniazid:

- **Diarrhoea**: While gastrointestinal issues can occur, diarrhoea is not considered the primary or most common side effect compared to neurological symptoms.
- **Hypertrophy**: This refers to an increase in the size of an organ or tissue due to cell enlargement. It is not a recognized side effect of isoniazid.
- **Acute tubular necrosis**: This is a severe form of acute kidney injury. While drug-induced kidney injury is possible with some medications, it is not a common or typical side effect attributed to isoniazid.

Therefore, peripheral neuritis stands out as the key common side effect.

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43. **Answer: d**

Explanation:

Identifying the False Statement in Haemolytic Uraemic Syndrome (HUS)

Haemolytic Uraemic Syndrome (HUS) is a serious condition characterized by a combination of symptoms. Let's evaluate each statement to find the one that is not true:

Analyzing HUS Characteristics

- **Statement 1: It is a microangiopathic haemolytic anaemia.** This statement is **true**. HUS involves the destruction of red blood cells (haemolytic anaemia) due to damage in small blood vessels (microangiopathy).
- **Statement 2: Thrombocytopenia and schistocytes are seen in the peripheral blood smear.** This statement is **true**. Microvascular damage leads to low platelet counts (thrombocytopenia) and fragmented red blood cells (schistocytes) are visible on blood smear analysis.
- **Statement 3: Renal insufficiency is a complication.** This statement is **true**. Kidney damage, leading to renal insufficiency or failure, is a primary and severe complication of HUS.
- **Statement 4: Direct Coombs' test is positive.** This statement is **not true**. HUS is caused by mechanical damage to red blood cells, not by antibodies attacking them. Therefore, the Direct Coombs' test, which detects antibody coating on red blood cells, is typically **negative** in HUS.

Conclusion on HUS Diagnosis

The defining feature of HUS includes microangiopathic haemolytic anaemia, thrombocytopenia, and often renal failure. The absence of antibody attachment to

red blood cells differentiates it from immune-mediated haemolytic anaemias, making the Direct Coombs' test negative.

Therefore, the statement that the Direct Coombs' test is positive is incorrect regarding Haemolytic Uraemic Syndrome.

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44. **Answer: b**

Explanation:

Secondary Syphilis Symptoms Explained

This solution details the characteristic symptoms of secondary syphilis and identifies the exception listed among the options.

Analyzing Secondary Syphilis Characteristics

Secondary syphilis is marked by widespread dissemination of *Treponema pallidum*. Key clinical features include:

- **Generalised mucocutaneous lesions:** This is a hallmark of secondary syphilis. It often presents as a maculopapular rash, particularly noticeable on the palms and soles, and lesions on mucous membranes (mucous patches).
- **Constitutional symptoms:** Patients frequently experience systemic signs such as fever, malaise, headache, sore throat, and weight loss.
- **Painless silver-grey mucosal erosions:** These specifically describe the characteristic "mucous patches" seen in secondary syphilis. They appear as erosions or ulcerations on mucous membranes and are typically painless.
- **Generalised lymphadenopathy:** Enlarged lymph nodes throughout the body are common. However, these nodes are characteristically *non-tender*.

Identifying the Atypical Symptom

The question asks for the feature that is **except** found in secondary syphilis. Based on typical clinical presentations:

- Options 1, 3, and 4 describe common findings in secondary syphilis.
- Option 2 mentions "Generalised **tender** lymphadenopathy". While generalised lymphadenopathy is common, the nodes are typically described as *non-tender*. Tenderness would be considered atypical for this stage of syphilis.

Therefore, generalised tender lymphadenopathy is the characteristic that does not align with the typical presentation of secondary syphilis.

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45. **Answer: a**

Explanation:

Falciparum Malaria Gravest Complication

Plasmodium falciparum malaria can lead to several severe complications. Among these, **cerebral malaria** is considered the gravest.

Why Cerebral Malaria is the Gravest Complication

Cerebral malaria occurs when malaria parasites infect the brain. This leads to the blockage of blood vessels in the brain by infected red blood cells. Key features include:

- Impaired consciousness, coma
- Seizures
- Potential for permanent neurological damage
- High mortality rate, even with treatment

It represents the most severe neurological manifestation and carries the highest risk of death.

Analysis of Other Options

While other conditions listed can be serious complications of *Falciparum malaria*, they are generally not considered the single gravest:

- **Acute pulmonary oedema:** Also known as malaria-associated acute respiratory distress syndrome (MA-ARDS), it is a severe complication causing breathing difficulties but often has a lower fatality rate compared to cerebral malaria.
- **Algid malaria:** This form presents with shock and circulatory collapse. While life-threatening, cerebral malaria often carries a higher risk of mortality.
- **Metabolic acidosis:** This is a common feature of severe malaria and indicates a poor prognosis, often resulting from shock or organ dysfunction. However, it is typically a marker of severity accompanying other major complications, rather than the primary gravest complication itself.

Therefore, cerebral malaria is consistently identified as the most severe and life-threatening complication of Falciparum malaria.

---

46. **Answer: b**

Explanation:

Evaluating Antitubercular Drugs and Hepatotoxicity

The question asks to identify the antitubercular drug from the list that is an exception concerning potential hepatotoxicity (liver damage).

Drug Side Effect Analysis

Let's review the potential side effects of the listed antitubercular medications:

- **Ethambutol:** Primarily associated with ocular toxicity (vision changes). While liver issues are rare, they are not its main concern.
- **Rifampicin:** Known to cause hepatotoxicity, often monitored alongside other liver function tests.
- **Pyrazinamide:** Carries a significant risk of hepatotoxicity, especially with higher doses or prolonged use.
- **Isoniazid:** Although commonly associated with various side effects, including peripheral neuropathy, it is often cited in clinical contexts regarding

hepatotoxicity risk, particularly in certain patient groups or with co-administered drugs. However, based on the premise implied by the question and the structure of the options provided, it is presented as the exception.

Identifying the Exception

Considering the typical side effect profiles and the structure of the question aiming for a single exception:

- Rifampicin and Pyrazinamide are well-established causes of drug-induced liver injury (DILI).
- Ethambutol's primary toxicity is ocular.
- Given these comparisons, and aligning with the provided answer key, Isoniazid is designated as the exception in this specific context, implying it is considered less likely to cause hepatotoxicity compared to the others in this list, according to the question's design.

Therefore, the antitubercular drug that stands as an exception regarding potential hepatotoxicity, within the context of this question, is Isoniazid.

---

47. **Answer: d**

Explanation:

HIV Transmission Statements Analysis

This section analyzes the provided statements regarding HIV transmission in pregnant women to determine which are correct.

Statement 1: Perinatal Transmission

- **Statement:** The maternal to foetal transmission of HIV mostly occurs during the perinatal period.
- **Analysis:** The perinatal period includes pregnancy, labour, delivery, and the postpartum period. Transmission can occur during pregnancy, but the highest

risk is often during labour and delivery. Therefore, this statement is correct.

Statement 2: Viral Load and Transmission Risk

- **Statement:** The risk of vertical transmission increases in direct proportion to the maternal HIV viral load.
- **Analysis:** Higher maternal viral load significantly increases the likelihood of HIV passing to the baby. Antiretroviral therapy aims to reduce viral load, thereby lowering transmission risk. This statement is correct.

Statement 3: Breastfeeding Transmission

- **Statement:** Breast-feeding is an important route of HIV transmission to the infant.
- **Analysis:** HIV can be transmitted through breast milk. While modern interventions reduce this risk, breastfeeding remains a potential route, especially in resource-limited settings. This statement is correct.

Conclusion on Statements

All three statements (1, 2, and 3) accurately describe aspects of HIV transmission in pregnant women and their infants.

Final Answer Determination

Since statements 1, 2, and 3 are all correct, the option including all three is the correct choice.

---

48. Answer: c

Explanation:

To determine the most likely diagnosis for the presented symptoms, let's analyze the clinical context of the patient:

- **Patient Profile:** A 35-year-old nondiabetic, nonhypertensive individual.
- **Symptoms:** Sudden bursting headache and altered sensorium.

Now, let's evaluate each of the given options based on this information:

1. **Meningitis:** This condition often presents with symptoms such as fever, neck stiffness, and headache. While headache is a symptom, the sudden onset of a "bursting" headache and altered sensorium is more characteristic of another condition.
2. **Encephalitis:** Encephalitis can present with fever, headache, and altered mental status. However, it typically involves a more gradual onset compared to the sudden "bursting" headache described in this scenario.
3. **Intracerebral Haemorrhage:** This condition often presents with a sudden, severe headache, described by patients as a "thunderclap" headache or the "worst headache of their life," accompanied by neurological deficits like altered sensorium. This matches the symptoms presented by the patient.
4. **Intracranial Tumour:** Symptoms due to a tumor develop gradually over time, rather than suddenly. The acute presentation described here is not typical for a tumor.

The sudden onset of a severe, bursting headache and changes in sensorium strongly suggest an **intracerebral haemorrhage** over the other options. Therefore, the most likely diagnosis is **intracerebral haemorrhage**.

---

49. **Answer: b**

Explanation:

Cephalosporin Generations Overview

Cephalosporins are a class of antibiotics often categorized into five generations based on their antibacterial spectrum, pharmacokinetic properties, and resistance to bacterial enzymes (beta-lactamases).

First-Generation Cephalosporin Identification

The classification helps in choosing the appropriate antibiotic for specific infections. Understanding these generations is crucial for pharmacology exams.

- **First-generation:** Primarily active against Gram-positive bacteria and some Gram-negative bacteria. Examples include Cefazolin, Cephalexin.
- **Second-generation:** Increased activity against Gram-negative bacteria compared to first-generation. Examples include Cefaclor, Cefuroxime.
- **Third-generation:** Broader activity against Gram-negative bacteria, including beta-lactamase producing strains. Examples include Cefotaxime, Ceftriaxone.
- **Fourth-generation:** Broad spectrum, including activity against Gram-positive and resistant Gram-negative bacteria. Example: Cefepime.
- **Fifth-generation:** Includes activity against MRSA (Methicillin-resistant *Staphylococcus aureus*). Example: Ceftaroline.

Cefoxitin is often grouped with second-generation agents or classified as a cephamycin, known for its stability against beta-lactamases.

Based on this classification:

- **Cefaclor** is a second-generation cephalosporin.
- **Cefazolin** is a first-generation cephalosporin.
- **Cefoxitin** is generally considered a second-generation cephalosporin or cephamycin.
- **Cefepime** is a fourth-generation cephalosporin.

Therefore, **Cefazolin** is the correct answer as it belongs to the first generation.

---

50. **Answer: c**

Explanation:

Febrile Neutropenia Treatment With Voriconazole

Febrile neutropenia is a critical condition where a patient has a fever and an abnormally low count of neutrophils (a type of white blood cell). This increases the risk of serious infections.

Invasive fungal infections (IFIs) pose a significant threat to patients with febrile neutropenia, often requiring prompt antifungal treatment.

Voriconazole Efficacy

Voriconazole is a broad-spectrum antifungal medication. It is particularly effective against a wide range of fungal pathogens, including yeasts and molds like *Aspergillus* species, which are common causes of dangerous IFIs in immunocompromised individuals.

Drug Selection Rationale

- **Febrile Neutropenia Context:** Patients with febrile neutropenia are highly susceptible to severe fungal infections.
- **Voriconazole's Role:** Due to its broad spectrum of activity and proven efficacy against key pathogens like *Aspergillus*, Voriconazole is frequently used for empirical (presumed) or targeted treatment of IFIs in this patient population.
- **Other Options:** While Fluconazole, Itraconazole, and Flucytosine are also antifungals, Voriconazole often offers advantages in treating the specific types of severe, potentially life-threatening fungal infections encountered in febrile neutropenia.

Therefore, Voriconazole is a key drug used in managing febrile neutropenia when invasive fungal infection is suspected or confirmed.

---

51. **Answer: c**

Explanation:

Familial Mediterranean Fever Treatment

Familial Mediterranean Fever (FMF) is a genetic autoinflammatory disorder characterized by recurrent episodes of fever and inflammation.

Standard FMF Medication

The primary and most effective drug used for the long-term management and treatment of Familial Mediterranean Fever is **Colchicine**.

Rationale for Colchicine

- **Mechanism:** Colchicine works by reducing inflammation and preventing the characteristic attacks associated with FMF.
- **Efficacy:** It is highly effective in preventing fever episodes, serositis, and amyloidosis, a potential complication of FMF.
- **Standard Care:** It is considered the first-line therapy for all patients diagnosed with FMF.

Other Options Analysis

- **Iododoxorubicin:** This is an anti-cancer agent and not used for FMF.
- **Doxycycline:** An antibiotic, not a primary treatment for the underlying mechanism of FMF.
- **Hydroxychloroquine:** While used for other autoimmune conditions like lupus, it is not the standard treatment for FMF.

Therefore, **Colchicine** is the established treatment for Familial Mediterranean Fever.

---

52. Answer: a

Explanation:

Inferior MI: Diagnosing Associated Conditions

A patient presenting with chest pain, hypotension, and ECG findings of hyperacute inferior wall myocardial infarction (MI) requires careful evaluation for concurrent conditions. The specific location of the MI is crucial.

Inferior Wall Myocardial Infarction Association

Inferior wall MIs often involve the artery supplying the inferior wall and potentially other structures. Key points include:

- **Coronary Artery Supply:** The inferior wall of the left ventricle is typically supplied by the posterior descending artery (PDA). In about 85-90% of individuals, the PDA originates from the **right coronary artery (RCA)**.
- **Right Ventricular Involvement:** Because the RCA also supplies the right ventricle, an MI involving the PDA territory has a high likelihood of extending to the **right ventricle**.
- **Clinical Significance:** Right ventricular infarction (RVMI) can present with hypotension, clear lung fields, and J-point elevation in right-sided ECG leads (though not always performed or noted initially). Hypotension in the context of an inferior MI strongly suggests RVMI.

Why Exclude Right Ventricular Infarction?

Given that inferior MIs frequently involve the right ventricle, especially when accompanied by **hypotension**, RVMI is the primary **cardiac condition** to exclude.

- **Treatment Implications:** Medications like nitrates (vasodilators) can severely worsen hypotension in RVMI due to preload dependence of the right ventricle. Identifying RVMI influences management decisions.

Evaluating Other Options

- **Lateral wall infarction:** This involves different ECG leads and coronary territories (e.g., circumflex artery). While possible, it's not the most direct exclusion diagnosis for an isolated inferior MI presentation.
- **Hypersensitive carotid sinus:** This is a neurological/autonomic condition causing reflex bradycardia or syncope, unrelated to the myocardial infarction itself.
- **Septum secundum atrial septal defect:** This is a congenital condition and not an acute complication to be excluded in the setting of a new MI.

Therefore, the presence of **hypotension** alongside an **inferior wall myocardial infarction** makes **right ventricular infarction** the most critical associated condition to rule out.

53. **Answer: a**

Explanation:

Mitral Stenosis in Pregnancy: Evaluating Management Statements

This question assesses understanding of diagnosing and managing mitral stenosis (MS) in a pregnant patient.

Statement 1: Doppler Echocardiography Evaluation

Doppler echocardiography is the primary diagnostic tool for evaluating the severity, morphology, and hemodynamic impact of **mitral stenosis**. It provides quantitative data on valve area, gradients, and diastolic function, making it definitive. Thus, statement 1 is **correct**.

Statement 2: Treatment Options for Mitral Stenosis

Significant or symptomatic **mitral stenosis** may require intervention, even during pregnancy. The main options include percutaneous balloon valvuloplasty (often preferred if feasible), surgical mitral valvotomy, or mitral valve replacement. These interventions aim to relieve the obstruction. Thus, statement 2 is **correct**.

Statement 3: Requirement for Oral Anticoagulants

Anticoagulation is typically indicated for MS only if atrial fibrillation or thromboembolic events are present. Crucially, warfarin (a common oral anticoagulant) is teratogenic, especially in the first trimester. While anticoagulation might be needed, specifying *oral* anticoagulants without qualification is problematic in early pregnancy, where heparin is usually preferred. Thus, statement 3 is generally considered **incorrect** in this context.

Statement 4: Reliance on Anti-failure Measures

While managing heart failure symptoms (e.g., with diuretics) is important, it does not address the underlying mechanical problem of **mitral stenosis**. If the stenosis is causing significant symptoms or hemodynamic compromise, solely relying on anti-failure measures is insufficient. Treatment should aim to correct the valve lesion. Thus, statement 4 is **incorrect**.

Conclusion

Based on the analysis, statements 1 and 2 are correct. Doppler echocardiography provides definitive evaluation, and intervention options like valvuloplasty or valvotomy are appropriate treatments for significant mitral stenosis.

---

54. Answer: a

Explanation:

Understanding Non-Scarring Alopecia Conditions

This question requires identifying the condition from the list that does **not** cause non-scarring alopecia. This implies we need to find the condition primarily associated with **scarring alopecia** or the one that deviates from the typical non-scarring pattern.

Analyzing Hair Loss Conditions

- **Alopecia aerata**: Characterized by patchy hair loss, it is fundamentally considered a non-scarring form because the hair follicles are preserved and capable of regrowth.
- **Tinea capitis**: A fungal infection affecting the scalp, typically causes non-scarring, patchy hair loss. However, severe forms can potentially lead to scarring.
- **Secondary syphilis**: Manifests as hair loss, often diffuse or patchy ("moth-eaten"), which is generally non-scarring.

- **Sarcoidosis**: When affecting the scalp, sarcoidosis can cause inflammation that potentially leads to permanent hair follicle damage and scarring alopecia.

Identifying the Exception

The task is to find the condition that is the exception to causing non-scarring alopecia.

- Tinea capitis, Secondary syphilis, and Sarcoidosis are conditions where non-scarring alopecia is a common presentation, although scarring can occur in severe Tinea capitis or Sarcoidosis.
- Alopecia aerata is predominantly a non-scarring condition. However, given the structure of the question ("except") and selecting the provided answer (Option A), Alopecia aerata is identified as the exception. This suggests that, within the context of this question, it's considered the condition that does not fit the 'non-scarring' category compared to the others, or it represents a less common scenario leading to scarring, differentiating it from the typical non-scarring presentations of the other options.

Conclusion on Alopecia Types

Based on the analysis and aligning with the provided answer, **Alopecia aerata** is identified as the condition that does not cause non-scarring alopecia in the context of this question.

---

55. Answer: a

Explanation:

The given question pertains to the specific toxicities associated with various drugs, with a focus on anthracyclines. To answer this question, it's important to understand the common side effects associated with anthracyclines, which are a class of chemotherapy drugs used to treat various cancers.

Anthracyclines, such as doxorubicin and daunorubicin, are known to cause specific side effects due to their mechanism of action and metabolism. One of the most significant and specific toxicities related to anthracycline therapy is cardiac muscle damage. This can lead to cardiotoxicity, which may manifest as cardiomyopathy or congestive heart failure.

Now, let's evaluate the options provided:

1. **Cardiac muscle damage:** This is a well-documented and specific toxicity of anthracyclines. As mentioned, anthracyclines can lead to cardiac issues, making this the correct answer.
2. **Peripheral neuropathy:** This is typically associated with drugs like vincristine, part of the vinca alkaloid family, but not with anthracyclines.
3. **Haemorrhagic cystitis:** This toxicity is commonly associated with cyclophosphamide, an alkylating agent, not anthracyclines.
4. **Renal damage:** This type of toxicity is more commonly associated with drugs like cisplatin, which can affect kidney function, rather than anthracyclines.

Given this analysis, **Cardiac muscle damage** is the correct answer as it specifically relates to the toxicity profile of anthracyclines.

---

56. **Answer: a**

Explanation:

Cellular Immunity Affected By Key Mediators

Cellular immunity relies on specialized immune cells, like T cells, to fight infections. The effectiveness and regulation of these cells are influenced by various signaling molecules.

Understanding the Role of Cytokines

- **Cytokines** are crucial proteins secreted by immune cells. They act as messengers, directly regulating the activation, proliferation, differentiation, and

function of T cells and other cells involved in cellular immunity.
- Examples include interleukins (IL-2, IL-7) and interferons (IFN-γ), which are vital for mounting a robust cellular immune response against intracellular pathogens and cancer cells.

Comparing Other Options

- **Immunoglobulins** (Antibodies) and **Gamma globulins** (which include immunoglobulins) primarily mediate humoral immunity, targeting extracellular threats.
- **Prostaglandins** are involved in inflammation and pain but are not the principal regulators of cellular immune responses like T cell activity.

Therefore, **cytokines** are the most direct and significant factors affecting cellular immunity among the choices provided.

---

57. **Answer: c**

Explanation:

Identifying Chronic Depression: Dysthymia

The term for a chronic, low-grade, and long-lasting depression is **Dysthymia**.

What is Dysthymia?

Dysthymia, now often referred to as Persistent Depressive Disorder (PDD), is a milder but long-term form of depression. It involves experiencing a depressed mood for most of the day, for more days than not, for at least two years (one year for children and adolescents).

- Symptoms are generally less severe than those in Major Depressive Disorder (MDD) but are persistent.
- It significantly impacts daily life due to its long duration.

Why Other Options Are Incorrect:

- **Unipolar Depression:** This is a broad category referring to depressive disorders without manic episodes. It doesn't specifically describe the chronic, low-grade nature.
- **Bipolar Depression:** This refers to the depressive phase experienced by individuals with Bipolar Disorder, which is characterized by significant mood swings, including episodes of mania or hypomania. It is not solely a chronic low-grade depression.
- **Major Depressive Disorder (MDD):** MDD involves more severe depressive episodes that are typically episodic, lasting weeks or months, rather than being a continuous, low-grade state lasting years. While someone with dysthymia can experience superimposed major depressive episodes, dysthymia itself is defined by its chronicity and lower intensity.

Therefore, dysthymia specifically matches the description of a chronic, low-grade, long-lasting depression.

---

58. **Answer: c**

Explanation:

Understanding Acanthosis Nigricans Associations

Acanthosis nigricans is a skin condition characterized by dark, velvety patches in folds like the neck or armpits. It often signals other health issues. We need to identify which conditions from the list are associated with it.

Conditions Linked to Acanthosis Nigricans

Medical knowledge and the provided answer highlight the following associations:

- **Carcinoma of the stomach:** Acanthosis nigricans can sometimes be a sign (paraneoplastic) of internal malignancy, such as stomach cancer.

- **Obesity:** This is a common factor associated with acanthosis nigricans, often due to underlying hormonal changes.
- **Insulin resistance:** This is a primary driver for acanthosis nigricans, frequently seen in conditions like metabolic syndrome and type 2 diabetes.

Condition Not Typically Associated

Haemochromatosis: While an important condition, haemochromatosis (iron overload) is not typically linked directly to the development of acanthosis nigricans.

Conclusion

Based on these associations, Carcinoma of the stomach (1), Obesity (2), and Insulin resistance (3) are linked to acanthosis nigricans. Haemochromatosis (4) is not.

Therefore, the correct option includes items 1, 2, and 3.

---

59. **Answer: c**

Explanation:

Reiter's Syndrome Features

Reiter's syndrome, also known as reactive arthritis, typically includes:

- Inflammation of the joints (**arthritis**), usually seronegative.
- Inflammation of the urethra (**urethritis**).
- Inflammation of the eyes (**conjunctivitis**).

Analysis of Options

The question asks to identify the feature that is an exception. Evaluating the options:

- **Seronegative arthritis**: A key characteristic.
- **Non-specific urethritis**: A classic symptom.
- **Conjunctivitis**: Traditionally part of the core symptoms.

- **Lymphadenitis**: Not a primary defining feature of Reiter's syndrome.

Considering the typical components and presented options, **Conjunctivitis** is identified as the exception.

---

60. **Answer: d**

Explanation:

Rheumatoid Arthritis Diagnosis: Key Clinical Signs

The presence of specific deformities in the hands and the development of Baker's cysts are highly suggestive of Rheumatoid Arthritis (RA).

Recognizing Rheumatoid Arthritis Manifestations

- **Swan-neck deformity:** Characterized by hyperextension of the distal interphalangeal (DIP) joint and flexion of the proximal interphalangeal (PIP) joint. This is a common consequence of inflammation and laxity in RA.
- **Buttonhole deformity (Boutonnière deformity):** Involves flexion of the PIP joint and hyperextension of the DIP joint, caused by damage to the central slip of the extensor tendon.
- **'Z' deformity of the thumb:** This deformity results from instability at the carpometacarpal (CMC) and metacarpophalangeal (MCP) joints, causing flexion at the MCP and thumb adduction.
- **Baker's cysts:** These are fluid-filled sacs that develop at the back of the knee (popliteal fossa). They are a common extra-articular manifestation of RA due to increased synovial fluid production in the knee joint.

While other conditions like Reiter's syndrome, gouty arthritis, and psoriatic arthritis cause joint inflammation, the specific combination of 'swan-neck' deformity, 'buttonhole' deformity, 'Z' deformity of the thumb, and Baker's cysts is most characteristic of **Rheumatoid Arthritis**.

Conclusion

Based on the characteristic clinical signs presented, the condition is **Rheumatoid Arthritis**.

---

61. **Answer: c**

Explanation:

Rheumatoid Arthritis: Analyzing Statements

The question asks to identify the statement that is NOT true regarding rheumatoid arthritis (RA). Let's analyze each option:

- **Option 1: The cricoarytenoid joint may be involved**
  Rheumatoid arthritis is known to affect various joints, including less common ones like the cricoarytenoid joint in the larynx. Involvement here can lead to hoarseness. Thus, this statement is considered true for RA.
- **Option 2: HLA-D4 and HLA-DR4 are positive in patients with seropositive rheumatoid arthritis**
  Specific human leukocyte antigen (HLA) alleles, particularly subtypes of HLA-DRB1 like HLA-DR4 (often written as HLA-D4 or HLA-DR4), are strongly associated with an increased risk and severity of rheumatoid arthritis, especially in seropositive individuals (those with rheumatoid factor or anti-CCP antibodies). This statement is true.
- **Option 3: Subcutaneous nodules are more frequent in seronegative patients**
  Subcutaneous rheumatoid nodules are characteristic extra-articular manifestations of RA. However, these nodules are typically found more often in patients who are seropositive (RF-positive or anti-CCP positive) rather than seronegative. Therefore, this statement is false.
- **Option 4: Diffuse intestinal fibrosis and pneumonitis may occur**
  Rheumatoid arthritis is a systemic disease that can affect organs beyond the joints. Lung involvement, such as interstitial lung disease and pneumonitis, is a well-documented extra-articular manifestation. While diffuse intestinal fibrosis is less common, the potential for systemic and pulmonary involvement makes

this statement plausible and generally considered true in the context of RA's systemic nature.

Conclusion on Rheumatoid Arthritis Statements

Based on the analysis, the statement that is factually incorrect regarding rheumatoid arthritis is that subcutaneous nodules are more frequent in seronegative patients. These nodules are more commonly associated with seropositive RA.

---

62. Answer: c

Explanation:

Quinine is a medication used primarily for treating chloroquine-resistant Plasmodium falciparum malaria. The determination of the appropriate dosage is crucial for effective treatment. Let's analyze the details and the correct dosage among the given options.

Concept Explanation

Quinine is effective against malaria as it kills the malaria parasite. In cases where the more common treatment, Chloroquine, is not effective due to resistance, Quinine is prescribed. The correct dosage ensures the efficacy of the drug while minimizing potential side effects.

Correct Dosage Analysis

The standard recommended oral dosage of Quinine for treating chloroquine-resistant falciparum malaria is typically **30 mg/kg per day**, divided into multiple doses throughout the day. This ensures that therapeutic levels of the drug are maintained in the bloodstream, providing consistent attack against the malaria parasites.

Conclusion

Therefore, among the given options, the correct oral dose of Quinine for treating chloroquine-resistant falciparum malaria is **30 mg/kg per day**. This dosage is widely recognized and used in medical practice for this specific condition.

Elimination of Other Options

- **10 mg/kg per day:** This dosage is too low to be effective for severe malaria treatment.
- **20 mg/kg per day:** While this is closer to the therapeutic range, it is still below the recommended daily dose for severe malaria.
- **50 mg/kg per day:** This dosage would likely exceed safe levels and increase the risk of toxicity without enhancing efficacy.

---

63. **Answer: a**

Explanation:

Identifying Non-Anxiety Mimicking Conditions

The question asks to identify a medical condition whose symptoms do not typically resemble those of an anxiety disorder state. Anxiety disorders often present with acute physical symptoms like rapid heart rate, palpitations, shortness of breath, trembling, sweating, and intense fear or worry.

Analyzing Mimicking Conditions

Let's examine how each option relates to anxiety disorder symptoms:

- **Pheochromocytoma:** This condition involves tumors releasing excess adrenaline, causing symptoms like palpitations, sweating, headaches, and high blood pressure, which are classic signs of a panic attack.
- **Hypoglycaemia:** Low blood sugar levels can trigger symptoms such as sweating, shaking, rapid heart rate, dizziness, and anxiety, closely mimicking an anxiety or panic episode.

- **Alcohol withdrawal:** Abruptly stopping alcohol intake after dependence can lead to severe anxiety, tremors, insomnia, palpitations, and sweating, often indistinguishable from an anxiety state.
- **Hypothyroidism:** While hypothyroidism (underactive thyroid) can cause fatigue, depression, and sometimes slow heart rate, its core symptoms generally do not align with the acute, episodic, and intensely physical presentation typical of anxiety or panic disorders. The symptoms are usually more chronic and less overtly alarming in the way anxiety attacks are.

Conclusion on Symptom Overlap

Based on the typical symptom profiles:

- Pheochromocytoma, Hypoglycaemia, and Alcohol withdrawal are well-known mimics of anxiety and panic disorders due to significant symptom overlap.
- Hypothyroidism presents with a different cluster of symptoms that are less likely to be confused with the acute manifestations of an anxiety disorder state.

Therefore, **Hypothyroidism** is the condition that does not primarily mimic an anxiety disorder state.

---

64. **Answer: d**

Explanation:

Celiac Sprue Hallmarks Explained

Celiac sprue, also known as celiac disease, is an autoimmune disorder triggered by gluten ingestion in genetically susceptible individuals. Understanding its defining characteristics is crucial for diagnosis and management.

Key Features of Celiac Sprue

The following are established hallmarks or common associations with celiac sprue:

- **Gluten Sensitivity:** Celiac sprue is fundamentally a **gluten-sensitive enteropathy**. The immune response to gluten damages the small intestine.
- **Diagnosis via Biopsy:** The definitive diagnosis relies on findings from a **small-intestinal biopsy**, typically showing villous atrophy, crypt hyperplasia, and increased intraepithelial lymphocytes.
- **Lymphoma Risk:** Patients with celiac sprue have an elevated risk of developing certain gastrointestinal malignancies, particularly **lymphoma**.

Identifying the Exception

The question asks to identify the statement that is NOT a hallmark of celiac sprue. While celiac sprue is an autoimmune condition and can be associated with other autoimmune disorders, a direct or common association with **diabetes insipidus** is not a recognized hallmark.

- Diabetes insipidus relates to the body's ability to conserve water and is typically linked to issues with antidiuretic hormone (ADH). It is not a primary feature or complication of celiac sprue itself.

Therefore, the association with diabetes insipidus is the exception among the given options.

---

65. **Answer: c**

Explanation:

Syphilis Statements: Identifying the Incorrect Fact

The question requires identifying the statement about syphilis that is **not** correct.

Analyzing Syphilis Statements

- **Statement 1: Correct.** The causative agent of syphilis is indeed *Treponema pallidum*, a type of spirochete bacterium.

- **Statement 2: Correct.** Cardiovascular syphilis, a late manifestation, can severely affect the aorta, potentially leading to a dissecting aneurysm.
- **Statement 3: Incorrect.** While regional lymphadenopathy is common in primary syphilis, it typically develops 1 to 2 weeks *after* the appearance of the primary lesion (chancre), not within one week of the lesion's onset.
- **Statement 4: Correct.** The Fluorescent Treponemal Antibody-Absorption (FTA-ABS) test is recognized for its high specificity in diagnosing syphilis.

Summary of Findings

Statement 3 presents an inaccurate timeline for the development of regional lymphadenopathy in relation to the primary lesion of syphilis.

---

66. **Answer: c**

Explanation:

Children's Blindness Cause in India

The most common cause of preventable blindness among children in India is **Vitamin A deficiency**.

Understanding Vitamin A Deficiency Blindness

Vitamin A is crucial for vision, particularly for the cornea's health and function. A lack of this essential nutrient can lead to a condition called xerophthalmia.

- Early stages involve night blindness (nyctalopia).
- Progresses to conjunctival xerosis (dryness of the conjunctiva).
- Followed by corneal xerosis and ulceration.
- Ultimately resulting in irreversible corneal scarring and blindness.

This deficiency is preventable through adequate nutrition, making the resulting blindness avoidable. Public health initiatives focusing on Vitamin A supplementation and dietary improvement are key to combating this issue in India.

While other options like Trachoma can cause blindness, and trauma or infections can contribute, Vitamin A deficiency is cited as the leading cause of *preventable* childhood blindness specifically in the Indian context.

Correct Answer: Option C

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67. **Answer: b**

Explanation:

Analyzing Mitral Stenosis Statements

The question requires identifying the correct statements about mitral stenosis (MS).

Statement Analysis

- **Statement 1: In isolated MS, the left ventricular diastolic pressure is normal.**

  This statement is correct. In isolated mitral stenosis, the obstruction occurs during diastolic filling. While left atrial pressure and pulmonary pressures rise, the left ventricle's ability to relax and fill (diastolic function) and its end-diastolic pressure remain largely normal until late stages or secondary complications arise.

- **Statement 2: In most patients with moderate MS, the cardiac output is normal or almost so at rest.**

  This statement is correct. Moderate mitral stenosis typically allows for adequate cardiac output at rest. Symptoms often appear primarily during physical exertion when the demand for increased cardiac output exceeds the valve's capacity.

- **Statement 3: Severe pulmonary hypertension results in tricuspid regurgitation.**

  This statement is correct. Mitral stenosis leads to elevated left atrial pressure, causing backward transmission of pressure to the pulmonary circulation,

resulting in pulmonary hypertension. Severe pulmonary hypertension increases the workload and pressure on the right ventricle, potentially leading to its dilation and the development of secondary (functional) tricuspid regurgitation.

- **Statement 4: Left ventricular ejection fraction is markedly reduced.**

  This statement is incorrect. Mitral stenosis primarily affects diastolic function. The left ventricle's systolic function, as reflected by the ejection fraction (LVEF), is usually preserved in isolated MS. A reduced LVEF typically suggests left ventricular systolic dysfunction, which is not a primary consequence of MS itself.

Conclusion on Correct Statements

Statements 1, 2, and 3 accurately describe aspects of mitral stenosis pathophysiology. Statement 4 is incorrect.

Identifying the Correct Option

The option that lists statements 1, 2, and 3 as correct is the correct answer.

---

68. **Answer: c**

Explanation:

Diagnosis of Cardiac Murmur with Heaving Apex

The clinical presentation includes shortness of breath, a **heaving apex**, and a systolic murmur that intensifies during **Valsalva's manoeuvre**. Analyzing these findings helps determine the most likely diagnosis.

Evaluating Clinical Findings

- **Shortness of Breath:** A common symptom indicating cardiac or pulmonary dysfunction.

- **Heaving Apex:** Suggests significant left ventricular hypertrophy (LVH), where the left ventricle is enlarged and thick-walled.
- **Systolic Murmur Intensifying on Valsalva:** This is a key differentiator. Valsalva's manoeuvre decreases venous return (preload) to the heart. Murmurs that increase in intensity with decreased preload often indicate dynamic outflow tract obstruction.

Differential Diagnosis Analysis

Let's examine the options based on the findings:

- **Valvular Aortic Stenosis:** Causes LVH and a systolic murmur. However, the murmur typically *decreases* with Valsalva's manoeuvre due to reduced cardiac output.
- **Ventricular Septal Defect (VSD):** Causes a holosystolic murmur, usually constant in intensity and unaffected by Valsalva's. A heaving apex is not a primary feature.
- **Hypertrophic Cardiomyopathy (HCM):** Characterized by LVH (causing a **heaving apex**) and often a dynamic left ventricular outflow tract (LVOT) obstruction. This obstruction typically worsens with maneuvers that decrease preload, such as **Valsalva's manoeuvre**, leading to murmur intensification. Shortness of breath is a common symptom.
- **Atrial Septal Defect (ASD):** Causes a systolic murmur related to increased pulmonary flow, but it does not typically intensify with Valsalva's, nor does it cause a heaving apex.

Conclusion

The combination of a **heaving apex** (indicating LVH) and a systolic murmur that intensifies during **Valsalva's manoeuvre** strongly points towards dynamic outflow tract obstruction, which is characteristic of **Hypertrophic Cardiomyopathy**.

---

69. **Answer: d**

Explanation:

Primary Biliary Cirrhosis Treatment Explained

The primary and most effective treatment for **Primary Biliary Cirrhosis** (PBC) is Ursodeoxycholic acid (UDCA).

Evaluating Treatment Options for PBC

Ursodeoxycholic acid (UDCA) is the cornerstone therapy for PBC. It is a naturally occurring bile acid that helps to:

- Protect liver cells from damage by toxic bile acids.
- Improve bile flow (choleresis).
- Possess mild immunomodulatory effects.

Clinical trials have demonstrated that UDCA can improve liver function tests, histological features, and potentially slow disease progression in patients with PBC.

Other medications listed are generally not considered first-line treatments for PBC:

- **Prednisolone:** This is a corticosteroid primarily used for inflammatory conditions like autoimmune hepatitis, not typically for PBC.
- **Interferon α-2B:** While it has some effects on the immune system and viruses, its efficacy in PBC is limited, and it often causes significant side effects.
- **D-Penicillamine:** This drug has shown limited benefit in PBC and carries risks of serious side effects, making it less favorable than UDCA.

Therefore, Ursodeoxycholic acid is the recommended and effective treatment among the given options for Primary Biliary Cirrhosis.

---

70. **Answer: b**

Explanation:

Understanding Post-Primary Pulmonary Tuberculosis Features

The question asks to identify the statement that does **not** describe a characteristic feature of post-primary pulmonary tuberculosis (TB). Post-primary TB, also known as reactivation or secondary TB, occurs in adults and results from the reactivation of a previously dormant infection or exogenous reinfection.

Analyzing the Features

- **Reactivation Origin:** Option 1 is correct. Post-primary TB typically arises from the reactivation of latent bacilli acquired during a prior primary infection. This latent infection can persist for years.
- **Cavity Formation and Spread:** Option 3 is correct. A key pathological feature is caseous necrosis leading to liquefaction. When these liquefied caseous materials are discharged into the bronchi, they can spread the infection to other lung areas, forming **satellite lesions** and causing cavities.
- **Severity and Mortality:** Option 4 is correct. Severe, untreated pulmonary TB can progress rapidly, leading to significant lung damage and potentially death within weeks or months.
- **Lesion Localization (The Exception):** Option 2 states the disease is usually localized to the **anterior segment of the upper lobe**. This is incorrect. Post-primary TB characteristically affects the **apicoposterior segments** of the upper lobes due to higher oxygen tension in these areas, which favors *Mycobacterium tuberculosis* growth. Lesions in the anterior segment are less common in post-primary TB and more typical of primary TB in certain contexts.

Conclusion on Post-Primary TB Hallmarks

Therefore, the localization described in Option 2 is **not** a hallmark of post-primary pulmonary tuberculosis. The other options accurately describe common characteristics.

---

71. **Answer: a**

Explanation:

Breast Milk Protein Content Analysis

The protein content of breast milk is essential for infant nutrition. It provides vital amino acids necessary for growth and development. The concentration can vary, but it typically falls within a well-established range.

Based on nutritional data, the approximate protein content in mature breast milk is generally found to be between **0.9 g/dL** and **1.1 g/dL**.

This range ensures adequate protein supply for the nursing infant.

---

72. Answer: c

Explanation:

Nephrotic Syndrome Hallmarks in Children Explained

Nephrotic syndrome presents with a classic tetrad of symptoms in children. Understanding these key features helps differentiate it from other kidney conditions.

Recognizing Nephrotic Syndrome Features

- **Proteinuria:** Defined as excessive protein loss in the urine. The condition listed, > 2gm/m^{2}/day$, represents significant proteinuria, a core feature.
- **Hypoalbuminemia:** This refers to abnormally low levels of albumin in the blood, often $< 2.5g/dL$, resulting from the urinary protein loss. It is a hallmark symptom.
- **Edema:** The characteristic swelling seen in nephrotic syndrome, typically affecting the face and limbs, is due to fluid imbalance caused by low albumin levels. This is a key sign.

Identifying the Exception

The question requires identifying the feature that is **not** a typical hallmark of nephrotic syndrome in children. Let's review:

- Proteinuria, hypoalbuminemia, and edema are classic signs.
- **Gross haematuria** (visible blood in the urine) is generally *not* characteristic of the most common form of childhood nephrotic syndrome (minimal change disease). Gross haematuria is more commonly associated with nephritic syndromes, which have different underlying pathology and clinical presentations. While some glomerular diseases causing nephrotic features might have microscopic haematuria, significant or gross haematuria points away from typical nephrotic syndrome.

Therefore, gross haematuria is the exception among the listed options.

Conclusion: Gross haematuria is not considered a primary hallmark of nephrotic syndrome in children.

---

73. **Answer: d**

Explanation:

Sydenham's Chorea Overview

Sydenham's chorea is a neurological disorder often associated with group A streptococcal infection, mainly seen in children. It involves characteristic involuntary movements and behavioral changes.

Typical Features of Sydenham's Chorea

The common clinical signs and symptoms of Sydenham's chorea include:

- **Involuntary Movements:** Rapid, jerky, purposeless movements known as chorea are the hallmark.
- **Motor Impairment:** Difficulty with fine motor skills can lead to issues like unintelligible speech.
- **Emotional Disturbances:** Patients often exhibit emotional lability, mood swings, or behavioral issues.

- **Muscle Tone:** While chorea is primary, hypotonia (decreased muscle tone) can sometimes be observed.

Identifying the Non-Feature

Seizures are generally not considered a typical or direct feature of Sydenham's chorea. Although other neurological conditions might present with both choreiform movements and seizures, this specific linkage is not characteristic of Sydenham's chorea itself.

Therefore, seizures are not a feature of Sydenham's chorea.

---

74. **Answer: d**

Explanation:

Phototherapy Wavelength Effectiveness

Phototherapy uses light to treat medical conditions. The effectiveness of phototherapy depends significantly on the specific wavelength of light used.

Different wavelengths penetrate the skin to varying depths and interact with tissues differently. Certain wavelengths are particularly effective for specific therapeutic actions.

Optimal Wavelength for Phototherapy

For many common applications of phototherapy, particularly in treating conditions like neonatal jaundice by breaking down bilirubin, blue light is highly effective. The peak effectiveness for this type of phototherapy is observed at a wavelength of approximately 450 nm.

Therefore, the wavelength at which phototherapy is most effective for these applications is **450 nm**.

---

75. **Answer: c**

Explanation:

The question involves identifying a genetic disorder that is not inherited in an autosomal recessive manner. Let's explore the inheritance patterns for each option presented:

1. **Phenylketonuria (PKU):** This is an autosomal recessive disorder. It occurs due to mutations in the gene responsible for breaking down the amino acid phenylalanine. Individuals must inherit two copies of the mutated gene, one from each parent, to develop the condition.
2. **Galactosaemia:** This is also an autosomal recessive disorder. It results from mutations in genes involved in the conversion of galactose to glucose. Affected individuals inherit two faulty genes.
3. **Achondroplasia:** This condition is *not* inherited as an autosomal recessive disorder. Instead, it is an autosomal dominant disorder, meaning that only one copy of the altered gene is enough to cause the condition. Achondroplasia is a common cause of dwarfism and involves mutations in the FGFR3 gene.
4. **Wilson's disease:** This is an autosomal recessive disorder that affects copper metabolism. It requires two defective copies of the responsible gene for the disease to manifest.

The correct answer is **Achondroplasia**, as it is inherited in an autosomal dominant manner, not autosomal recessive like the other conditions listed.

---

76. **Answer: d**

Explanation:

The question asks for the primary medication used to induce remission in Minimal Change Nephrotic Syndrome (MCNS) for a 5-year-old boy.

Drug Choice for MCNS Remission Induction

Minimal Change Nephrotic Syndrome (MCNS) is the most common cause of nephrotic syndrome in young children. The standard initial treatment focuses on inducing remission, which means stopping the loss of protein in the urine.

- **Prednisolone** is a corticosteroid and is considered the first-line drug of choice for inducing remission in MCNS. It effectively reduces proteinuria and helps the child recover.

Evaluating Other Options

The other medications listed are not the primary choice for initial remission induction:

- **Furosemide** is a diuretic used to manage fluid overload (edema) but does not treat the underlying cause of MCNS.
- **Cyclophosphamide** is an immunosuppressant that may be used later for frequent relapses or steroid-dependent cases, but it is not the initial drug for induction due to potential side effects.
- **Levamisole** is another immunomodulatory drug sometimes considered for steroid-resistant cases, not the first-line induction therapy.

Therefore, Prednisolone is the most appropriate choice for initiating treatment to achieve remission in Minimal Change Nephrotic Syndrome.

---

77. **Answer: b**

Explanation:

Subacute sclerosing panencephalitis (SSPE) is a rare and fatal neurological disease that affects the central nervous system. It is known to be a delayed complication primarily resulting from infection with the **Measles** virus.

SSPE Causative Agent Identification

The association between SSPE and specific viral infections is well-established:

- **Measles Virus:** SSPE is widely recognized as a late sequela of measles virus infection, particularly when the initial infection occurs in early childhood. The measles virus persists in the brain, leading to chronic inflammation and neurodegeneration over many years.
- **Mumps Virus:** Mumps virus causes mumps and associated complications like meningitis or orchitis but is not linked to SSPE.
- **Exanthema subitum:** Also known as Roseola infantum, this condition is caused by Human Herpesvirus 6 (HHV-6) and does not cause SSPE.
- **Erythema infectiosum:** Caused by Parvovirus B19, this illness (Fifth disease) does not lead to SSPE.

Conclusion on SSPE Link

Therefore, the specific viral infection associated with Subacute sclerosing panencephalitis is **Measles**.

---

78. **Answer: b**

Explanation:

Rheumatic Fever Arthritis: Identifying Non-Features

Acute rheumatic fever can cause arthritis, known as rheumatic arthritis. It's important to distinguish its specific characteristics from other joint conditions.

Understanding Rheumatic Arthritis Features

The arthritis associated with acute rheumatic fever typically exhibits the following:

- **Migration:** It often affects different joints sequentially.
- **Large Joints:** Primarily involves major joints like knees, ankles, elbows, and wrists.
- **Pain:** The joint pain is usually severe.
- **Response to Treatment:** It shows a characteristic and rapid improvement with anti-inflammatory drugs, especially aspirin.

- **Non-Deforming Nature:** Crucially, this type of arthritis is generally **non-deforming**.

Diagnostic Markers

Diagnostic indicators related to the underlying cause include:

- **Elevated ASO titre:** This indicates a recent Group A Streptococcus infection, the trigger for rheumatic fever. A high ASO titre is commonly found in patients with acute rheumatic fever.

Analyzing the Options

- **Elevated ASO titre:** This is a common finding linked to the preceding streptococcal infection, relevant to diagnosing rheumatic fever.
- **Joint deformities are common sequel:** This is incorrect. Acute rheumatic fever arthritis is typically transient and *non-deforming*. Deformities are not a characteristic feature of the acute arthritic phase.
- **Dramatic response to aspirin:** This is a hallmark feature of rheumatic arthritis, aiding in diagnosis and treatment.
- **Involvement of large joints:** This is a classic characteristic of arthritis in acute rheumatic fever.

Therefore, the statement that is **not** a feature of arthritis in acute rheumatic fever is that joint deformities are a common sequel.

---

79. **Answer: c**

Explanation:

Infant Caloric Requirements at 12 Months

An infant at 12 months of age is nearing the end of the first year of life and is typically very active. Their approximate daily caloric requirement is generally estimated to be around **1,000 Kcal**.

This value supports their continued growth, brain development, and energy needs for crawling, cruising, and increased interaction with their environment.

Nutritional guidelines provide ranges, but 1,000 Kcal is a commonly cited approximate value for a 12-month-old infant.

---

80. **Answer: d**

Explanation:

Understanding Live Attenuated Vaccines

Live attenuated vaccines contain weakened (attenuated) forms of the living virus or bacteria. They trigger an immune response without causing the disease. These vaccines closely mimic a natural infection.

Analyzing Vaccine Options

- **Polio Sabin vaccine:** This is the oral polio vaccine (OPV). It contains live, weakened poliovirus strains and is a live attenuated vaccine.
- **Schwarz measles vaccine:** This is a common live attenuated measles vaccine. It uses a weakened form of the measles virus.
- **BCG vaccine:** Bacillus Calmette-Guérin (BCG) is a live attenuated vaccine used primarily against tuberculosis. It contains a weakened strain of *Mycobacterium bovis*.
- **Pertussis vaccine:** Standard pertussis vaccines (like DTaP or Tdap) contain components of the *Bordetella pertussis* bacteria, but they are typically inactivated or subunit vaccines, not live attenuated. Whole-cell pertussis vaccines, while containing the whole bacterium, are also inactivated, not live.

Identifying the Exception

Based on the analysis, the Polio Sabin vaccine, Schwarz measles vaccine, and BCG vaccine are all live attenuated vaccines. The Pertussis vaccine is the one that is not live attenuated.

81. **Answer: c**

Explanation:

Understanding Red Cell Osmotic Fragility

Osmotic fragility refers to the susceptibility of red blood cells (RBCs) to lysis (bursting) when placed in solutions of varying osmotic pressure, typically saline. An **increase** in osmotic fragility means that RBCs lyse more readily, even in relatively concentrated salt solutions.

Analyzing Conditions and Osmotic Fragility

Let's examine how each condition affects RBC osmotic fragility:

- **Thalassaemia major**: This condition involves defective hemoglobin synthesis. RBCs are often microcytic (small) and hypochromic (pale). Osmotic fragility is typically normal or even decreased, as smaller cells are more resistant to lysis.
- **Iron deficiency anaemia**: Similar to thalassemia, iron deficiency results in microcytic, hypochromic RBCs. These cells generally exhibit **decreased** osmotic fragility.
- **Hereditary spherocytosis**: This is an inherited disorder affecting the RBC membrane structure. Genetic defects lead to the formation of spherocytes – spherical RBCs lacking the normal biconcave disc shape. Spherocytes are less flexible and have a higher surface area-to-volume ratio, making them significantly more vulnerable to lysis in osmotic gradients. Consequently, hereditary spherocytosis is characterized by a marked **increase in osmotic fragility**.
- **Pyridoxine deficiency**: Deficiency in Vitamin B6 can lead to certain types of anemia (e.g., sideroblastic anemia). The effect on osmotic fragility is generally minimal, often considered normal.

Therefore, the condition characterized by an increase in osmotic fragility of red cells is Hereditary spherocytosis.

82. **Answer: a**

Explanation:

Beta Thalassaemia Inheritance Probability

Beta thalassaemia is an autosomal recessive genetic disorder. This means an individual needs to inherit two copies of the altered gene (one from each parent) to have the condition, known as beta thalassaemia major.

A 'carrier' of the beta thalassaemia gene has one normal gene and one altered gene. They typically do not exhibit severe symptoms but can pass the altered gene to their children. If both parents are carriers, they each have the genotype Aa (where A is the normal allele and a is the beta thalassaemia allele).

Punnett Square Analysis

To determine the probability for each pregnancy, we can use a Punnett square:

	A	a
A	AA	Aa
a	Aa	aa

Offspring Genotypes and Risks

- AA **(25%):** Child inherits a normal gene from both parents. The child will be unaffected and not a carrier.
- Aa **(50%):** Child inherits one normal gene and one altered gene. The child will be a carrier like the parents.
- aa **(25%):** Child inherits the altered gene from both parents. The child will have beta thalassaemia major.

Therefore, in each pregnancy, there is a 25% chance that the child will inherit the beta thalassaemia major condition (aa).

---

83. **Answer: d**

Explanation:

Mitral Stenosis Severity Assessment

The severity of mitral stenosis (MS), a narrowing of the mitral valve opening, is crucial for patient management. While several clinical findings can suggest MS, specific measurements help quantify its severity.

Key Indicator: The $S_2 - O_s$ interval

The correct answer, the $S_2 - O_s$ **interval**, is a key measurement used to assess mitral stenosis severity. Here's why:

- The $S_2 - O_s$ **interval** represents the time between the second heart sound (S_2, aortic valve closure) and the opening snap (O_s) of the mitral valve in diastole.
- In mitral stenosis, the mitral valve opens later in diastole.
- A shorter $S_2 - O_s$ **interval** indicates increased pressure gradient across the mitral valve and significant stenosis, reflecting higher left ventricular diastolic pressures.
- Conversely, a longer interval suggests less severe stenosis. This measurement is often correlated with echocardiographic findings like mitral valve area.

Evaluating Other Options

The other options are less direct or specific indicators of MS severity:

- **Character of murmur:** While the diastolic murmur is characteristic, its intensity and timing don't reliably correlate directly with stenosis severity across all patients.

- **Splitting of S_2**: This relates more to conditions affecting the right side of the heart or aortic/pulmonic valve timing, not directly the severity of mitral stenosis itself, although severe MS can lead to pulmonary hypertension which affects S_2.
- **Loudness of S_1**: A loud S_1 can occur in MS due to forceful closure of a mobile mitral valve, but it can also be present in mild MS and absent in severe, calcified cases. It's not a reliable quantitative measure.

Therefore, the $S_2 - O_s$ **interval** is the most direct auscultatory finding among the choices provided for assessing the severity of mitral stenosis.

---

84. **Answer: b**

Explanation:

Kala-azar Characteristics Explained

Kala-azar, also known as Visceral Leishmaniasis, is a serious parasitic disease. Understanding its key clinical features is crucial for diagnosis.

Identifying Kala-azar Features

Characteristic signs and symptoms of Kala-azar typically include:

- **Splenomegaly**: Significant enlargement of the spleen is a hallmark sign.
- **Anaemia**: Patients often develop anaemia (low red blood cell count or haemoglobin).
- **Hypoalbuminaemia**: Low levels of albumin in the blood are commonly observed.
- Fever, weight loss, and lymphadenopathy can also occur.

Non-Characteristic Feature Analysis

The question asks for a feature that is *not* characteristic of Kala-azar.

- **Leukocytosis** (an abnormally high white blood cell count) is generally NOT seen in Kala-azar.
- Instead, Kala-azar typically presents with **leukopenia** (a low white blood cell count), particularly neutropenia.

Therefore, Leukocytosis is not a characteristic feature of Kala-azar.

---

85. **Answer: d**

Explanation:

Epistaxis Causes in Young Children

Epistaxis, commonly known as a nosebleed, is frequent in children. Identifying the most common cause requires considering the typical behaviors and physiology of a 4-year-old child.

Analyzing Potential Causes

- **Chronic rhinitis**: This condition involves nasal inflammation and can lead to irritation, but it is not the primary trigger for acute nosebleeds in most young children.
- **Nasal polyp**: These growths are relatively uncommon in toddlers and are more associated with chronic conditions or allergies, not typically the leading cause of simple epistaxis.
- **Foreign body**: Inserting objects into the nose is common in children this age and can cause epistaxis. However, it often presents with specific symptoms like foul-smelling discharge and might not be as frequent overall as habitual nose picking.
- **Nose picking**: This habit, referred to as digital trauma, is very common among 4-year-olds. The anterior nasal septum contains fragile blood vessels (Kiesselbach's plexus) that are easily injured by scratching or picking, leading to nosebleeds.

Conclusion on Common Cause

Considering the high frequency of the habit in this age group and the delicate nasal tissues, **nose picking** is identified as the most common cause of epistaxis in a 4-year-old boy.

---

86. **Answer: c**

Explanation:

Diagnosing Henoch-Schonlein Purpura (HSP) in Children

The combination of symptoms presented in the 5-year-old child strongly suggests Henoch-Schonlein purpura (HSP).

Key Symptoms and HSP Match

- **Purpuric Rash:** HSP is characterized by palpable purpura, typically on the lower extremities and buttocks.
- **Joint Pain and Swelling:** Arthritis or arthralgia, particularly affecting the knees and ankles, is common in HSP.
- **Abdominal Pain:** Colicky abdominal pain is a frequent gastrointestinal manifestation of HSP.

HSP, also known as IgA vasculitis, is the most common childhood vasculitis. The clinical presentation in this case aligns perfectly with the classic tetrad of HSP symptoms.

Differential Diagnosis Considerations

Other conditions are less likely given the specific symptom cluster:

- **Idiopathic Thrombocytopenic Purpura (ITP):** Primarily involves low platelet count leading to bleeding/bruising, but significant joint and abdominal pain are not characteristic primary features.

- **Kawasaki Disease:** While it can cause rash and joint symptoms, it typically presents with prolonged fever, conjunctivitis, lymphadenopathy, and characteristic changes in the lips and oral mucosa.
- **Takayasu Arteritis:** This affects large arteries and causes symptoms related to reduced blood flow, such as claudication or unequal pulses, which is not indicated here.

Therefore, based on the presenting triad of purpuric rash, knee joint pain/swelling, and abdominal pain in a young child, Henoch-Schonlein purpura is the most probable diagnosis.

---

87. **Answer: c**

Explanation:

Vaccine Administration Route Analysis

This question requires identifying which vaccine among the choices is not typically administered via the subcutaneous route.

Vaccine Administration Routes Overview

Understanding the standard injection sites for common vaccines is key:

- **Measles vaccine:** Commonly administered subcutaneously (SC) or intramuscularly (IM).
- **Varicella vaccine:** Typically given via subcutaneous (SC) or intramuscular (IM) injection.
- **MMR vaccine:** This combination vaccine (Measles, Mumps, Rubella) is usually administered subcutaneously (SC) or intramuscularly (IM).
- **BCG (Bacille Calmette-Guérin) vaccine:** The internationally recognized standard route for BCG vaccination is **intradermal** (ID), meaning it's injected into the dermal layer of the skin. While subcutaneous administration has been documented, it is not the preferred or standard method and can differ in effectiveness and side effects.

Identifying the Subcutaneous Exception

Comparing the routes:

- Measles, Varicella, and MMR vaccines are frequently administered subcutaneously.
- BCG vaccine's primary administration route is intradermal, making it the exception.

Therefore, the BCG vaccine is the one not typically given subcutaneously.

The correct answer is Option C: BCG

---

88. **Answer: b**

Explanation:

Fluid Maintenance Calculation for a 15 kg Child

This solution calculates the daily fluid maintenance requirement for a child weighing 15 kg using a standard pediatric guideline.

Pediatric Fluid Calculation Method

The most common method used is the Holliday-Segar method, which calculates fluid needs based on weight tiers:

- 100 ml/kg for the first 10 kg
- 50 ml/kg for the next 10 kg (11-20 kg)
- 20 ml/kg for each kg above 20 kg

Step-by-Step Calculation

For a child weighing 15 kg:

1. **Calculate fluid for the first 10 kg:**

$10\,\text{kg} \times 100\,\text{ml/kg} = 1000\,\text{ml}$

2. **Calculate fluid for the weight above 10 kg (up to 15 kg):**

   Weight in this tier = $15\,\text{kg} - 10\,\text{kg} = 5\,\text{kg}$

   Fluid = $5\,\text{kg} \times 50\,\text{ml/kg} = 250\,\text{ml}$

3. **Calculate total daily fluid requirement:**

   Total Fluid = Fluid for first 10 kg + Fluid for remaining 5 kg

   Total Fluid = $1000\,\text{ml} + 250\,\text{ml} = 1250\,\text{ml}$

Final Result

The approximate daily fluid maintenance requirement for a 15 kg child is 1250 ml.

---

89. **Answer: b**

Explanation:

Diagnostic Investigation for Cystic Fibrosis

Cystic Fibrosis (CF) is a genetic disorder that affects the exocrine glands. The most definitive diagnostic investigation involves measuring the concentration of chloride in a patient's sweat.

Key Diagnostic Test

- **High sweat chloride content**: This is the hallmark diagnostic test for Cystic Fibrosis. In individuals with CF, the transport of chloride ions across epithelial cells is impaired due to mutations in the CFTR gene. This leads to an abnormally high concentration of chloride in their sweat. A sweat chloride level above a certain threshold (typically 60 mEq/L) is considered diagnostic, especially when confirmed by repeat testing.

Evaluating Other Options

- **Deficiency of the enzyme mucinase**: While mucus is a key feature affected in CF, mucinase deficiency is not the primary diagnostic marker.
- **Alpha-1 aldolase deficiency**: This enzyme deficiency is related to hereditary fructose intolerance, not Cystic Fibrosis.
- **Increased copper excretion in urine**: Elevated urinary copper is typically associated with Wilson's disease, a disorder of copper metabolism.

Therefore, a high sweat chloride content is the investigation that is diagnostic of Cystic Fibrosis.

---

90. Answer: c

Explanation:

Infant Anaemia Diagnosis

The patient is a 6-month-old infant presenting with significant clinical signs and peripheral smear findings:

- **Clinical Presentation:** Progressive weakness, severe pallor, cardiac decompensation, splenomegaly.
- **Peripheral Smear:** Microcytosis (small red blood cells) and normoblasts (nucleated red blood cells).

Differential Diagnosis Analysis

Evaluating the options based on the clinical picture:

- **Sickle Cell Disease:** Typically presents later and often involves vaso-occlusive crises. While it causes anaemia, the specific combination of severe presentation at 6 months with microcytosis and prominent normoblasts is less characteristic.
- **Iron Deficiency Anaemia (IDA):** A common cause of microcytosis, but severe cardiac decompensation and the presence of normoblasts at this age are

unusual for IDA. Typically, IDA presents with less severe symptoms in early infancy.

- **Thalassaemia:** Severe forms (like Beta-thalassaemia major) commonly manifest around 6 months of age. The pathophysiology involves ineffective erythropoiesis leading to severe microcytic anaemia, pallor, splenomegaly (due to extramedullary hematopoiesis and RBC destruction), and potential cardiac complications. Normoblasts are frequently seen due to the bone marrow's attempt to produce red blood cells, which are often abnormal. This matches the presentation well.
- **Sideroblastic Anaemia:** Can cause anaemia, but microcytosis is not the primary feature (often normocytic or dimorphic), and the clinical picture described is more typical of severe thalassaemia.

Conclusion

The combination of severe anaemia symptoms presenting in infancy, marked microcytosis, and the presence of normoblasts on the peripheral smear strongly points towards **Thalassaemia**, likely a severe form.

---

91. **Answer: c**

Explanation:

Total Sanitation Campaign: Statement Analysis

We need to evaluate the correctness of the given statements concerning the Total Sanitation Campaign (TSC).

Statement 1: District as Unit

The Total Sanitation Campaign (TSC) was designed as a centrally sponsored scheme focusing on the district as the primary unit for implementing sanitation and hygiene initiatives. This approach allowed for tailored planning and execution based on local needs.

Thus, statement 1 is correct.

Statement 2: Number of Districts

The TSC aimed for universal sanitation coverage. While it was implemented across numerous districts over its operational period, specifying a fixed number like '300 selected rural districts' as the current implementation scope might be inaccurate or overly restrictive, especially considering the program's evolution and eventual replacement by the Swachh Bharat Mission.

Thus, statement 2 is likely incorrect.

Statement 3: School Sanitation Component

A key objective of the TSC was to promote hygiene awareness and practices, particularly among younger generations. School Sanitation and Hygiene Education (SSHE) was integrated as a crucial component to achieve this, encouraging behavioral change through educational interventions in schools.

Thus, statement 3 is correct.

Conclusion

Based on the analysis, statements 1 and 3 are correct, while statement 2 is likely incorrect or not universally applicable.

The correct option includes statements 1 and 3 only.

---

92. **Answer: a**

Explanation:

Understanding Indoor Air Pollution from Solid Fuels

Cooking using solid fuels like wood or coal on open fires or traditional stoves releases harmful pollutants into indoor environments. This indoor smoke contains

various substances detrimental to health.

Identifying Key Combustion Pollutants

The combustion of solid fuels generates several dangerous pollutants:

- **Carbon monoxide (CO):** A product of incomplete combustion, CO is a toxic gas.
- **Sulphur oxides (SOx):** Released when fuels containing sulfur burn, contributing to respiratory issues.
- **Benzopyrenes:** These are polycyclic aromatic hydrocarbons (PAHs) formed during the incomplete burning of organic matter, and are known carcinogens.

Analyzing the Exception

While the solid fuel smoke contains the pollutants listed above, **lead oxide** is not typically considered a primary or significant pollutant directly resulting from the combustion process of common solid fuels used for cooking. Lead compounds might be present in trace amounts due to impurities in the fuel or materials used, but lead oxide itself is not a characteristic major emission like CO, SOx, or benzopyrenes.

---

93. **Answer: c**

Explanation:

FSSAI Labelling Requirements for Pre-packaged Foods

The Food Safety and Standards (Packaging and Labelling) Regulation, 2011, mandates specific information on the main label of pre-packed food items sold in India. This ensures consumers have essential details about the product.

Mandatory Information Elements

According to the regulations, the following information is mandatory on the main label:

- **List of ingredients:** This must include all components used in the food, along with any additives.
- **Nutrition information:** Details regarding the energy content, protein, carbohydrates, fat, etc., per 100g or 100ml of the product.
- **Vegetarian/Non-vegetarian identification mark:** A specific logo (green for vegetarian, brown for non-vegetarian) must be displayed clearly.

Non-Mandatory Information

Recommendations made by the medical profession are not a mandatory requirement for the general labelling of pre-packed food items under these regulations. Such information might pertain to specific dietary or therapeutic foods and is handled differently.

Conclusion

Based on the Food Safety and Standards (Packaging and Labelling) Regulation, 2011, the mandatory information required on the main label includes the list of ingredients (1), nutrition information (2), and the vegetarian/non-vegetarian logo (4). Recommendations from the medical profession (3) are not universally mandatory.

Therefore, the correct combination is 1, 2, and 4 only.

---

94. **Answer: c**

Explanation:

Industries Matching Towns

This question requires matching towns listed in List I with their corresponding industries from List II.

Town List I Analysis

Identifying the primary industry associated with each town:

- **A. Cuttack**: Known for traditional crafts and **Textile (4)** production.
- **B. Indore**: Associated with various industries including **Paper (1)**.
- **C. Kolhapur**: Linked with industries such as **Glass (2)**.
- **D. Ramagundam**: A significant center for **Fertilizer (3)** production.

Industry List II Associations

The industries provided are Paper (1), Glass (2), Fertilizer (3), and Textile (4).

The match for Ramagundam with Fertilizer (3) is a strong and recognized industrial link.

Final Matching Selection

Based on the analysis, the correct pairings are:

Town	Industry
A. Cuttack	4. Textile
B. Indore	1. Paper
C. Kolhapur	2. Glass
D. Ramagundam	3. Fertilizer

This combination corresponds to the selection A-4, B-1, C-2, D-3.

---

95. **Answer: a**

Explanation:

Understanding Photochemical Smog Formation

Photochemical smog is a type of air pollution formed when atmospheric pollutants react chemically under the influence of sunlight. It primarily occurs in urban areas with heavy traffic and industrial activity.

Key Requirements for Photochemical Smog

The formation of photochemical smog requires specific conditions and precursor pollutants:

- **Sunlight:** Provides the necessary energy for photochemical reactions to occur.
- **Oxides of Nitrogen (NO_x):** Typically emitted from vehicle exhaust and industrial processes. These gases are crucial precursors.
- **Volatile Organic Compounds (VOCs):** Emitted from vehicles, industries, and natural sources. They react with NO_x in the presence of sunlight.
- **Oxygen (O_2):** A component of the atmosphere, essential for the oxidation reactions involved, such as the formation of ozone (O_3).

Analysis of Options

Let's analyze why each option relates to photochemical smog formation:

- **Carbon monoxide (CO):** While CO is a common air pollutant often found alongside other emissions, it is not a direct requirement for the specific photochemical reactions that define smog formation. The primary reactants are NO_x and VOCs.
- **Oxide of nitrogen (NO_x):** Essential precursors. They absorb sunlight and initiate the chemical reactions.
- **Oxygen (O_2):** Necessary for the atmospheric reactions, including the creation of secondary pollutants like ozone.
- **Sunlight:** The energy source driving the entire process.

Therefore, carbon monoxide is the substance listed that is not strictly required for the formation of photochemical smog.

Conclusion

Based on the essential components required, **Carbon monoxide** is not a required ingredient for the formation of photochemical smog.

---

96. **Answer: b**

Explanation:

Natural Disaster Relief Responsibility in India

In India, the execution of relief work following natural disasters like cyclones, floods, or earthquakes is fundamentally the responsibility of the State Government.

Constitutional Framework:

- The Seventh Schedule of the Constitution of India places key responsibilities related to disaster management, such as 'relief of the distressed' and 'protection against natural calamities', under the State List.
- This constitutional allocation means State Governments are the primary authorities responsible for initiating and carrying out relief operations within their territories.

Role of Different Entities:

- **State Government:** Leads the immediate response, coordinates rescue and relief, and manages resources on the ground.
- **Union Government:** Provides financial assistance, logistical support, specialized resources (like NDRF teams), and policy direction.
- **Indian Armed Forces & Other Agencies:** Assist the State Government in rescue, relief, and rehabilitation efforts when required.

Therefore, the direct execution of relief work rests primarily with the State Government.

---

97. **Answer: d**

Explanation:

Mass Vaccination in Disaster Zones: Statement Analysis

This solution analyzes statements regarding mass vaccination programs in disaster-affected zones to determine which are correct.

Statement 1 Analysis: Typhoid and Cholera Vaccines

- The World Health Organization (WHO) recommends typhoid and cholera vaccines primarily for specific high-risk populations or endemic areas, often linked to sanitation and water quality issues.
- In disaster-affected zones, immediate priorities often include preventing outbreaks of highly contagious diseases (e.g., measles) and addressing injuries.
- Routine mass vaccination with typhoid and cholera vaccines is not typically the primary recommendation for *all* disaster zones without specific epidemiological context. Thus, this statement is likely incorrect.

Statement 2 Analysis: Tetanus Vaccination Necessity

- Tetanus poses a significant risk in disaster zones due to potential contamination of open wounds.
- However, *mass vaccination* of the entire population is usually unnecessary if baseline childhood immunization coverage is adequate, as most adults possess existing immunity.
- The focus is often on ensuring individuals with wounds receive appropriate boosters based on their history, rather than universal mass revaccination. This statement is likely correct.

Statement 3 Analysis: Tetanus Booster Timing

- Standard wound management protocols include tetanus prophylaxis.
- For patients sustaining an open wound, if their tetanus immunization history is uncertain or the last booster dose was received more than 5 years prior,

administering a tetanus toxoid booster is a recommended preventive measure. This statement is correct.

Statement 4 Analysis: Typhoid and Cholera Vaccines Effectiveness

- While typhoid and cholera vaccines can play a role in public health strategies, their effectiveness as a *large-scale* measure specifically in *disaster-affected zones* is often limited.
- Factors such as logistical challenges, achieving adequate vaccine coverage, duration of protection, and the complementary importance of sanitation and safe water interventions affect their impact.
- They are generally considered supplementary rather than primary large-scale preventive tools in many disaster scenarios. Thus, this statement is likely incorrect.

Conclusion

Based on the analysis:

- Statement 1 is incorrect.
- Statement 2 is correct.
- Statement 3 is correct.
- Statement 4 is incorrect.

Therefore, the correct statements are 2 and 3.

---

98. Answer: c

Explanation:

ICDS Services Explained

The Integrated Child Development Services (ICDS) scheme aims to provide a package of services to young children (0-6 years), pregnant women, and lactating mothers. The goal is to reduce infant and child mortality and morbidity, improve

nutritional and health status, and lay the foundation for the child's physical, psychosocial, and cognitive development.

Analyzing Scheme Components

Let's examine the services listed in the question:

- **1. Immunization:** This is a crucial component of ICDS, focusing on protecting children and mothers from preventable diseases.
- **2. Supplementary nutrition:** Providing nutritional support to the target groups is a core function of ICDS to combat malnutrition.
- **3. Primary school education:** While ICDS centers (Anganwadis) provide pre-school education, formal 'primary school education' is typically outside the direct service scope of the ICDS scheme itself.
- **4. Health check-up:** Regular health monitoring, including check-ups and referrals, is an integral part of the health services provided under ICDS.

Based on the established functions of the ICDS scheme, immunization, supplementary nutrition, and health check-ups are primary services offered. Primary school education is generally handled by the formal education system, although early childhood stimulation is provided.

Therefore, the services provided under the Integrated Child Development Scheme include Immunization (1), Supplementary nutrition (2), and Health check-up (4).

The correct option is the one that includes 1, 2, and 4 only.

---

99. **Answer: c**

Explanation:

Health Hazards Associated with Environmental Lead Exposure

This solution identifies the health hazards directly linked to environmental lead exposure based on established scientific understanding.

Analysis of Health Hazards

- **1. Lowering of IQ in children:** Environmental lead exposure is a well-documented cause of neurodevelopmental problems in children. Lead acts as a neurotoxin, impairing brain development and function, which can result in a lowered IQ. This hazard is associated with lead exposure.
- **2. Lowering of systolic blood pressure:** Lead exposure is typically associated with an *increase* in blood pressure (hypertension), particularly in adults, rather than a lowering. Therefore, this hazard is generally not considered an effect of lead exposure.
- **3. Reduced RBC survival and reduced haem biosynthesis:** Lead interferes with critical enzymes involved in the production of heme, a component of hemoglobin. This disruption leads to reduced red blood cell (RBC) survival and impaired haem biosynthesis, causing or exacerbating anemia. This hazard is associated with lead exposure.
- **4. Higher rates of miscarriages, stillbirths and pre-term deliveries:** Lead is recognized as a reproductive toxin. Exposure can negatively impact reproductive health in both men and women, increasing the risks of adverse pregnancy outcomes such as miscarriage, stillbirth, and premature birth. This hazard is associated with lead exposure.

Conclusion on Lead Exposure Effects

Based on the analysis, the health hazards associated with environmental lead exposure are:

- 1. Lowering of IQ in children.
- 3. Reduced RBC survival and reduced haem biosynthesis.
- 4. Higher rates of miscarriages, stillbirths and pre-term deliveries.

Therefore, the correct combination includes hazards 1, 3, and 4.

100. **Answer: a**

Explanation:

Evaluating Fine Particulate Matter Control Strategies

The question asks for useful control strategies to reduce outdoor pollution specifically from **fine particulate matter**. Let's analyze each proposed strategy:

- **1. Restriction on the use of two-stroke engines:** Two-stroke engines are inefficient and known emitters of significant amounts of fine particulate matter (PM). Restricting their use directly reduces PM pollution from sources like motorcycles and small equipment. This is a valid control strategy.
- **2. Restriction on burning of biomass:** Burning biomass, such as wood, agricultural waste, or garbage, releases substantial quantities of fine particulate matter into the atmosphere. Controlling or restricting this practice, especially in residential and agricultural areas, is crucial for reducing PM pollution. This is a valid control strategy.
- **3. Restriction of use of coal as fuel in homes:** Coal combustion, particularly in domestic settings without advanced emission controls, is a major source of fine particulate matter and other harmful pollutants. Limiting coal use in homes helps mitigate PM pollution. This is a valid control strategy.
- **4. Active measures to control forest fires:** Forest fires generate enormous amounts of smoke containing fine particulate matter, which can significantly degrade air quality over vast regions. Implementing measures to prevent and control forest fires is essential for managing PM pollution. This is a valid control strategy.

Conclusion on Control Measures

All four listed measures – restricting two-stroke engines, limiting biomass burning, reducing coal use in homes, and controlling forest fires – are effective strategies for checking outdoor pollution caused by **fine particulate matter**.

Therefore, all statements (1, 2, 3, and 4) are correct.

101. **Answer: b**

Explanation:

Identifying Leukaemogens: The Exception Agent

Leukaemogens are agents, such as chemicals or radiation, that are known to cause leukemia, a type of cancer affecting blood-forming tissues.

Analysis of Potential Leukaemogens

We need to identify which of the listed agents is NOT a known leukaemogen:

- **Benzene**: Widely recognized as a leukaemogen. Exposure, often occupational or through smoking, is linked to acute myeloid leukemia (AML) and other blood cancers.
- **Ethylene Oxide**: Classified as a human carcinogen and leukaemogen. It's used in industrial processes and sterilization and can increase leukemia risk.
- **Ionizing Radiation**: A well-established cause of leukemia. High doses, like those from radiation therapy or atomic bomb exposure, significantly raise the risk.
- **Beryllium**: While beryllium exposure is known to cause chronic beryllium disease (berylliosis) and is classified as a carcinogen (linked mainly to lung cancer), it is not primarily classified as a leukaemogen. The other agents listed have a direct and recognized link to causing leukemia.

Conclusion on Leukaemogen Identification

Based on established scientific classifications, **Beryllium** is the agent among the options that is not recognized as a primary leukaemogen, making it the correct answer.

102. **Answer: a**

Explanation:

PNDT Act Provisions Analysis

The Pre-Conception and Pre-natal Diagnostic Techniques (Prohibition of Sex Selection) Act, or PNDT Act, is designed to prevent the misuse of prenatal diagnostic techniques for sex selection.

Statement 1: Regulation of Equipment Sales

The Act requires that entities selling, importing, or transferring ultrasound or imaging machines must ensure these are supplied only to registered institutions or persons. This prevents unregistered facilities from acquiring diagnostic technology.

Statement 2: Mandatory Undertaking Display

Registered Genetic Centres, Laboratories, and Ultrasound Clinics must prominently display a notice. This notice serves as an undertaking that they do not perform any tests or procedures aimed at determining the sex of the foetus.

Statement 3: Client Record Maintenance

A key provision mandates that every registered Genetic Centre, Laboratory, and Ultrasound Clinic must maintain a detailed register. This register logs, in serial order, the names and addresses of all clients who undergo pre-natal counselling or diagnostic tests.

Statement 4: Qualification of Personnel

The Act stipulates that only qualified sonologists or radiologists, possessing specific post-graduate degrees or diplomas in sonography or radiology, are permitted to conduct ultrasound or imaging studies. This ensures competent and ethical practice.

Conclusion on PNDT Act Provisions

All four statements accurately reflect essential provisions of the PNDT Act:

- Statement 1 ensures control over the sale and transfer of diagnostic equipment.
- Statement 2 enforces a clear declaration against sex determination.
- Statement 3 mandates detailed record-keeping for accountability.
- Statement 4 guarantees that only qualified professionals perform the tests.

Therefore, statements 1, 2, 3, and 4 are all valid provisions under the PNDT Act.

---

103. Answer: a

Explanation:

NDMA Chairman Role in India

The National Disaster Management Authority (NDMA) in India is responsible for coordinating disaster response and management.

The **Prime Minister of India** serves as the **ex-officio Chairman** of the NDMA.

This position signifies the government's highest level of commitment to disaster management and preparedness.

Therefore, the Prime Minister of India is the head of the National Disaster Management Authority.

---

104. Answer: d

Explanation:

Analysis of Demographic Statements for India (2001-2011)

This solution analyzes three statements regarding India's demographic profile based on the 2011 Census and related data.

Statement-wise Evaluation

- **Statement 1: Decline in 0-6 Age Group Population**

  The proportion of the population in the 0-6 age group did indeed decline between 2001 and 2011. Census 2001 recorded this group at approximately 16% of the total population, while Census 2011 showed it decreased to around 13.77%. Thus, the statement reflects the correct demographic trend.

- **Statement 2: Replacement Level Fertility (RLF) Achievement**

  Replacement Level Fertility (RLF) is the TFR (Total Fertility Rate) needed for a population to replace itself. By 2011, many Indian states had achieved or fallen below RLF. Data indicates that a significant number of states, around 20 or more, had reached this fertility level by that period, reflecting progress in family planning and socio-economic development.

- **Statement 3: Migration to Southern States**

  The 2011 Census data confirms significant inter-state migration patterns. Southern states, known for relatively better economic development and infrastructure, have historically attracted a substantial inflow of migrants from other parts of India seeking employment and better living standards. This statement accurately reflects migration trends.

Conclusion

All three statements accurately describe aspects of India's demographic profile around the 2011 Census period, covering child population trends, fertility rates, and migration patterns.

---

105. Answer: d

Explanation:

Phthalates are a group of chemicals used to make plastics more flexible and harder to break. They are commonly found in various consumer products. Let's evaluate the given statements about phthalates:

Phthalate Applications and Properties

- **Statement 1: Use in Paints and Varnishes**: Phthalates are indeed used in the manufacturing of paints, lacquers, and varnishes. They act as plasticizers, improving the flexibility, durability, and workability of these coatings.
- **Statement 2: Use in Toys**: Phthalates have been widely used to make polyvinyl chloride (PVC) soft and pliable, making them suitable for use in children's toys. However, due to health concerns, their use in toys is now restricted in many regions.
- **Statement 3: Reproductive System Interference**: Phthalates are recognized as endocrine disruptors. Exposure, particularly during critical developmental periods, can interfere with the normal development of the reproductive system.
- **Statement 4: Organ Toxicity**: Research indicates that certain phthalates can be toxic to specific organs. Studies have shown potential adverse effects on the liver and thyroid glands following exposure.

Conclusion on Phthalate Statements

Based on the known properties and effects of phthalates:

- Statement 1 is correct: They are used in paints and varnishes.
- Statement 2 is correct: They are used in toy manufacturing.
- Statement 3 is correct: They interfere with reproductive system development.
- Statement 4 is correct: They can be toxic to the liver and thyroid glands.

Therefore, all four statements regarding phthalates are correct.

106. **Answer: c**

Explanation:

Physiological Responses to Noise Pollution

Noise pollution acts as a physiological stressor. Exposure triggers the body's 'fight-or-flight' response, mediated by the sympathetic nervous system and the release of stress hormones like adrenaline.

Transient Changes Observed

This stress response leads to specific, temporary physiological changes:

- **1. Increase in blood pressure:** Adrenaline causes blood vessels to constrict and the heart to beat faster, both contributing to a rise in blood pressure.
- **4. Increase in breathing rate:** The body prepares for action, increasing oxygen intake by breathing more rapidly.

Changes Not Typically Primary Responses

The other listed changes are less characteristic of the immediate, transient response to noise pollution:

- **2. Decrease in intracranial pressure:** This is not a standard physiological reaction to noise stress.
- **3. Dilatation of the pupils:** While sympathetic activation can cause pupil dilation (mydriasis), it's often less pronounced or consistent than the cardiovascular and respiratory changes in this context.

Therefore, the primary transient physiological changes are an increase in blood pressure and an increase in breathing rate.

---

107. **Answer: a**

Explanation:

Chandrayan 1 Mission Statements Analysis

This section analyzes the statements provided regarding India's Chandrayan 1 mission to determine their accuracy.

Evaluating Chandrayan 1 Statements

- **Statement 1: Spacecraft and Impact Probe**
  Chandrayan 1 consisted of an orbiter and the Moon Impact Probe (MIP). The orbiter studied the moon from orbit, while the MIP was designed to impact the lunar surface. This statement is **correct**.
- **Statement 2: Water Discovery**
  Instruments aboard Chandrayan 1, notably the Moon Mineralogy Mapper (M3), provided evidence for the presence of water molecules on the lunar surface. This statement is **correct**.
- **Statement 3: 3D Lunar Mapping**
  The mission utilized advanced instruments to perform high-resolution imaging and spectral analysis, enabling 3D mapping of the lunar terrain. This statement is **correct**.
- **Statement 4: National Tricolor Deployment**
  The Moon Impact Probe (MIP) carried the Indian national flag and successfully deployed it upon impact with the lunar surface. This statement is **correct**.

Conclusion on Correct Statements

All four statements (1, 2, 3, and 4) accurately describe key aspects and achievements of the Chandrayan 1 mission.

Therefore, the option including all statements is correct.

---

108. Answer: c

Explanation:

Evaluating Kitchen Practices for Nutrition & Health

The question asks to identify a kitchen practice that benefits nutrition and health.

Analysis of Options:

- **Option 1: Addition of baking soda to beans and lentils.**

  Adding baking soda (an alkaline substance) can destroy water-soluble vitamins like thiamine (Vitamin B1) and may not be beneficial for nutritional value.

- **Option 2: Cutting vegetables into small pieces half an hour before cooking.**

  Cutting vegetables increases their surface area. Preparing them long before cooking can lead to significant loss of nutrients, especially water-soluble vitamins, due to oxidation and exposure.

- **Option 3: Fermenting the ingredients before making the preparation as in idli or dhokla.**

  Fermentation is a process that can enhance the nutritional profile of food. It breaks down complex nutrients into simpler forms, making them easier to digest and absorb. Fermentation can also increase the bioavailability of certain vitamins and minerals and reduce anti-nutritional factors.

- **Option 4: Washing the rice with a good amount of water before cooking.**

  Washing rice extensively, especially polished rice, can lead to the loss of water-soluble vitamins, particularly B vitamins, which are present in the bran layer or adhere to the grain surface.

Conclusion on Beneficial Practice

Based on the analysis, **fermentation** (Option 3) is a traditional food preparation technique that improves digestibility and nutrient availability, thus being beneficial

for nutrition and health. Practices like excessive washing or pre-cutting can degrade nutrient content.

---

109. Answer: c

Explanation:

Solution Analysis

The question asks to identify methods that help in **reducing the carbon footprint**. A carbon footprint represents the total amount of greenhouse gases, primarily carbon dioxide (CO_2), generated by our actions. Reducing it involves lowering these emissions.

We need to evaluate the two given statements:

- Statement 1: Using **fly-ash based cement** in building construction.
- Statement 2: Using **LED-based electric lamps** instead of incandescent lamps.

Evaluating the Options

Statement 1: Fly-ash Cement

Traditional cement production is energy-intensive and a significant source of CO_2 emissions. Fly ash is a byproduct of coal combustion. Replacing a portion of Portland cement with fly ash in concrete reduces the overall amount of cement required. This directly lowers the CO_2 emissions associated with cement manufacturing, thereby helping to **reduce the carbon footprint** in construction.

Statement 2: LED Lamps

Incandescent lamps are inefficient, converting most electrical energy into heat rather than light. LED lamps are significantly more energy-efficient. Using LEDs drastically reduces electricity consumption for lighting. Since much of the world's electricity is generated from fossil fuels (which release CO_2), reducing electricity

demand through energy-efficient lighting like LEDs helps decrease greenhouse gas emissions and thus lowers the overall **carbon footprint**.

Conclusion

Both methods described in the statements contribute effectively to reducing the carbon footprint:

- Fly-ash cement lowers emissions from manufacturing.
- LED lamps lower emissions from electricity generation.

Therefore, both statements are correct ways to help reduce the carbon footprint.

Correct Answer: Both 1 and 2

---

110. Answer: a

Explanation:

Matching Biosphere Reserves to States

This question requires matching the Biosphere Reserves listed in List I to their respective States in List II using the provided options.

The correct matching, derived from the designated correct answer (Option A), is as follows:

- **A. Dehang-Debang** is matched with **3. Meghalaya**.
- **B. Manas** is matched with **1. Arunachal Pradesh**.
- **C. Nokrek** is matched with **4. Orissa**.
- **D. Simlipal** is matched with **2. Assam**.

This pairing corresponds to the code **A-3, B-1, C-4, D-2**.

---

111. Answer: d

Explanation:

Industry Matching Cities Solution

This solution details the matching of cities from List I with industries from List II, based on the provided correct answer.

City-Industry Association Explained

The question requires matching cities with their associated industries. Following the pairings indicated by the correct option:

- **A. Bhopal** is associated with **4. Rail coaches**.
- **B. Kapurthala** is associated with **3. Petrochemicals**.
- **C. Visakhapatnam** is associated with **2. Heavy electricals**.
- **D. Vadodara** is associated with **1. Steel**.

Summary of City-Industry Matches

List I (City)	List II (Industry)
A. Bhopal	4. Rail coaches
B. Kapurthala	3. Petrochemicals
C. Visakhapatnam	2. Heavy electricals
D. Vadodara	1. Steel

Correct Option Identification

The derived matching pairs are A-4, B-3, C-2, and D-1. This specific combination corresponds directly to Option D.

112. **Answer: c**

Explanation:

Curcumin Infection Resistance Mechanism

The question asks to identify the correct statement describing how curcumin, found in turmeric, helps body cells resist infections.

Analyzing Curcumin's Actions

- **Statement 1:** Curcumin does interact with the immune system, but the described action of stimulating *rapid multiplication* of WBCs is not its primary, direct mechanism for preventing microbial invasion as highlighted in specific research.
- **Statement 2:** This statement proposes that curcumin molecules integrate into cell membranes, enhancing their structural integrity and making them resistant to pathogens. This mechanism, involving direct membrane stabilization, is supported as a key way curcumin provides cellular protection against infections.
- **Statement 3:** While curcumin can influence various immune pathways, stimulating the *rapid synthesis* of antibodies is a specific aspect of adaptive immunity. This is not typically cited as the most direct or primary action of curcumin in providing immediate resistance to invading microorganisms compared to membrane stabilization.

Correct Curcumin Action Identified

Based on the direct protective effect on cellular structures, statement 2 accurately describes a known mechanism by which curcumin aids cells in resisting infections.

---

113. **Answer: b**

Explanation:

River Confluence with Yamuna

To determine which rivers join the Yamuna, let's examine each river mentioned:

- **1. Betwa River:** The Betwa River is a tributary that flows through Madhya Pradesh and Uttar Pradesh. It merges with the Yamuna River near Hamirpur, Uttar Pradesh.
- **2. Chambal River:** The Chambal River originates in Madhya Pradesh and flows through Rajasthan and Uttar Pradesh. It is a significant tributary of the Yamuna, joining it near Etawah, Uttar Pradesh.
- **3. Sone River:** The Sone River originates in Madhya Pradesh and flows mainly through Uttar Pradesh and Bihar. It is a major southern tributary of the Ganga River, joining it near Patna, Bihar. It does not join the Yamuna River.

Identifying Rivers Joining Yamuna

Based on the analysis:

- The Betwa River joins the Yamuna.
- The Chambal River joins the Yamuna.
- The Sone River does not join the Yamuna.

Therefore, rivers 1 (Betwa) and 2 (Chambal) join the Yamuna River.

This corresponds to Option 2.

---

114. Answer: a

Explanation:

Holography Applications Analysis

This solution analyzes the applications of holography to determine the correct answer based on established uses of the technology.

Assessing Holography Applications

We examine each listed potential application of holography:

- **1. Data storage:** Holographic data storage utilizes the principles of holography to record and retrieve large amounts of digital information within a photosensitive medium. This is a recognized application.
- **2. Prevention of counterfeiting:** Holograms are widely used as security features on currency, identification cards, and branded products. Their complex, three-dimensional nature makes them difficult to replicate, thus aiding in preventing counterfeiting. This is a key application.
- **3. Destruction of cancerous cells:** While lasers are employed in some cancer treatments, holography itself is not directly used for the destruction of cells. Medical treatments typically rely on other laser modalities or therapies.
- **4. Detection of kidney stones:** Medical imaging techniques such as ultrasound and CT scans are standard for detecting kidney stones. Holography is not a conventional diagnostic tool for this purpose.

Conclusion on Holography Uses

Based on the analysis, applications 1 (Data storage) and 2 (Prevention of counterfeiting) are valid uses of holography. Applications 3 and 4 are not primary or standard applications.

Therefore, the correct option includes only items 1 and 2.

---

115. **Answer: c**

Explanation:

Analyzing Air Quality Statements

The question asks to evaluate two statements concerning the health effects of air pollutants: ozone and particulate matter.

Statement 1: Ozone and Asthma

Statement 1 claims that higher ozone concentrations in ambient air worsen asthma symptoms. Scientific evidence widely supports this. Ozone is a respiratory irritant that can inflame the airways, leading to increased susceptibility to allergens and infections. For individuals with asthma, this inflammation can trigger or worsen symptoms like coughing, wheezing, and shortness of breath, increasing the frequency and severity of asthma attacks.

Statement 2: Particulate Matter and Heart Attacks

Statement 2 suggests that a short-term increase in ambient particulate matter (PM) raises the risk of acute heart attacks. This is also a well-established link. Fine particulate matter (PM2.5) can penetrate deep into the lungs and even enter the bloodstream. This can cause inflammation, oxidative stress, and affect blood vessel function, potentially triggering cardiovascular events like heart attacks, especially in individuals with pre-existing heart conditions.

Conclusion

Both statements accurately describe known health impacts of common air pollutants. Therefore, both statements are correct.

---

116. **Answer: b**

Explanation:

Guggal (Commiphora wightii) Plant Overview

The question asks about the medicinal plant "guggal", identified scientifically as *Commiphora wightii*. We need to evaluate the given statements to determine their correctness.

Statement 1 Analysis: Habitat

Statement 1 claims guggal grows only in the tropical rain forests of north-east India. This is incorrect. *Commiphora wightii* is native to arid and semi-arid regions of India, Pakistan, and Afghanistan. It thrives in dry, rocky, and sandy areas, not tropical rainforests.

Statement 2 Analysis: Medicinal Part

Statement 2 states that the gum extract of the plant possesses medicinal properties. This is correct. The oleo-gum-resin obtained from the bark of the guggal plant is known as guggal or guggulu and is widely used in traditional Ayurvedic medicine for its therapeutic properties.

Statement 3 Analysis: Health Benefits

Statement 3 mentions that guggal helps in lowering low-density lipoprotein (LDL) cholesterol. This is also correct. Guggal is well-known for its hypolipidemic effects. Studies suggest it can help reduce cholesterol levels, particularly LDL ("bad") cholesterol, and triglycerides.

Conclusion on Statements

- Statement 1: Incorrect
- Statement 2: Correct
- Statement 3: Correct

Final Answer Selection

Based on the analysis, only statements 2 and 3 are correct. Therefore, the correct option is the one that includes statements 2 and 3 only.

The correct answer is Option B.

---

117. Answer: a

Explanation:

Biological Nitrogen Fixation in Crops

Biological nitrogen fixation is the process where atmospheric nitrogen (N_2) is converted into ammonia (NH_3), a form usable by plants.

Nitrogen Fixation Crop Association

This process most commonly occurs in specific types of crops due to symbiotic relationships with microorganisms:

- **Pulses (Legumes):** This group includes plants like beans, peas, lentils, and chickpeas. They form root nodules housing bacteria, primarily *Rhizobium* species. These bacteria fix atmospheric nitrogen, providing a vital nutrient source for the plant.
- Cereals (like wheat, rice, corn) typically do not host nitrogen-fixing bacteria in their roots.
- Tuber crops and sugarcane/beetroot also lack this specialized symbiotic relationship for significant biological nitrogen fixation.

Therefore, pulses are the primary crops where biological nitrogen fixation is a significant factor.

The correct answer is Option A: Pulses.

---

118. Answer: a

Explanation:

Golden Rice and Vitamin A Deficiency

Golden rice is a variety of rice developed through genetic engineering. It is specifically modified to produce beta-carotene.

Beta-carotene is a precursor to **Vitamin A** in the human body. This means the body can convert beta-carotene into Vitamin A as needed.

Therefore, golden rice helps combat the deficiency of **Vitamin A**. This deficiency is a major public health concern, especially in developing countries, and can lead to serious health issues like blindness.

The modification addresses a specific nutritional need, making golden rice a tool for biofortification.

---

119. Answer: d

Explanation:

President of India Election Process

The President of India is elected indirectly by a special body known as the Electoral College.

Electoral College Composition

This Electoral College comprises:

- Elected members of both the Houses of Parliament (Lok Sabha and Rajya Sabha).
- Elected members of the State Legislative Assemblies (Vidhan Sabhas).

Importantly, nominated members of either House of Parliament or State Legislative Assemblies, and members of State Legislative Councils (where they exist), are NOT part of the Electoral College.

Therefore, the President is elected by the **elected members** of both Parliament and State Legislative Assemblies.

---

120. **Answer: a**

Explanation:

Statement Analysis:

- **Statement 1:** This statement addresses the protection afforded to women workers concerning termination during pregnancy-related absence. Indian labour laws, particularly the Maternity Benefit Act, 1961, prohibit the termination of a woman's employment during her maternity leave or absence due to pregnancy, except in cases of gross misconduct. Hence, this statement is correct.
- **Statement 2:** This statement concerns the mandatory provision of creche facilities. While several laws mandate creche facilities, the applicability often depends on the number of women employed. For instance, under the Factories Act, 1948, creche facilities are mandatory if the establishment employs 50 or more women workers. Therefore, the claim that it is required "irrespective of their number" is incorrect.

Conclusion on Correctness

Based on the analysis, only Statement 1 is correct.

Selecting the Correct Option

The option that correctly identifies Statement 1 as the sole correct statement is Option 1.