

PHILSCA Aircraft Construction, Repair, and Maintenance (ACRM) Practice Exam (Sample)

Study Guide



Everything you need from our exam experts!

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SAMPLE

Questions

SAMPLE

- 1. What type of equipment is used for destructive testing by measuring diamond indentation?**
 - A. A) Brinell**
 - B. B) Vickers**
 - C. C) Rockwell**
 - D. D) Shore**
- 2. Which of the following is NOT typically included in a comprehensive safety audit?**
 - A. Review of maintenance records**
 - B. Inspection of emergency equipment**
 - C. Assessment of pilot skills**
 - D. Evaluation of aircraft structural integrity**
- 3. What solution should be used to neutralize nickel-cadmium battery cases affected by electrolyte?**
 - A. Boric acid**
 - B. KNO₃**
 - C. Sodium bicarbonate**
 - D. Sodium Hydroxide**
- 4. What aluminum alloy designation indicates no hardening or tempering treatment?**
 - A. 3003-F**
 - B. 5052-H36**
 - C. 6061-0**
 - D. 2024-T4**
- 5. Why are clad aluminum alloys used in aircraft?**
 - A. They can be heat treated much easier than other aluminum forms**
 - B. They are less subject to corrosion than uncoated aluminum alloys**
 - C. They are stronger than unclad aluminum alloys**
 - D. They are heat resistant**

- 6. What material are oxygen and acetylene cylinders primarily made of?**
- A. Steel**
 - B. Magnesium**
 - C. Aluminum**
 - D. Bronze**
- 7. After experiencing what load must the airframe structure remain intact?**
- A. The design ultimate load times a 1.5 safety factor**
 - B. The design limit load plus the design ultimate load**
 - C. Three times the safety factor**
 - D. The design limit load times a 1.5 safety factor**
- 8. Which solvent should be used to clean a part before dye penetrant inspection?**
- A. A volatile petroleum-based solvent**
 - B. A penetrant developer**
 - C. Water-based solvents only**
 - D. Vegetable-based solvents only**
- 9. What are the common signs of metal fatigue in aircraft structures?**
- A. Increased fuel consumption**
 - B. Cracks, discoloration, and surface deformation**
 - C. Engine overheating**
 - D. Poor cabin pressure**
- 10. Why are clad aluminum alloys favored in aircraft construction?**
- A. Stronger than unclad aluminum alloys**
 - B. Heat treated easier than other forms**
 - C. Less subject to corrosion**
 - D. Endorsed by major manufacturers**

Answers

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- 1. B**
- 2. C**
- 3. A**
- 4. A**
- 5. B**
- 6. A**
- 7. D**
- 8. A**
- 9. B**
- 10. C**

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Explanations

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1. What type of equipment is used for destructive testing by measuring diamond indentation?

- A. A) Brinell
- B. B) Vickers**
- C. C) Rockwell
- D. D) Shore

The Vickers hardness test is utilized for destructive testing in materials, particularly metals, by measuring the size of an indentation made by a diamond pyramid indenter. This method is designed to provide a continuous scale of hardness values and can be used on a wide range of materials, making it quite versatile. In the Vickers test, a specific load is applied through a diamond indenter, and following the removal of the load, the diagonal lengths of the indentation left in the material are measured. The Vickers hardness number is calculated based on the load applied and the surface area of the indentation. This gives a clear indication of the hardness of the material being tested, allowing for effective comparisons and assessments of material properties. The Vickers hardness test stands out due to its ability to measure very hard materials and its application across various thicknesses and types of materials, making it particularly useful in the field of aircraft construction, repair, and maintenance where materials must meet strict standards for safety and performance.

2. Which of the following is NOT typically included in a comprehensive safety audit?

- A. Review of maintenance records
- B. Inspection of emergency equipment
- C. Assessment of pilot skills**
- D. Evaluation of aircraft structural integrity

A comprehensive safety audit in the context of aviation typically encompasses various aspects aimed at ensuring the safety and proper functioning of an aircraft and its operations. The primary focus is to identify potential hazards and mitigate risks associated with aircraft maintenance, emergency procedures, and aircraft integrity. The review of maintenance records is crucial because it allows auditors to verify that all maintenance procedures have been correctly followed, ensuring that the aircraft remains airworthy. This helps confirm adherence to regulatory standards and best practices in aircraft upkeep. Inspections of emergency equipment are critical as well, as they ensure that all safety equipment—such as fire extinguishers, emergency exits, and first aid kits—is operational and accessible. This is vital for ensuring the safety of passengers and crew during emergencies. Evaluation of aircraft structural integrity is also fundamental. It involves examining the airframe and components to ensure they can withstand the operational stresses and maintain safety. This assessment is key to preventing structural failures that could jeopardize aircraft safety. In contrast, while assessing pilot skills is undeniably important in the broader context of aviation safety, it is not typically part of a safety audit focused specifically on aircraft maintenance and operational safety. Pilot assessments usually fall under training and competency evaluations, rather than the safety audit of the aircraft's physical and operational assets.

3. What solution should be used to neutralize nickel-cadmium battery cases affected by electrolyte?

- A. Boric acid**
- B. KNO₃**
- C. Sodium bicarbonate**
- D. Sodium Hydroxide**

The appropriate solution for neutralizing nickel-cadmium battery cases affected by electrolyte is boric acid. This is because nickel-cadmium batteries contain alkaline electrolyte solutions, primarily potassium hydroxide. When the electrolyte comes into contact with surfaces, it can create a hazardous situation. Boric acid is an effective neutralizer for alkaline substances. When applied, it can counteract the effects of the alkaline electrolyte found in nickel-cadmium batteries. Unlike stronger alkaline substances such as sodium hydroxide, boric acid is less corrosive and safer to handle, making it a suitable choice for this particular application. It not only helps in neutralizing the pH but also can aid in cleaning the affected surfaces without causing additional damage. Using alternatives like sodium bicarbonate could also neutralize some acids but may not be as effective in directly addressing alkaline electrolyte issues, which can be more persistent than acidic contaminants. Thus, while sodium bicarbonate is a common neutralizing agent for certain types of battery leaks, boric acid is specifically chosen for nickel-cadmium batteries due to its effectiveness against alkaline environments.

4. What aluminum alloy designation indicates no hardening or tempering treatment?

- A. 3003-F**
- B. 5052-H36**
- C. 6061-0**
- D. 2024-T4**

The designation that indicates no hardening or tempering treatment is recognized as "-O," which denotes the fully annealed condition of the aluminum alloy. In this context, the option that corresponds to this description is 6061-0. The "0" in the designation indicates that the material has undergone a method of heat treatment and is specifically in the annealed state. This means that the alloy has not been subjected to any aging or hardening processes, making it softer and more workable than its heat-treated counterparts. Understanding this is crucial in aircraft construction and maintenance, where the selection of material properties directly influences structural integrity and performance. Each aluminum alloy is assigned specific designations based on its composition and processing, impacting its strength, ductility, and other characteristics essential for aviation applications.

5. Why are clad aluminum alloys used in aircraft?

- A. They can be heat treated much easier than other aluminum forms
- B. They are less subject to corrosion than uncoated aluminum alloys**
- C. They are stronger than unclad aluminum alloys
- D. They are heat resistant

Clad aluminum alloys are primarily used in aircraft due to their enhanced corrosion resistance compared to uncoated aluminum alloys. In the aerospace industry, where aircraft are exposed to diverse environmental conditions, including moisture and various chemicals, the susceptibility to corrosion is a significant concern. Cladding involves the application of a thin layer of a more corrosion-resistant alloy (often aluminum-lithium) over the core alloy, which provides excellent protection against oxidation and corrosion. This protective layer helps maintain the mechanical properties of the core alloy while significantly reducing the tendency to corrode, thereby extending the lifespan of the aircraft components. This corrosion resistance is particularly vital as it contributes to safety, maintenance costs, and overall structural integrity. While other options mention strength, heat treatment, or heat resistance, they do not accurately capture the primary advantage of clad aluminum alloys in aircraft applications, which is their enhanced corrosion resistance.

6. What material are oxygen and acetylene cylinders primarily made of?

- A. Steel**
- B. Magnesium
- C. Aluminum
- D. Bronze

Oxygen and acetylene cylinders are primarily made of steel, which is chosen for its strength, durability, and ability to withstand high pressures. Steel can handle the internal pressures required for storing these gases safely, making it the most suitable material for these types of cylinders. The high tensile strength of steel prevents the likelihood of ruptures or leaks, ensuring safe transportation and use during welding and cutting applications. Other materials, such as magnesium, aluminum, and bronze, do not possess the same level of strength and resilience required in high-pressure environments. Although aluminum is sometimes used for lighter-weight applications, it lacks the structural integrity of steel for high-pressure storage. Magnesium is typically not used in this context due to its flammable nature and potential hazards with certain gases. Bronze is less common as a construction material for gas cylinders, as it does not provide the same performance characteristics as steel in this specialized application.

7. After experiencing what load must the airframe structure remain intact?

- A. The design ultimate load times a 1.5 safety factor**
- B. The design limit load plus the design ultimate load**
- C. Three times the safety factor**
- D. The design limit load times a 1.5 safety factor**

The correct answer is that the airframe structure must remain intact after experiencing the design limit load times a 1.5 safety factor. This concept is rooted in the standards of aircraft design and safety regulations that ensure the structural integrity of aircraft under expected operational conditions. The design limit load is the maximum load that the structure is expected to encounter during normal operations. However, because aircraft may occasionally encounter unexpected loads due to turbulence, maneuvers, or other factors beyond standard operating conditions, a safety factor is applied. Multiplying the design limit load by a factor of 1.5 provides a margin of safety, ensuring that the structure can withstand loads greater than those it will typically experience without risking structural failure. This means that the airframe must not only handle normal operational loads but also have the capacity to endure potential overload situations, reflecting a critical aspect of aircraft safety and reliability. This approach to safety factors helps to account for uncertainties in load predictions and material behavior, thereby safeguarding the aircraft and its occupants. Such rigorous standards ensure that aircraft can operate safely throughout their intended lifespan even in the face of variable and unpredictable conditions.

8. Which solvent should be used to clean a part before dye penetrant inspection?

- A. A volatile petroleum-based solvent**
- B. A penetrant developer**
- C. Water-based solvents only**
- D. Vegetable-based solvents only**

Using a volatile petroleum-based solvent to clean a part before dye penetrant inspection is appropriate because these solvents effectively remove surface contamination such as oil, grease, dirt, and other unwanted materials that could interfere with the penetrant's ability to identify defects. Proper surface preparation is crucial in dye penetrant inspection, as any residual contaminants can prevent the penetrant from adequately entering any cracks or surface irregularities. The use of a volatile solvent is beneficial, as it evaporates quickly, minimizing the risk of leaving behind any residue that could affect the inspection results. In contrast, other types of solvents mentioned do not offer the same level of efficiency or effectiveness for this specific cleaning process. Water-based solvents, for example, may not be able to dissolve certain oils or contaminants as effectively as petroleum-based solvents, while vegetable-based solvents also typically lack the necessary cleaning power for comprehensive surface preparation in the context of dye penetrant inspections.

9. What are the common signs of metal fatigue in aircraft structures?

- A. Increased fuel consumption**
- B. Cracks, discoloration, and surface deformation**
- C. Engine overheating**
- D. Poor cabin pressure**

The common signs of metal fatigue in aircraft structures primarily include cracks, discoloration, and surface deformation because these indicators directly reflect the material's response to repeated stress and strain. Metal fatigue occurs when a material is subjected to cyclic loading, which can lead to microscopic cracks that grow over time. Cracks are one of the most critical signs, as they can compromise the structural integrity of the aircraft. Discoloration may indicate oxidation or other chemical changes within the material, often as a result of environmental exposure or stress. Surface deformation, which can manifest as warping or bulging, suggests that the structure has undergone significant mechanical stress that could worsen over time if not addressed. In contrast, increased fuel consumption, engine overheating, and poor cabin pressure are not direct indicators of metal fatigue. These issues may arise from factors such as engine performance, aerodynamics, or environmental conditions, but they do not directly correlate with the fatigue process in the structural materials of the aircraft. Understanding these signs is vital for maintenance and inspection practices to ensure aircraft safety and longevity.

10. Why are clad aluminum alloys favored in aircraft construction?

- A. Stronger than unclad aluminum alloys**
- B. Heat treated easier than other forms**
- C. Less subject to corrosion**
- D. Endorsed by major manufacturers**

Clad aluminum alloys are favored in aircraft construction primarily because they are less subject to corrosion. The process of cladding involves bonding a thin layer of a more corrosion-resistant alloy to the surface of a less corrosion-resistant aluminum alloy. This protective layer effectively shields the underlying material from environmental factors that could lead to corrosion, significantly extending the life of the aluminum structure in aircraft. In aviation, where exposure to moisture and various chemicals is a concern, using clad aluminum provides a notable advantage. The enhanced corrosion resistance helps maintain the structural integrity of the aircraft, which is critical for safety and performance. This characteristic is especially important considering the harsh conditions that aircraft frequently encounter, including varying temperatures, humidity levels, and exposure to harsh elements. While other choices may hint at important properties of aluminum alloys, none address the critical role of corrosion resistance as effectively as the correct choice. Clad aluminum's dual-layer structure provides strength and durability while protecting against ultimately damaging environmental influences.