

# OCR Engineering Design Practice Exam (Sample)

## Study Guide



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## **Questions**

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- 1. What does HSE stand for?**
  - A. Health and Safety Employment**
  - B. Health and Safety Executive**
  - C. Hazard Safety Executive**
  - D. Health and Safety Evaluation**
- 2. Which component is essential for creating a watertight seal in machinery?**
  - A. O-Rings**
  - B. Nails**
  - C. M6 Bolt**
  - D. Bulbs**
- 3. What are relevant notes used for in design documentation?**
  - A. To provide details about the selected materials**
  - B. To outline project goals**
  - C. To explain information about the product**
  - D. To summarize team discussions**
- 4. Which testing method helps validate the volume and shape of an ice cube created by an ice cube tray?**
  - A. Temperature test**
  - B. Operational test**
  - C. Strength test**
  - D. Durability test**
- 5. What does 'sustainable design' aim to achieve?**
  - A. A focus solely on profits in manufacturing**
  - B. Reduction of environmental impact**
  - C. Increased market share**
  - D. Design trends that prioritize aesthetics**
- 6. Which statement best describes adhesives?**
  - A. They can be easily removed from surfaces**
  - B. They are used to bind materials together permanently**
  - C. They are only effective with certain materials**
  - D. They alter the properties of materials they are applied to**

- 7. What does the term 'raw materials' refer to in the context of a product's life cycle?**
- A. Materials processed to create energy**
  - B. Energy required to extract materials**
  - C. Waste produced during manufacturing**
  - D. Finished products ready for use**
- 8. Which statement accurately describes a 3rd angle orthographic drawing?**
- A. A working drawing showing each side of a design without perspective**
  - B. A method used only for electrical schematics**
  - C. A type of drawing that employs isometric techniques**
  - D. A representation that excludes dimensions**
- 9. What type of components can be found in a product?**
- A. Only standard components**
  - B. Only special components**
  - C. Standard and special components**
  - D. None of the above**
- 10. Which of the following is commonly used to join materials together in construction?**
- A. Pins**
  - B. Bulbs**
  - C. Seals**
  - D. Fuse**

## **Answers**

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

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## **Explanations**

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## **1. What does HSE stand for?**

**A. Health and Safety Employment**

**B. Health and Safety Executive**

**C. Hazard Safety Executive**

**D. Health and Safety Evaluation**

HSE stands for Health and Safety Executive, which is the primary regulatory body in the United Kingdom responsible for enforcing workplace health and safety legislation. The organization aims to reduce work-related death and serious injury across various industries by promoting health and safety standards and ensuring compliance with legal requirements. The significance of HSE lies in its comprehensive approach to regulating and advising on health and safety, which is crucial in guiding organizations to create safer work environments. This includes issuing guidelines, conducting inspections, and providing information, advice, and support to both employers and employees. Understanding the role of the Health and Safety Executive is vital for professionals involved in engineering and design practices, as it directly impacts the development of safe and compliant working conditions.

## **2. Which component is essential for creating a watertight seal in machinery?**

**A. O-Rings**

**B. Nails**

**C. M6 Bolt**

**D. Bulbs**

Creating a watertight seal in machinery is crucial for preventing leakage of fluids and maintaining the integrity of the equipment. O-rings are specifically designed for this purpose, as they are circular and can compress against the mating surfaces when installed, creating a reliable seal that prevents water and other fluids from escaping. The material used for O-rings is often chosen based on the specific application, with options available that can withstand various temperatures, pressures, and chemical environments. This versatility makes O-rings an essential component in various machinery and equipment where watertight seals are required. In contrast, nails, bolts, and bulbs do not serve the purpose of creating fluid-tight seals. Nails are typically used in construction for fastening materials together, while bolts, including M6 bolts, are used for securing components tightly but do not inherently provide a sealing function. Bulbs are not related to sealing mechanisms in machinery at all. Thus, O-rings uniquely fulfill the role of ensuring watertight integrity in mechanical systems.

### 3. What are relevant notes used for in design documentation?

- A. To provide details about the selected materials
- B. To outline project goals
- C. To explain information about the product**
- D. To summarize team discussions

Notes used in design documentation are critical for explaining information about the product. They serve as a comprehensive guide to various aspects of the design, including specifications, functionalities, and the rationale behind design decisions. This information helps ensure that everyone involved in the project has a clear understanding of what the product is intended to do, how it should perform, and the reasons for specific design choices. By providing detailed explanations, the notes facilitate communication among team members, stakeholders, and later, any individuals involved in production or implementation. This clarity is vital for maintaining alignment throughout the project lifecycle and assists in avoiding misunderstandings that could impact the development process. While details about materials, project goals, and summaries of team discussions are also important components of design documentation, they serve different purposes. Materials focus on the physical aspects of the design, project goals outline the broader objectives, and discussions are about team dynamics and decision-making processes. Each aspect contributes to the project but explaining information about the product is specifically pivotal for ensuring everyone involved understands what is being designed and developed.

### 4. Which testing method helps validate the volume and shape of an ice cube created by an ice cube tray?

- A. Temperature test
- B. Operational test**
- C. Strength test
- D. Durability test

The operational test is crucial in assessing the performance of an ice cube tray, particularly in validating the volume and shape of the ice cubes it produces. This testing method involves evaluating how the tray functions during the actual ice-making process. By filling the tray with water, freezing it, and then assessing the resulting ice cubes, one can determine if the tray produces consistently sized and shaped cubes as intended. In this context, operational tests focus on whether the tray performs its primary function effectively and whether the produced ice cubes meet the design specifications for volume and shape. This method ensures that the tray can adequately hold, freeze, and release the ice cubes as designed, which is essential for both user satisfaction and product quality. Other testing methods like temperature tests would focus on the thermal properties and freezing efficiency, strength tests would evaluate material resilience under force, and durability tests would assess the longevity of the tray under repeated use but do not directly validate volume and shape in ice production. Thus, the operational test is the most relevant for evaluating the functionality of the ice cube tray in this regard.

**5. What does 'sustainable design' aim to achieve?**

- A. A focus solely on profits in manufacturing**
- B. Reduction of environmental impact**
- C. Increased market share**
- D. Design trends that prioritize aesthetics**

Sustainable design aims to achieve the reduction of environmental impact by creating products, buildings, and systems that minimize negative effects on the environment throughout their lifecycle. This encompasses various strategies such as using renewable materials, promoting energy efficiency, reducing waste, and ensuring that designs consider the ecological and social contexts in which they exist. The goal is to meet current needs without compromising the ability of future generations to meet their own needs. This holistic approach reflects an awareness of the interconnectedness of human activity and the environment, leading to thoughtful design practices that prioritize long-term sustainability rather than short-term gains.

**6. Which statement best describes adhesives?**

- A. They can be easily removed from surfaces**
- B. They are used to bind materials together permanently**
- C. They are only effective with certain materials**
- D. They alter the properties of materials they are applied to**

Adhesives are designed primarily to bond materials together permanently or at least provide a strong, durable connection that can withstand various stresses and environmental conditions. This capability makes them essential in many engineering and construction applications, where a long-lasting bond is crucial for structural integrity and performance. By creating a robust bond between substrates, adhesives contribute to the overall strength of the assembly, allowing for greater design flexibility and material usage. The other statements, while they may address certain aspects of adhesives, do not encapsulate their primary function as effectively. For example, while some adhesives can be removed, this is not a defining feature of most adhesives, particularly those intended for permanent applications. Additionally, while it is true that certain adhesives are designed for specific materials, many types are versatile and can bond a wide variety of substrates. Lastly, while adhesives may interact with surfaces and influence their properties to some extent, their primary function is not to alter material properties but to provide a strong bond. Thus, the statement that best captures the essence of what adhesives do is that they are used to bind materials together permanently.

**7. What does the term 'raw materials' refer to in the context of a product's life cycle?**

- A. Materials processed to create energy**
- B. Energy required to extract materials**
- C. Waste produced during manufacturing**
- D. Finished products ready for use**

In the context of a product's life cycle, the term 'raw materials' specifically refers to the basic substances that are extracted or harvested from the earth before they undergo any processing or transformation into finished products. These materials can be metals, minerals, timber, or agricultural products, which are then utilized in the manufacturing process to create the final item. The energy required to extract these materials plays a pivotal role in understanding the life cycle of a product, as it encompasses the environmental impact and resources consumed during the initial stages of production. This energy is essential for the extraction processes, such as mining, drilling, or harvesting, and contributes to the overall sustainability considerations of the product's life cycle. Recognizing raw materials in this way allows for a holistic view of the environmental implications associated with sourcing and using resources, highlighting the importance of sustainable practices right from the inception of a product through its entire lifecycle, including production, use, and disposal.

**8. Which statement accurately describes a 3rd angle orthographic drawing?**

- A. A working drawing showing each side of a design without perspective**
- B. A method used only for electrical schematics**
- C. A type of drawing that employs isometric techniques**
- D. A representation that excludes dimensions**

The statement that accurately describes a 3rd angle orthographic drawing is that it is a working drawing showing each side of a design without perspective. In 3rd angle orthographic projection, multiple views of an object are created, typically including the front, top, and side views, which illustrate the dimensions and details of the design clearly and precisely. This type of drawing is standard in engineering and design because it provides a comprehensive understanding of the object's geometry without the distortion that can occur in perspective drawings. The focus on showing each side of the design allows engineers and manufacturers to understand complex parts and their relationships, ensuring that all critical details are communicated effectively for accurate production or analysis.

**9. What type of components can be found in a product?**

- A. Only standard components
- B. Only special components
- C. Standard and special components**
- D. None of the above

A product can incorporate both standard and special components to meet its design and functional requirements. Standard components refer to widely available parts that adhere to recognized specifications and can be sourced from multiple manufacturers, such as nuts, bolts, and common electronic components. These components are typically used due to their cost-effectiveness and broad availability. On the other hand, special components are custom-designed or fabricated specifically for a particular product or application. These may include unique parts that enhance functionality or performance, which standard components cannot fulfill. Combining standard and special components allows designers to optimize the performance of the product while maintaining cost efficiency. This integration can lead to innovations and increased competitiveness in the market as products cater to both generic needs and specific customer requirements. Hence, the answer indicating the presence of both types of components is accurate, as it reflects the diverse approach needed in engineering design.

**10. Which of the following is commonly used to join materials together in construction?**

- A. Pins**
- B. Bulbs
- C. Seals
- D. Fuse

In construction, pins are commonly used as fastening devices to join materials together. They provide a strong mechanical connection that ensures stability and alignment between components. Pins can come in various forms, such as dowel pins, cotter pins, and clevis pins, each suited for specific applications. Their ease of installation and removal makes them ideal for temporary and permanent assemblies in a variety of structural settings. Other options like bulbs and seals do not serve the primary function of joining materials together. Bulbs could refer to decorative elements or lighting, while seals are typically used for weatherproofing or providing a barrier against elements rather than for mechanical fastening. The term "fuse" generally refers to methods that involve melting or soldering, which differ from the mechanical joining processes associated with pins. Thus, pins are the most appropriate choice for joining materials in construction.