QMED Sea School Practice Test (Sample)

Study Guide

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Questions

1. What function does a selector switch serve in electrical systems?

A. It regulates fuel flow

B. It indicates battery health

C. It acts as a voltmeter

D. It measures current flow

2. Which of the following is a common effect of dirt in lubricant grease?

A. It quickly dissolves in oil

B. It can cause abrasive wear

C. It provides better lubrication

D. It is washed away easily

3. What type of boilers are all propulsion boilers on modern ships?

A. Fire-tube boilers

B. Water-tube boilers

C. Steam boilers

D. Composite boilers

4. Which characteristic is indicative of a reciprocating engine?

A. It utilizes rotary motion for efficiency

B. It consists of pistons that move back-and-forth

C. It requires no combustion process

D. It operates continuously without any cycles

5. What is one important reason to keep steam lines insulated?

A. To reduce steam output

B. To protect personnel

C. To increase maintenance costs

D. To facilitate faster cooling

6. What can occur if bearings in an electrical motor are over-greased?

A. Improved motor efficiency

B. Damage to windings and stator

C. Increased lubrication lifespan

D. Better heat dissipation

7. What happens to the volume of a gas when the temperature decreases, according to Boyle's law?

A. The volume increases

B. The volume decreases

C. The volume remains the same

D. The pressure decreases

8. What is horsepower a measure of?

A. The intensity of heat

B. The power output of electric motors

C. The volume of a gas at high pressures

D. The speed of a vessel at sea

9. In which application is a positive-displacement pump primarily used?

A. For cooling systems

B. For delivering oil under pressure to engine components

C. For transferring fuel

D. For air circulation

10. What is the primary function of an internal combustion engine?

A. To convert electrical energy into mechanical energy

B. To convert heat energy into work by burning fuel

C. To burn fuel without producing any waste

D. To operate solely on renewable energy sources

Answers

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

Explanations

1. What function does a selector switch serve in electrical systems?

A. It regulates fuel flow

B. It indicates battery health

C. It acts as a voltmeter

D. It measures current flow

A selector switch in electrical systems is designed to allow the operator to choose between different circuits or sources of power. It does not act as a voltmeter; rather, the primary function is to control which circuit is active, enabling the user to switch from one option to another seamlessly. This is crucial for managing various electrical components or systems that may require separate power sources or configurations. The other options refer to functions that selector switches do not perform. For example, regulating fuel flow pertains to fuel systems and is unrelated to electrical circuitry. Indicating battery health involves monitoring voltage, current, or overall battery performance, which is typically done using specific diagnostic tools rather than a simple switch. Measuring current flow requires specialized equipment like ammeters, which are designed for that specific purpose. Thus, the role of a selector switch is distinct and centers on circuit management rather than measurement or regulation.

2. Which of the following is a common effect of dirt in lubricant grease?

A. It quickly dissolves in oil

B. It can cause abrasive wear

C. It provides better lubrication

D. It is washed away easily

The presence of dirt in lubricant grease contributes to abrasive wear, which is a significant concern in machinery and equipment operation. When dirt particles mix with grease, they can act like tiny cutting tools that scratch and erode the surfaces of moving parts. This abrasive action can lead to increased friction, higher temperatures, and ultimately, mechanical failure or reduced lifespan of components. In contrast, other options do not accurately describe the effects of dirt in lubricants. Dirt does not quickly dissolve in oil, as the solid particles remain suspended rather than integrating into the lubricant. Additionally, dirt does not provide better lubrication; rather, it compromises optimal performance by introducing contaminants that interfere with the lubricant's ability to form a protective film. Lastly, dirt is not washed away easily once it is within the grease, since the thick consistency of grease makes it difficult to remove contaminants without proper cleaning methods.

3. What type of boilers are all propulsion boilers on modern ships?

A. Fire-tube boilers

B. Water-tube boilers

C. Steam boilers

D. Composite boilers

Modern ships predominantly utilize water-tube boilers for propulsion. This boiler type is characterized by its design, where water circulates through tubes that are heated externally by combustion gases. This construction allows for a number of advantages, particularly in propulsion applications, such as higher steam pressures and efficiencies, reduced water volume, and quicker response times to load changes. One of the key benefits of water-tube boilers is their ability to withstand high pressures, which is often a requirement in marine propulsion systems. They also typically possess a smaller footprint and lighter weight compared to other boiler types, making them more suitable for the space constraints of modern vessels. Various other boiler types exist, but fire-tube boilers, while historically significant, are less common in modern ship propulsion due to their limitations with high-pressure steam and slower heat recovery. Steam boilers, as a broader category, may include both fire-tube and water-tube designs, but the specific reference in the context of modern ship propulsion points specifically to water-tube configurations. Composite boilers combine both fire-tube and water-tube elements, which is often more applicable in auxiliary applications than for main propulsion systems.

4. Which characteristic is indicative of a reciprocating engine?

A. It utilizes rotary motion for efficiency

B. It consists of pistons that move back-and-forth

C. It requires no combustion process

D. It operates continuously without any cycles

A reciprocating engine is characterized by its use of pistons that move back-and-forth within cylinders to convert fuel into mechanical energy. This movement is a fundamental aspect of how the engine operates, as it involves the cyclical intake, compression, power, and exhaust of gases, all facilitated by the pistons' reciprocating motion. The reciprocating motion allows for a very efficient conversion of linear motion into rotary motion, but the key characteristic that distinguishes a reciprocating engine is the piston's movement. This back-and-forth motion drives the crankshaft, ultimately enabling the engine to perform work effectively. In contrast, the other options do not accurately describe the essential nature of a reciprocating engine. While it does create rotary motion, it is not primarily about efficiency in that regard. Combustion is essential for the operation of this type of engine, and it does operate in cycles, not continuously, as each cycle corresponds to a full sequence of the piston's movement through intake, compression, power, and exhaust strokes.

5. What is one important reason to keep steam lines insulated?

A. To reduce steam output

B. To protect personnel

C. To increase maintenance costs

D. To facilitate faster cooling

Keeping steam lines insulated serves several critical functions, one of the most important being the protection of personnel. Insulation helps to maintain safe surface temperatures on steam piping, minimizing the risk of burns or other injuries to crew members who may come into contact with the piping. Without proper insulation, the outer surfaces of steam lines could reach dangerously high temperatures, creating a significant safety hazard in working environments. In addition to personnel safety, insulation also helps in maintaining the efficiency of the steam system by reducing heat loss, although this aspect is not as directly related to personnel safety. The other options, such as reducing steam output or increasing maintenance costs, do not align with the fundamental purpose of steam line insulation, which centers on safety and efficiency. Facilitating faster cooling is also not a relevant consideration, as insulation is primarily intended to retain heat rather than accelerate cooling processes.

6. What can occur if bearings in an electrical motor are over-greased?

A. Improved motor efficiency

B. Damage to windings and stator

C. Increased lubrication lifespan

D. Better heat dissipation

When bearings in an electrical motor are over-greased, it can lead to several detrimental effects, with potential damage to windings and the stator being a prominent concern. Over-greasing can cause excessive pressure within the bearing chamber, which forces grease beyond the bearing and into areas where it is not needed, ultimately interfering with the operation of the motor. This excess grease can accumulate in the windings or stator, leading to insulation breakdown and other electrical issues. In severe cases, the motor could experience overheating or failure due to restricted movement of the rotor or interference with the electrical components. Maintaining the appropriate amount of lubricant is crucial for the smooth operation of the motor, and an excess can significantly compromise its efficiency and longevity.

7. What happens to the volume of a gas when the temperature decreases, according to Boyle's law?

A. The volume increases

B. The volume decreases

C. The volume remains the same

D. The pressure decreases

Boyle's Law states that, at constant temperature, the pressure of a gas is inversely proportional to its volume. This means that when the volume of a gas decreases, the pressure increases, and vice versa. However, when we consider the effect of temperature decreases specifically, we are referring to the principles of gas laws in a broader context, primarily focusing on the ideal gas law and Charles's law. When the temperature of a gas decreases while the pressure remains constant, the kinetic energy of the gas molecules also decreases, leading to reduced movement and interaction. As a result, the gas molecules occupy less space, causing the volume to decrease as temperature drops. In summary, a decrease in temperature correlates with a decrease in the volume of the gas under controlled conditions, aligning with the principles derived from the gas laws.

8. What is horsepower a measure of?

A. The intensity of heat

B. The power output of electric motors

C. The volume of a gas at high pressures

D. The speed of a vessel at sea

Horsepower is a unit of measurement that quantifies power output, which represents the rate at which work is performed or energy is transferred. Although it is commonly associated with engines, including electric motors, it is not limited to them and can apply to various types of machinery, vehicles, and systems that convert energy into mechanical work. Specifically, in the context of electric motors, horsepower indicates the motor's effectiveness in converting electrical energy into mechanical motion. Understanding horsepower is crucial in marine contexts, as it helps determine how much work engines can perform, which directly relates to vessel performance and efficiency. While horsepower can also relate to other systems, such as different types of engines, its characterization of electrical power output is particularly relevant in assessing electric motor capabilities. The other options provided do not align with the definition of horsepower: the intensity of heat refers to thermal energy, volume of gas at high pressures pertains to gas laws and behaviors, and speed of a vessel at sea indicates velocity rather than the measure of power. Therefore, the best choice for what horsepower measures is the power output of electric motors.

9. In which application is a positive-displacement pump primarily used?

A. For cooling systems

B. For delivering oil under pressure to engine components

C. For transferring fuel

D. For air circulation

A positive-displacement pump is primarily used for delivering oil under pressure to engine components. This type of pump operates by trapping a fixed amount of fluid and forcing that volume into the discharge pipe. Its ability to generate a high pressure makes it particularly suited for applications where precise fluid delivery is critical, such as in lubrication systems for engines. In engine components, the timely and consistent supply of oil is essential for maintaining proper lubrication, reducing friction, and preventing wear. Thus, the characteristics of a positive-displacement pump ensure that engine components receive a steady flow of oil, even under varying load conditions. Other applications such as cooling systems, fuel transfer, or air circulation more commonly utilize centrifugal pumps or specific designs that cater to those processes, as they typically require lower pressures and different flow dynamics compared to those needed in oil delivery systems. Therefore, the specific use of a positive-displacement pump in delivering oil is a vital function in mechanical systems where reliability and pressure are paramount.

10. What is the primary function of an internal combustion engine?

A. To convert electrical energy into mechanical energy

B. To convert heat energy into work by burning fuel

C. To burn fuel without producing any waste

D. To operate solely on renewable energy sources

The primary function of an internal combustion engine is to convert heat energy into work by burning fuel. This process takes place when fuel is mixed with air and ignited within the engine's cylinders. The combustion generates high-temperature gases that expand rapidly, creating pressure which moves the engine's pistons. This movement is then transformed into mechanical energy, allowing the engine to perform work, such as turning the wheels of a vehicle. The process fundamentally relies on the heat produced by combustion to perform mechanical tasks, which is a key characteristic of how internal combustion engines operate. Understanding this conversion process is crucial for grasping the principles of engine functionality and efficiency.