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Topic Break Down

Topic	No. of Questions
Topic 1, Compliance	51
Topic 2, Planning, Design and Construction	15
Topic 3, Maintenance and Operations	37
Topic 4, Finance	22
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Total	128

QUESTION NO: 1

Which of the following represents the average power consumed by a single-phase electric motor?

- A. KVA / PF
- B. kW x PF / 1,000
- C. KVA x PF
- D. amps / PF

ANSWER: C

Explanation:

KVA x PF represents the average power consumed because it calculates real power, expressed in kilowatts. A motor is an inductive load, so its current and voltage are typically out of phase. The kVA value represents apparent power—the total voltage-current product supplied to the motor—while power factor accounts for the portion of that apparent power that is converted into useful real power and losses in the motor. Multiplying apparent power by power factor therefore gives real power: $\text{kW} = \text{kVA} \times \text{PF}$.

For a single-phase motor, apparent power can first be determined from voltage and current ($\text{VA} = \text{volts} \times \text{amps}$), then converted to real power using the measured or specified power factor. This real-power value is the relevant quantity for energy consumption, electrical-demand calculations, and estimating operating cost. For example, a motor drawing 10 kVA at a 0.80 power factor consumes 8 kW of real power. The relationship between real power, apparent power, and power factor is described by [the U.S. Department of Energy's power-factor guidance](#) and is also summarized in [Eaton's power-factor reference](#).

QUESTION NO: 2

Which scenario is best for managing an inventory of repair parts?

- A. Purchase spare parts from suppliers as replacements are needed.
- B. Purchase critical spare parts from suppliers on an annual basis.
- C. Purchase one spare part in inventory for all patient equipment parts in use.
- D. Purchase one spare part in inventory for each part in use.

ANSWER: C

Explanation:

Purchase one spare part in inventory for all patient equipment parts in use. is the best choice because repair-parts inventory should prioritize continuity of patient care. Maintaining an on-site spare for repair parts used in patient-care equipment supports timely restoration when a component fails, reducing the chance that essential clinical equipment will be unavailable while a replacement is sourced. This is especially important when supplier lead times, shipping delays, sole-source parts, or equipment downtime could affect care delivery.

In practice, the facility manager should apply this approach through a documented critical-spares process: identify patient-care assets and their repair components, assess the operational and clinical consequence of failure, confirm lead times and availability, and establish appropriate stock levels. The inventory should be periodically reviewed against actual use, equipment age, manufacturer support status, and changes in clinical operations. This risk-based approach makes a readily available spare part an operational safeguard rather than merely a purchasing convenience. CMS requires hospitals to maintain their physical environment and equipment in a manner that ensures safety and supports care delivery; dependable repair-part availability is part of that maintenance capability. See the [CMS Conditions of Participation for Physical Environment](#) and ASHE's [health care facilities management resources](#).

QUESTION NO: 3

According to NFPA 13, when replacing standard response sprinkler heads with quick response heads, all heads must be replaced in the entire

- A. compartment.
- B. zone.
- C. building.
- D. corridor.

ANSWER: A

Explanation:

compartment. is correct. NFPA 13 generally requires sprinklers installed within the same compartment to have consistent operating characteristics, including response type. Standard-response and quick-response sprinklers use different thermal elements and have different operating-time characteristics. Replacing only selected standard-response sprinklers with quick-response sprinklers in a compartment can produce nonuniform operation during a fire, affecting the intended sprinkler-system performance and the assumptions used for the design.

Accordingly, when an upgrade or replacement changes the response characteristic from standard response to quick response, the sprinklers throughout the affected compartment should be changed so the compartment has a uniform response type, unless a specific NFPA 13 allowance for the particular arrangement applies. A compartment-based approach aligns the replacement scope with the fire-separated or bounded space in which sprinkler activation behavior must remain coordinated. Facility managers should also verify the edition of NFPA 13 adopted by their authority having jurisdiction, because the adopted edition and any local amendments govern compliance for a specific project.

NFPA identifies NFPA 13 as the standard addressing the installation of automatic sprinkler systems: [NFPA 13](#). The standard is available through NFPA's official code-access platform: [NFPA LiNK](#).

QUESTION NO: 4

When a motor malfunctions on an air handler, what is the first step to be taken in the replacement of the motor?

- A. Megger the motor windings.
- B. Remove the motor/machine guard.
- C. Disconnect the power wiring.
- D. Initiate lockout/tagout procedures.

ANSWER: D

Explanation:

Initiate lockout/tagout procedures. is the correct first step because motor replacement exposes personnel to hazardous electrical and mechanical energy. Before anyone removes guards, disconnects conductors, or performs diagnostic work, the equipment must be placed under a controlled energy-isolation process. For an air handler, this includes identifying all applicable energy sources, shutting the unit down using normal controls, isolating its electrical supply at the appropriate disconnecting means, applying personal locks and tags, releasing or restraining any stored energy, and verifying that the equipment cannot start or operate. Air-handling equipment may also present mechanical hazards from fans, belts, sheaves, and dampers; proper lockout/tagout prevents an unexpected restart while these components are accessible. OSHA's Control of Hazardous Energy standard requires employers to establish procedures for isolating equipment from energy sources and rendering it inoperative before servicing or maintenance. Beginning the replacement process with lockout/tagout establishes the safe condition required for all subsequent motor-removal activities. See OSHA's [29 CFR 1910.147 hazardous-energy-control standard](#) and its [lockout/tagout guidance](#).

QUESTION NO: 5

The Resource Conservation and Recovery Act (RCRA) was enacted to protect public health from

- A. improper disposal of used needles.
- B. hospital incinerator emissions.
- C. improper management of hazardous wastes.
- D. improper medical waste management.

ANSWER: C

Explanation:

The correct answer is **improper management of hazardous wastes**. Enacted in 1976, the Resource Conservation and Recovery Act (RCRA) establishes a federal framework for managing hazardous waste from the point it is generated through its transportation, treatment, storage, and final disposal—commonly called “cradle-to-grave” management. Its purpose is to protect human health and the environment by ensuring that hazardous wastes are identified, handled, documented, and managed under appropriate controls. In a health care setting, RCRA may apply to hazardous pharmaceuticals, chemical disinfectants, laboratory chemicals, solvents, certain batteries, and other materials that meet the regulatory definition or listing criteria for hazardous waste. Facility managers should ensure that waste determinations, container management, labeling, accumulation-time limits, employee training, and disposal arrangements comply with applicable federal and authorized state requirements. The U.S. Environmental Protection Agency describes RCRA as the principal federal law governing solid and hazardous waste management and explains its cradle-to-grave hazardous-waste program at <https://www.epa.gov/rcra>. EPA’s hazardous-waste generator guidance, including generator responsibilities relevant to health care facilities, is available at <https://www.epa.gov/hwgenerators>.

QUESTION NO: 6

According to the AIA standard contract, final approval of shop drawings submitted by suppliers of construction materials is typically the responsibility of the

- A. architect.
- B. construction manager.
- C. owner.
- D. subcontractor.

ANSWER: A

Explanation:

The **architect** is the correct answer. Under AIA A201 General Conditions, the contractor must first review, approve, and submit shop drawings, product data, samples, and similar submittals in accordance with the contract documents. The architect then reviews those properly submitted materials and takes appropriate action—such as approval, approval with notation, rejection, or another required response—to determine whether they conform with the design intent and information expressed in the contract documents. In common construction-administration usage, this architect-led review is often called “final approval” of the shop drawing, even though the AIA documents more precisely describe it as the architect’s review and action on submittals. This responsibility is integral to the architect’s role in administering the owner-contractor contract and protecting the integrity of the specified design. The contractor and its subcontractors retain responsibility for means, methods, coordination, dimensions, quantities, and construction execution; the architect’s review does not transfer those responsibilities. See the AIA description of [A201–2017 General Conditions of the Contract for Construction](#) and the AIA’s overview of [construction contract administration](#).

QUESTION NO: 7 - (SIMULATION)

A liquid oxygen tank has the chart shown below attached to the side of the tank:

At 107 in. = 234,480 cu. ft. (from chart)

Hospital usage = 15,000 cu. ft./day

How many days of oxygen are left in the tank?

ANSWER: See the explanation for the answer

Explanation:

Answer: Approximately 15.6 days of oxygen remain (about 15 days of usable supply if rounded down to whole days).

Use the tank volume shown on the chart and divide by the hospital's daily consumption:

$$234,480 \text{ cu. ft.} \div 15,000 \text{ cu. ft./day} = 15.632 \text{ days}$$

Therefore, the liquid oxygen tank contains about **15.6 days** of oxygen at the stated usage rate.

QUESTION NO: 8

The annual utility bill at a hospital is \$1.2M for a 500,000 sq. ft. facility. The current construction project will add 100,000 sq. ft. to the facility. What is the anticipated annual utility budget after the construction project is completed?

- A. \$240,000
- B. \$1,440,000
- C. \$1,728,000
- D. \$1,828,000

ANSWER: B

Explanation:

\$1,440,000 is the anticipated annual utility budget when the projection is based on the facility's current utility cost per square foot. First, calculate the existing annual utility cost intensity: \$1,200,000 divided by 500,000 square feet equals \$2.40 per square foot per year. The project increases the building area by 100,000 square feet, producing a total post-construction area of 600,000 square feet. Applying the current \$2.40-per-square-foot annual utility cost to 600,000 square feet gives \$1,440,000 annually. Equivalently, the added area is 20% of the existing 500,000-square-foot facility, so the budget is increased by 20% of \$1.2 million, or \$240,000. This calculation is an appropriate preliminary budget estimate when the addition is expected to have utility use characteristics comparable to the existing hospital space. In practice, the facility manager should refine the estimate for differences in occupancy, operating hours, clinical functions, equipment loads, envelope performance, and energy-efficiency design features. Energy-use benchmarking commonly normalizes consumption and cost by gross floor area, as described by [ENERGY STAR Portfolio Manager](#). The U.S. Department of Energy also identifies energy-use intensity as a useful whole-building performance metric: [Energy Use Intensity](#).

QUESTION NO: 9

The process of establishing a standard of reference and comparing a business function, activity, product, or enterprise as a whole against that standard is which of the following types of analyses?

- A. performance data
- B. performance improvement
- C. continuous quality improvement
- D. benchmarking

ANSWER: D

Explanation:

Benchmarking is the correct term for a systematic comparison of an organization's function, process, product, or overall performance with a defined reference point. That reference may be an internal best-performing department, historical organizational results, peer organizations, or an external industry standard. The essential feature is not merely collecting measures, but using comparable measures to establish relative performance and identify meaningful opportunities to improve. In health care facilities management, a manager may benchmark utility-use intensity, maintenance costs, work-order completion, equipment downtime, space utilization, or staffing metrics against prior internal performance and comparable facilities. For the comparison to support a sound management decision, the facility manager should define the metric consistently, normalize data where appropriate—for example, by square footage, occupied beds, or operating hours—and account for relevant differences in building type, climate, and service scope. The resulting comparison helps set realistic targets, prioritize improvement resources, and monitor whether changes produce sustained results. This use of comparative performance data aligns with the American Society for Health Care Engineering's emphasis on using operational data to support effective health care physical-environment management. See ASHE's [energy and sustainability resources](#) and the U.S. Department of Energy's [facility-performance benchmarking guidance](#).

QUESTION NO: 10

A code compliant, medical gas storage room contains a large number of different compressed gases. The gases are in 25 cu. ft. cylinders and in 250 cu. ft. cylinders. All cylinders are full. The Safety Officer completed a cylinder storage audit and discovered the room was over the maximum amount of compressed gas cylinders allowed by 140 cu. ft. Which of the following is the minimum number of 25 cu. ft. cylinders that must be removed to make the storage room code compliant?

- A. 4
- B. 5
- C. 6
- D. 7

ANSWER: C

Explanation:

The correct answer is **6**. The storage-room inventory exceeds the permitted compressed-gas volume by 140 cubic feet. Because each cylinder being removed has a capacity of 25 cubic feet, the number required is calculated by dividing the excess volume by the volume represented by each cylinder: $140 \div 25 = 5.6$ cylinders. A partial cylinder cannot be removed, and removing only five full 25-cubic-foot cylinders would reduce the stored volume by just 125 cubic feet. The room would consequently remain 15 cubic feet over its permitted storage quantity. Removing six full cylinders reduces the inventory by 150 cubic feet, eliminating the 140-cubic-foot overage and returning the storage room to a compliant quantity. This approach reflects the practical application of medical-gas storage limits: inventory must not exceed the allowable aggregate gas capacity, so the corrective action must remove enough whole cylinders to bring the total at or below the limit. NFPA 99 addresses requirements for medical gas and vacuum systems, while NFPA 55 provides requirements governing the storage, use, and handling of compressed gases. See [NFPA 99](#) and [NFPA 55](#).

QUESTION NO: 11

Which project delivery method leaves contractor input out of the design phase?

- A. Integrated Delivery Project (IDP)
- B. Design Bid Build (DBB)
- C. Design Build (DB)
- D. Construction Management at Risk (CMAR)

ANSWER: B

Explanation:

Design Bid Build (DBB) is correct because it follows a sequential, traditionally procured process: the owner first contracts with the architect or engineer to develop the project design and construction documents, then solicits contractor bids after those documents are substantially complete, and finally awards a separate construction contract. Since the builder is selected only after completion of the design and bidding documents, the contractor ordinarily does not provide preconstruction constructability, estimating, scheduling, phasing, or value-analysis input during design. For health care facility projects, this distinction can be important because early contractor participation may otherwise help identify operational constraints, infection-control logistics, utility shutdown sequencing, and constructability issues before documents are finalized. In the Design Bid Build model, the design professional remains responsible for completing the design package before competitive construction bidding occurs, preserving the separation between design and construction procurement. This standard description is reflected in the Federal Acquisition Regulation's definition of design-bid-build as a method in which design and construction are contracted separately and construction begins after design completion. The Construction Management Association of America also identifies design-bid-build as the traditional delivery approach with distinct design, bid, and construction phases. See the [Federal Acquisition Regulation, 36.104](#) and [Construction Management Association of America](#).

QUESTION NO: 12

In boiler operations, scale is most likely to occur

- A. in the huddling chamber.
- B. below the water line.
- C. on a weld above the water line.
- D. in the blowdown valve.

ANSWER: B

Explanation:

Scale is most likely to occur **below the water line**. Boiler feedwater contains dissolved minerals and salts, including hardness constituents such as calcium and magnesium and, in some circumstances, silica. As water is heated and converted to steam, these constituents become more concentrated in the remaining boiler water. When conditions cause them to precipitate, they adhere to the water-side surfaces exposed to heat, such as tubes, drums, and other heat-transfer surfaces below the normal operating water level.

This deposit is important because scale has much lower thermal conductivity than clean metal. Even a relatively thin scale layer insulates the pressure-part metal from the boiler water, reducing heat-transfer efficiency and requiring more fuel to produce the same steam output. If it is allowed to accumulate, metal temperatures can rise excessively, creating a risk of tube damage or failure. Effective feedwater treatment, routine testing, and properly controlled blowdown limit dissolved and suspended solids before they form deposits. The U.S. Department of Energy identifies scale on boiler heat-transfer surfaces as a significant energy-efficiency concern, while Spirax Sarco describes the role of water treatment in preventing scale formation in steam systems. See [U.S. Department of Energy O&M Best Practices Guide](#) and [Spirax Sarco's boiler-water treatment guidance](#).