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# Construction and Industry

## AEE-CEM

### Certified Energy Manager Certification Exam



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## Question: 1

Which organization develops and maintains the LEED green building rating system?

- A. EPA
- B. ASHRAE
- C. USGBC
- D. ISO

**Answer: C**

Explanation:

The US Green Building Council develops and maintains the LEED rating system.

## Question: 2

Which instrument could be used during an energy audit to measure the air velocity from a vent?

- A. Psychrometer
- B. Manometer
- C. Pyrometer
- D. Anemometer

**Answer: D**

Explanation:

An anemometer measures air velocity. They may operate by means of a rotating vane, deflecting vane, hot wires, ultrasonic sound waves, plate, or pitot tube.

## Question: 3

What type of measurements are taken by a pyrometer?

- A. Temperature
- B. Carbon dioxide level
- C. Relative humidity
- D. Light intensity

**Answer: A**

Explanation:

Temperature is measured by a pyrometer.

## Question: 4

Which of the following is a typical Energy Use Index?

- A. MMBtu/kWh
- B. \$/Mcf
- C. kWh/ft<sup>2</sup>
- D. therm

**Answer: C**

Explanation:

kWh/ft<sup>2</sup> is an Energy Use Index (EUI) that is typically used in energy benchmarking to compare the energy performance of similar building types of different size.

## Question: 5

For a given period of time, what is the ratio of the average energy consumption in a facility divided by the peak demand in the facility called?

- A. Energy balance
- B. Demand charge
- C. Energy Use Index
- D. Load factor

**Answer: D**

Explanation:

A building's load factor is an indicator of the shape of the daily demand profile. A high load factor indicates a relatively high base load compared to the peak; whereas a low load factor indicates that there is a period with a high peak load relative to other times in the day.

## Question: 6

During the past 12 months a 150,000 square foot facility used 1,350,000 kWh of electricity and 7,500 MMBtu of natural gas. The cost of electricity is \$0.085/kWh and the cost of natural gas is \$7.50/Mcf. What is the Energy Cost Index of the facility? (Assume 1 Mcf = 1.037 MMBtu).

- A. \$1.11/ft<sup>2</sup>
- B. \$1.13/ft<sup>2</sup>

- C. \$1.15/ft<sup>2</sup>
- D. \$1.17/ft<sup>2</sup>

**Answer: B**

**Explanation:**

The cost of electricity is kWh x \$0.085/kWh  
is: \$114,750. The cost of natural gas.

$$\frac{7,500 \text{ MMBtu}}{1.037 \frac{\text{MMBtu}}{\text{Mcf}}} \times \frac{\$7.50}{\text{Mcf}} = \$54,243$$

So the total cost is \$168,993. The Energy Cost Index is:

$$\frac{\$168,993}{150,000 \text{ ft}^2} = \frac{\$1.13}{\text{ft}^2}$$

### Question: 7

Which of the following is a potential application for an infrared camera?

- A. Finding faulty electrical connections or overloaded circuits.
- B. Determining areas of heat loss from a building.
- C. Identifying mechanical faults such as excessive bearing friction
- D. All of the above

**Answer: D**

**Explanation:**

Infrared thermography can be utilized to find excessively hot or cold areas in electrical systems, mechanical equipment, and the building fabric.

### Question: 8

An office building uses 1,200,000 kWh of electricity each year and 4,000 Mcf of natural gas. A lighting retrofit will save 80,000 kWh each year by reducing the power demand when the lights are switched on. Which measurement and verification method would be most appropriate?

- A. Spot measurement
- B. Continuous measurement
- C. Utility bill comparison
- D. Calibrated simulation

**Answer: A**

Explanation:

A spot measurement of the reduction in lighting power would be the best method since the power will not vary over time and the hours of operation are not being changed. The expected savings are only about 7% of the total electricity demand so utility bill comparison is not suitable.

### Question: 9

What is the maximum contract term a federal agency may have for an Energy Saving Performance Contract?

- A. 10 years
- B. 15 years
- C. 25 years
- D. 40 years

**Answer: c**

Explanation:

The Federal Acquisition Regulations (FAR Part 23.205) state that an ESPC cannot exceed 25 years.

### Question: 10

In which Energy Savings Performance Contract structure will an Energy Services Company (ESCO) pay the customer if the savings are less than expected?

- A. Shared savings
- B. Guaranteed savings
- C. Chauffage
- D. Deemed savings

**Answer: B**

Explanation:

A guaranteed savings ESPC requires the ESCO to cover any shortfall in savings. Often a provision is made whereby a portion of any excess savings can be set aside to help cover any future shortfalls.

### Question: 11

Which of the following is not one of the four allowable criteria for a capital lease?

- A. The ownership of the asset is transferred to the lessee by the end of the lease term
- B. There is a bargain purchase option, so the lessee can buy the asset at less than the market

value

- C. The lease period is at least 75% of the asset's useful life
- D. The value of the asset at the end of the lease must be at least of its value at the start of the lease

**Answer: D**

Explanation:

The residual value of the asset is not a condition of a capital lease. A fourth alternative criterion for capital leases is that the present value of the minimum lease payment is at least 90% of the fair market value of the asset at the beginning of the lease.

### **Question: 12**

Which of the following is not typically part of a lender's risk assessment of an Energy Savings Performance Contract?

- A. Value of savings
- B. Customer credit-worthiness
- C. Project complexity
- D. Contract terms

**Answer: A**

Explanation:

The value of the energy savings to the customer are not important to the lender since they are only concerned with receiving repayment for the loan. The ability of the customer to repay the loan is dependent upon their creditworthiness, how likely the project is to succeed and produce savings, and the terms of the contract such as how long the contract will last, how savings are calculated, and how savings are shared.

### **Question: 13**

A 30 foot by 30 foot office requires 50 footcandles of illumination on the work surface. LED lamps, each with an output of 2200 lumens, will be used in fixtures that hold two lamps. The light loss factor has been calculated to be 0.71 and the Coefficient of Utilization is 0.80. How many LED lamps will be required?

- A. 30
- B. 44
- C. 56
- D. 60

**Answer: D**

Explanation:

The number of lamps required can be calculated using the lumen method

$$\text{No. lamps} = \frac{FC \times \text{Area}}{\text{Lumens} \times LLF \times CU} = \frac{50 \times (50 \times 30)}{2200 \times 0.71 \times 0.80} = 60 \text{ lamps}$$

## Question: 14

A facility manager replaces all the T5 lights in an office when they have reached of their rated life of 20,000 hours. The lights operate for 12 hours each day, 5 days per week, for 52 weeks of the year. What is the group re-lamping interval for these lights?

- A. 3.7 years
- B. 4.6 years
- C. 5.1 years
- D. 6.4 years

**Answer: C**

Explanation:

The group re-lamping interval is calculated by:

$$GRI = \frac{\text{Average Rated Life} \times \% \text{ of Rated Life}}{\text{Annual Operation Hours}} = \frac{20,000 \times 0.8}{12 \times 5 \times 52} = \frac{16,000}{3,120} = 5.1 \text{ years}$$

## Question: 15

Consider a 30 horsepower three-phase motor with name plate rated performance of 93.6% efficiency drawing 35 A at 460 V. What is the power factor of this motor at 100% load?

- A. 0.80
- B. 0.86
- C. 0.90
- D. 0.92

**Answer: B**

Explanation:

the power in kilowatts of the motor is calculated by:

$$P_{kW} = \frac{\text{Horsepower} \times 0.746 \times \% \text{ of Full Load}}{\text{Efficiency}} = \frac{30 \times 0.746 \times 1}{0.936} = 23.9 \text{ kW}$$

The power is also calculated by:

$$P_{kW} = \sqrt{3} \times \text{kV} \times I \times \text{Power Factor} = \sqrt{3} \times 0.46 \times 35 \times PF$$

Therefore:

$$PF = \frac{23.9}{\sqrt{3} \times 0.46 \times 35} = 0.86$$

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