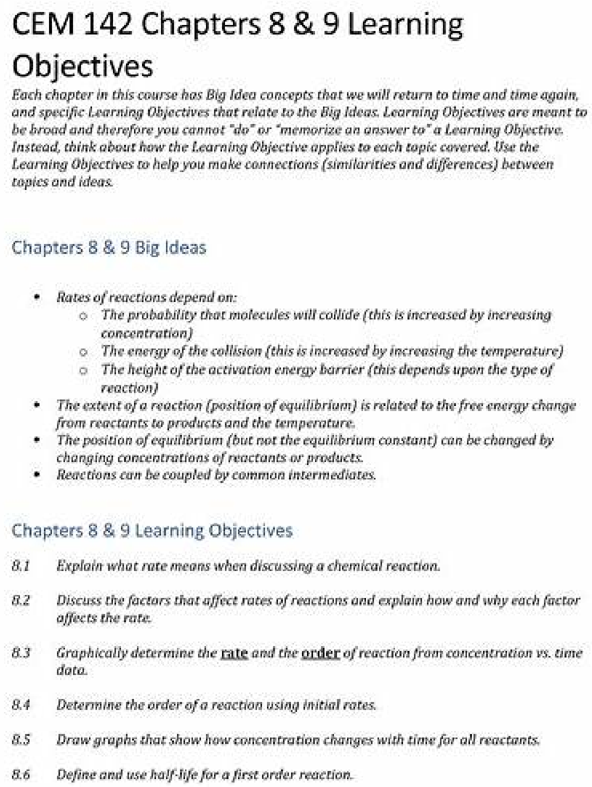
Exam CEM Objectives & CEM Latest Practice Materials



CEM 142 Chapters 8 & 9 Learning Objectives

Each chapter in this course has Big Idea concepts that we will return to time and time again, and specific Learning Objectives that relate to the Big Ideas. Learning Objectives are meant to be broad and therefore you cannot "do" or "memorize an answer to" a Learning Objective. Instead, think about how the Learning Objective applies to each topic covered. Use the Learning Objectives to help you make connections (similarities and differences) between topics and ideas.

Chapters 8 & 9 Big Ideas

- *Rates of reactions depend on:*
  - *The probability that molecules will collide (this is increased by increasing concentration)*
  - *The energy of the collision (this is increased by increasing the temperature)*
  - *The height of the activation energy barrier (this depends upon the type of reaction)*
- *The extent of a reaction (position of equilibrium) is related to the free energy change from reactants to products and the temperature.*
- *The position of equilibrium (but not the equilibrium constant) can be changed by changing concentrations of reactants or products.*
- *Reactions can be coupled by common intermediates.*

Chapters 8 & 9 Learning Objectives

8.1 *Explain what rate means when discussing a chemical reaction.*

8.2 *Discuss the factors that affect rates of reactions and explain how and why each factor affects the rate.*

8.3 *Graphically determine the rate and the order of reaction from concentration vs. time data.*

8.4 *Determine the order of a reaction using initial rates.*

8.5 *Draw graphs that show how concentration changes with time for all reactants.*

8.6 *Define and use half-life for a first order reaction.*

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AEE Certified Energy Manager (CEM) Sample Questions (Q123-Q128):

NEW QUESTION # 123

Lighting systems operate with a certain recoverable light loss factor. Control systems with photocell sensor inputs combined with dimming ballasts can be used to regulate dimming levels to maintain a continuous light level in the work space. Which of the following best describes this type of control?

- A. Two-position controller
- B. Demand-limiting controller
- C. Closed-loop controller
- D. Open-loop controller

Answer: C

NEW QUESTION # 124

A controller has a signal output that can range from 4 to 20 mA (milli-amperes). The controller regulates the output temperature from a three-way mixing valve from 5°C to 15°C. What is the control gain?

- A. 1.2
- B. 0.8
- C. 1.4
- D. 1.6
- E. 0.6

Answer: E

NEW QUESTION # 125

An energy project implemented today saves $10,000 per year for the next 20 years. Using the 5% interest table, determine the total value of savings at the end of the 20th year?

- A. $146,907
- B. $124,620
- C. $496,991
- D. $200,000
- E. $330,660

Answer: C

NEW QUESTION # 126

A 3 MW rated wind-powered turbine has a rotor diameter of 113 meters. What is the efficiency of the wind turbine at rated power if it is operating in wind power calculated at 8.6 MW? Assume an air density of 1.225 kg/m^3.

- A. 59.3%
- B. 28.4%
- C. 42.7%
- D. 34.9%

Answer: D

NEW QUESTION # 127

An energy-saving project costs $540,000. The project will have maintenance costs of $25,000 per year. The energy savings from the project are $160,000 per year. What is the simple payback of the project?

- A. 4.0 years
- B. 3.0 years
- C. 5.0 years
- D. 2.0 years

Answer: A

Explanation:
To determine the simple payback period for the energy-saving project, we need to apply the standard formula used in energy management as per the Association of Energy Engineers (AEE) Certified Energy Manager (CEM) guidelines. The simple payback period is a widely used metric in energy efficiency projects to evaluate how long it takes for the initial investment to be recovered through net savings. Let's break this down step-by-step using the provided data and CEM-aligned methodology.
Step 1: Understand the Simple Payback Formula
* Formula: Simple Payback Period (years)=Initial Investment CostNet Annual Savings\text{Simple Payback Period (years)} = \frac{\text{Initial Investment Cost}}{\text{Net Annual Savings}} Simple Payback Period (years)=Net Annual SavingsInitial Investment Cost
* Definition: The simple payback period represents the time (in years) required for the cumulative savings to equal the initial investment, without considering the time value of money (e.g., discount rates or inflation).
* CEM Reference: AEE CEM training materials emphasize this formula in the "Energy Economics" section, where simple payback is a fundamental tool for assessing project feasibility.
Step 2: Identify Given Data
* Initial Investment Cost: $540,000 (one-time cost of the project).
* Annual Energy Savings: $160,000 per year (benefit from the project).
* Annual Maintenance Costs: $25,000 per year (additional cost incurred due to the project).
* Net Annual Savings: This must account for both the savings and the costs incurred annually.
Step 3: Calculate Net Annual Savings
* Definition: Net annual savings is the difference between the annual energy savings and any additional annual costs (e.g., maintenance).
* Verification: The problem specifies maintenance costs as an ongoing expense tied to the project, which reduces the effective savings. CEM guidelines require including such costs in payback calculations unless explicitly stated otherwise.
Step 4: Compute the Simple Payback Period
* Apply the Formula: Simple Payback Period=Initial Investment CostNet Annual Savings\text{Simple Payback Period} = \frac{\text{Initial Investment Cost}}{\text{Net Annual Savings}} Simple Payback Period=Net Annual SavingsInitial Investment Cost Simple Payback Period=540,
000135,000=4.0 years\text{Simple Payback Period} = \frac{540,000}{135,000} = 4.0 \, \text{years} Simple Payback Period=135,000540,000=4.0years
* Result: The payback period is exactly 4.0 years, meaning it takes 4 years for the net savings to recover the initial investment.
Step 5: Validate Against Options
* Options:A. 2.0 yearsB. 3.0 yearsC. 4.0 yearsD. 5.0 years
* Check:
* If we ignored maintenance costs (incorrectly), payback would be 540,000160,000=3.375 \frac {540,000}{160,000} = 3.375 160,000540,000=3.375 years, which rounds to 3.4-not an exact match for any option.
* With maintenance costs included, 540,000135,000=4.0 \frac{540,000}{135,000} = 4.0 135,000540,000=4.0, which matches option C precisely.
* Conclusion: Option C (4.0 years) is correct based on the net savings approach.

NEW QUESTION # 128
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