Daylighting Design & Technique Worksheet

Part 1 – Design
Design a 1,000 sq. ft. house without using any daylighting techniques or methods.

Sketch:

Lighting
Suppose you decide to use standard 60-watt incandescent light bulbs in your house. Estimate how many bulbs you will need, and approximate the amount of time each bulb will be used per day. Based on your estimates, compute the total electricity consumption in one day attributed to lighting (give your answer in kilowatt-hours)

\[
electricity\ consumption = \frac{(\text{# of bulbs}) \times (\text{bulb wattage}) \times (\text{average # of hours per bulb})}{(1000 \text{ watts/kilowatt})}
\]

1. Indicate number of bulbs and hours per day of operation:

2. Calculate average # of hours per bulb:

3. Calculate energy consumption:

Answer:

Energy-Efficient Housing: Lesson 3, Daylighting Activity
— Daylighting Design & Technique Worksheet
Part 2 – Investigation and Re-Design
Using what you have learned, implement a daylighting system into the design of your house. Consider the position of the sun when deciding where to place windows and other daylighting devices. Indicate which cardinal direction the house should face and why.

Sketches:
**Part 3 – Build**
Build your model house according to your design. Make any necessary modifications.

**Part 4 – Testing**
Test your modified model house using a desk lamp to simulate the sun. Record any observations about the levels of natural light in each room due to your daylighting devices. Determine whether or not this has an impact on the amount of artificial light you designed the house to use.

Because of your implemented system of daylighting, you should be able to reduce the amount of artificial lights required, the usage time of certain bulbs, or both.

Decide which lights can be removed or used for less time than stated earlier. Calculate the total energy savings per day attributed to daylighting (give your answer in kWh).

\[
\text{total energy savings} = (\text{energy consumption before daylighting}) - (\text{energy consumption after daylighting})
\]

1. Indicate changes to required lighting:

2. Compute new average time of use per bulb:

3. Compute new electricity consumption:

4. Calculated total energy savings:

Answer:
Questions:

Does your house account for differences in solar altitude between summer and winter? If so, how? If not, explain how it might.

What kind of lighting is provided by each different daylighting technique you used (dispersed, concentrated, high/low level of luminous flux)?

How could you improve your design?