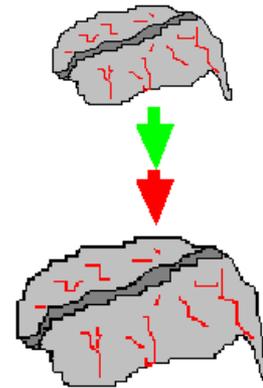


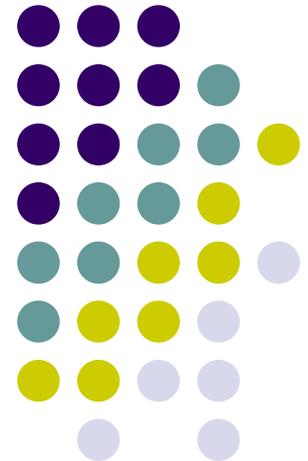
# Maximizing Educational Impact: Focus on Solar PV



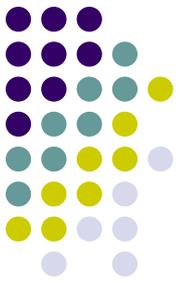
## Without Maxing Out Your Resources



Daniel Sherry  
SEET 2012 Workshop  
June 19, 2012



# Three Basic Challenges

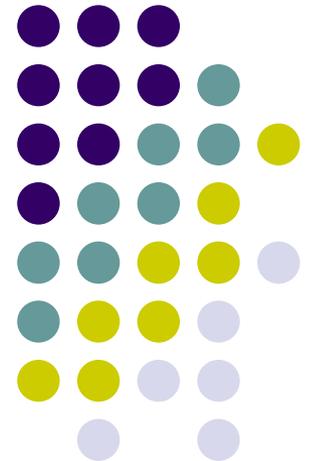


- | Safety / Risk management / Insurance Carriers
- | Maintaining Student's Attention
- | Budgetary Constraints

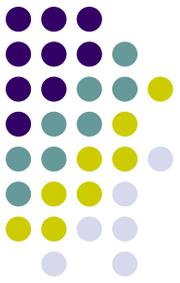
# Maximizing Educational Impact

---

Maximizing Safety  
& Minimizing Liability Issues

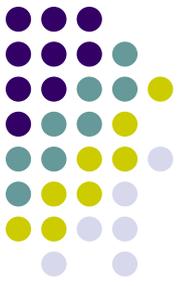


# Safety / Risk Management / Insurance Carriers



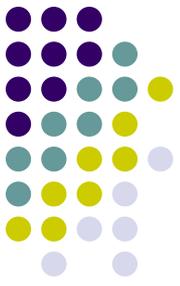
- | How is your safety program?
  - | Do you have one?
  - | Do safety issues put your program at risk?
  - | Does your program put you or your institution at risk?

# Safety / Risk Management / Insurance Carriers



- | Programs that include activities with safety issues:
  - | May be limited or curtailed by administration
    - § All about the budget (insurance cost / litigation / settlement)
  - | May cause insurance providers to raise rates
    - § In turn programs may be limited or curtailed by administration
    - § Back to the budget
  - | May be accident – brings program into an unwanted light
    - § May cause insurance providers to re-evaluate and raise rates
    - § Litigation costs / settlements
    - § In turn may cause limitation or curtailment by administration
    - § Back to the budget

# Safety / Risk Management / Insurance Carriers

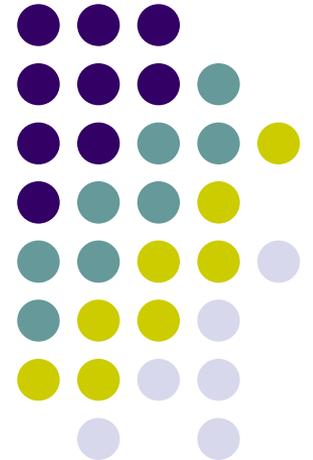


- | Is your safety program sound?
- | Are safety procedures written?
- | Are students trained on safety procedures?
- | Is the safety training documented?
  - | Limit the vulnerability of your program
  - | Limit exposure of you & your institution to liability

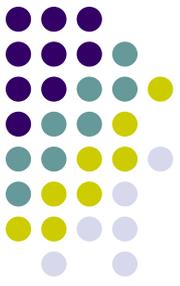
# Maximizing Educational Impact

---

Maintaining Student Attention



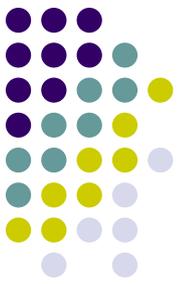
# Maintaining Student Interest



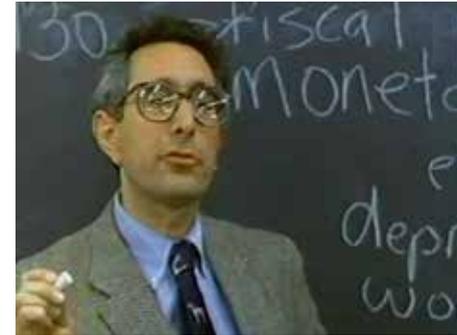
The more that students are allowed to see, touch, taste, smell, feel, or otherwise interact with what you are teaching; the more apt they are to learn, to retain, and to remain engaged.

– Daniel Sherry

# Maintaining Student Interest



## | Teaching Methods are Important



### | Bueller Method

- | Dull
- | Monotone
- | Repetitive
- | No Emotion – “Anyone.... Anyone.... Anyone... (Ferris Bueller’s Day Off)

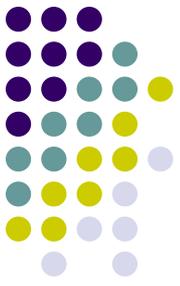
### | Alien Method

- | Dictatorial
- | Demanding
- | Harsh & Raspy
- | Charged with negative emotion
- | You’re making me very, very angry



Looney Toons  
Marvin the Martian

# Maintaining Student Interest



## Teaching Methods are Important

### Popcorn Method

- Often forgets and has to retrieve props or supplies
- Lesson backtracking
- Disorderly lesson – no set sequence or structure
- Low productivity
- Low attentiveness & Low learning

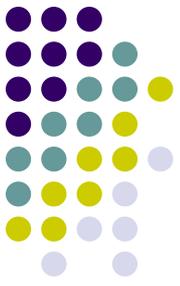


### Eternal Bookworm

- Covers highlights of the chapter directly from the pages
- When asked questions, flips relentlessly through pages and refers to the reading assignment
- No expansion of topics from the text
- Relies on the text as gospel without input from students



# Maintaining Student Interest



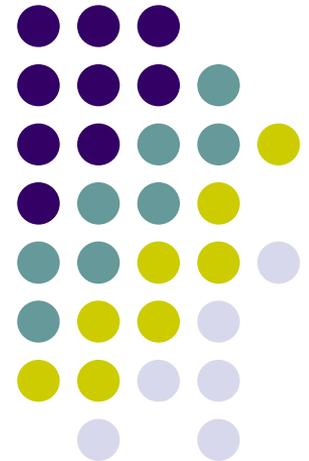
- | Focus on Effective Teaching Methods
  - | Mr. Holland's Opus
    - | Football Team & Marching Band
      - § Coach teaches the band how to march in unison
      - § Mr. Holland taught the football player rhythm and execution
    - | Synergistic
    - | Collaborative
    - | Win-Win
    - | Keep the student's interest
    - | Maximizes educational impact
  - | Many other effective methods



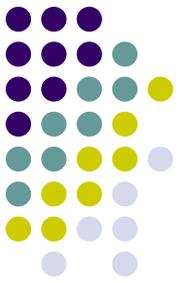
# Budgetary Constraints

---

Living Within Your Means While  
Maximizing Educational Impact

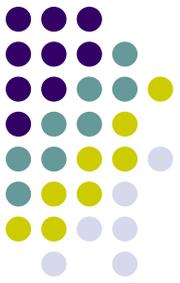


# Living Within Your Means



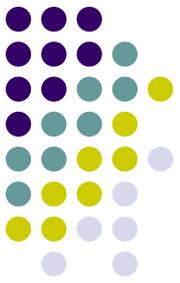
- | Budgetary constraints
  - | Cost of Solar PV System
    - | 3.8kW System \$10,000.00 (Competitive bid)
    - | Average cost: \$1.65 to \$2.00 / Watt (Panels Only)
    - | 280 Watt Panel: \$462.00 to \$560.00
  - | Final Cost of the system depends on your location
    - | State and local incentivizes / rebates
    - | Educational offsets
    - | Partnership funding / grants

# Living Within Your Means



- | Budgetary constraints
  - | Budgetary Limitations
    - | Supportive Administrations and organizations
    - | Willing to provide funding to support the program
  - | Budgetary Cutbacks
    - | Cutbacks in overall funding
    - | Cutbacks in specific program funding

# How Do You Maximize Educational Impact

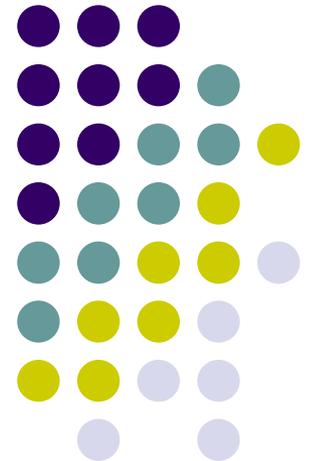


- | Minimizing safety and liability issues
- | Maintaining student's attention
- | Living within your means

# Basic Electricity 101

---

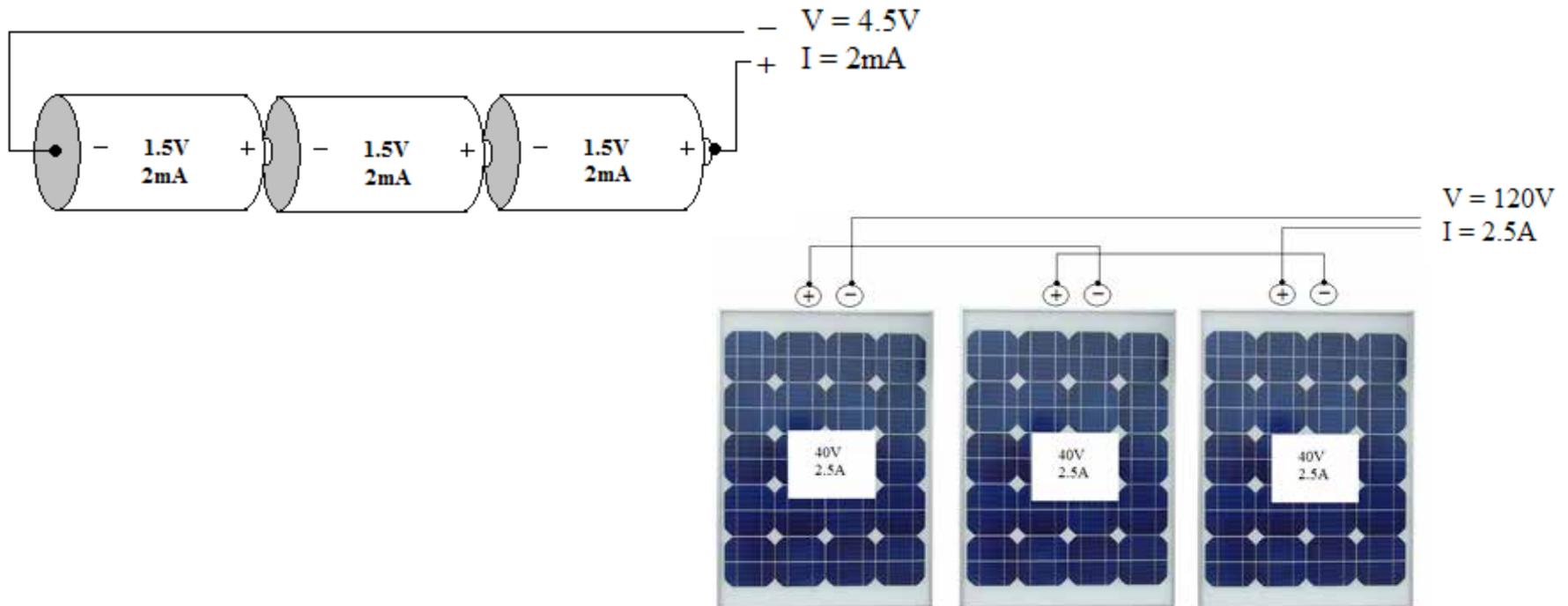
Basic Electrical Principles  
Applied to Solar PV



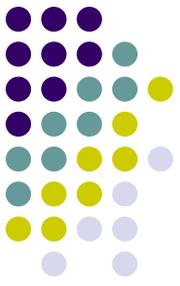
# Back to the Electrical Basics



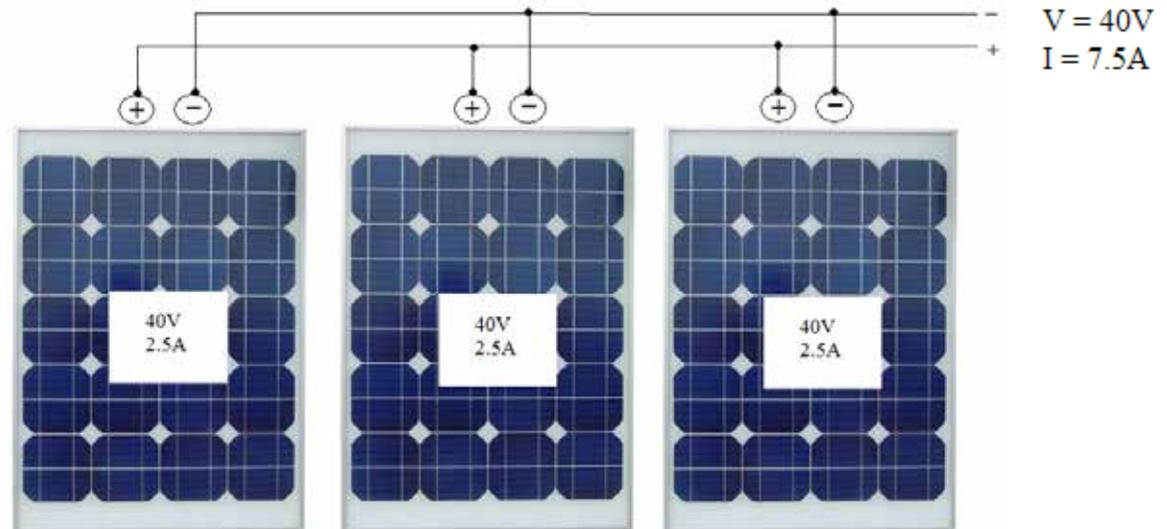
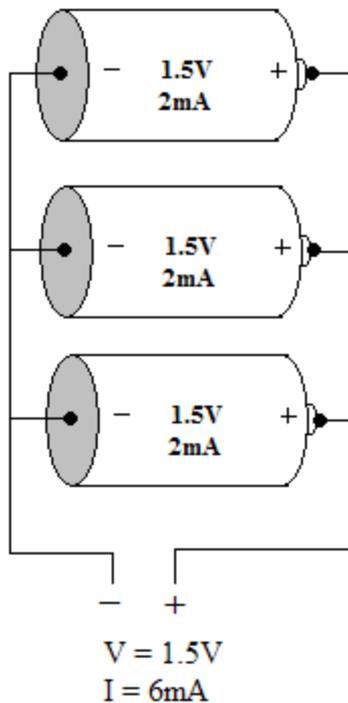
- | Series Circuit Characteristics (PV Source Circuit)
  - | Current is the same throughout the series source circuit
  - | Voltages in the series source are additive
  - | Forms one continuous loop



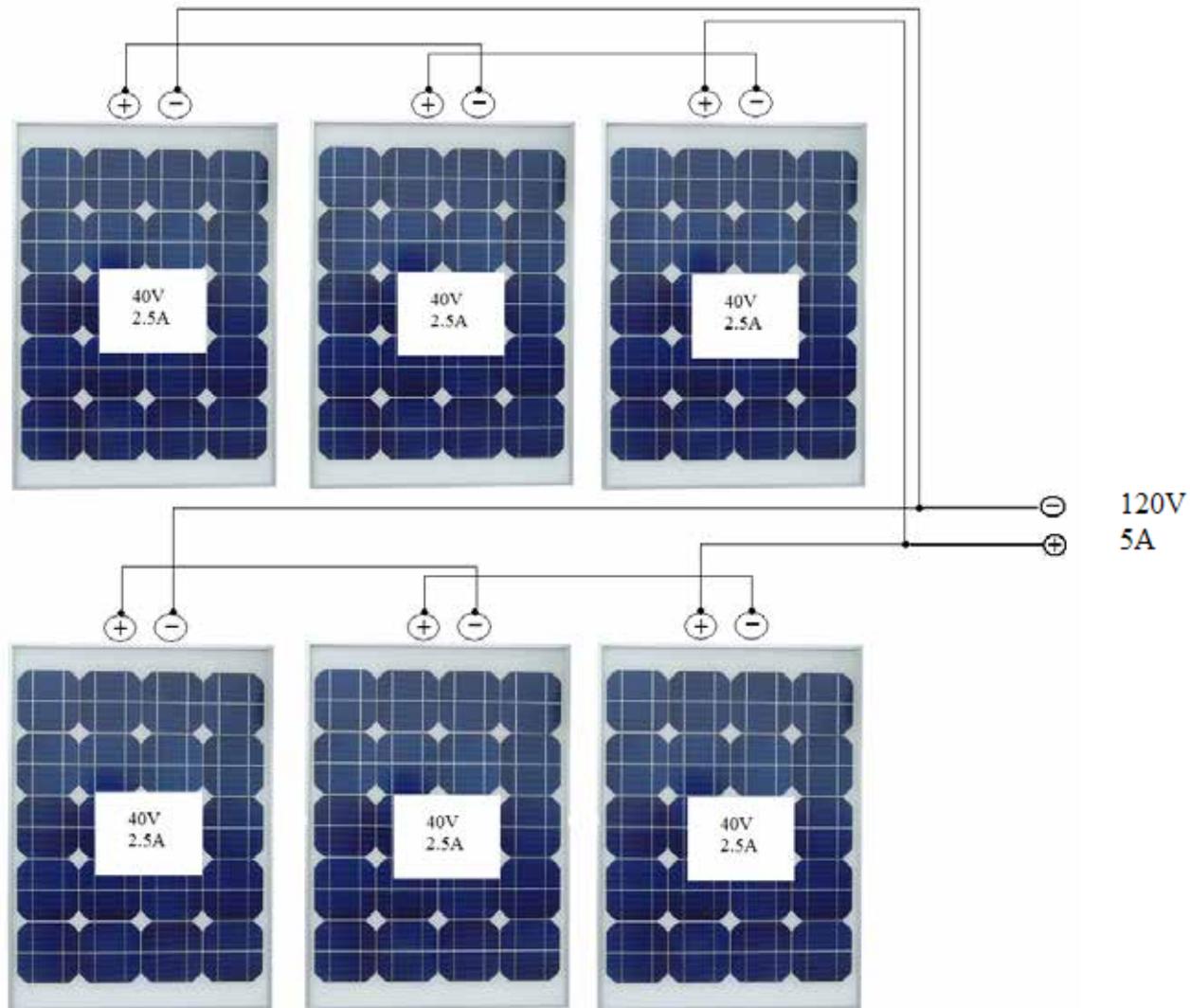
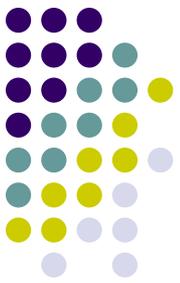
# Back to the Electrical Basics



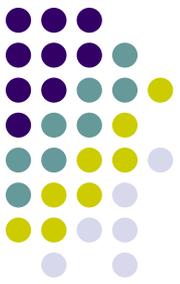
- | Parallel Circuit Characteristics
  - | Current in a parallel circuit is additive
  - | Voltages in a parallel circuit are the same
  - | Two common nodes (connections)



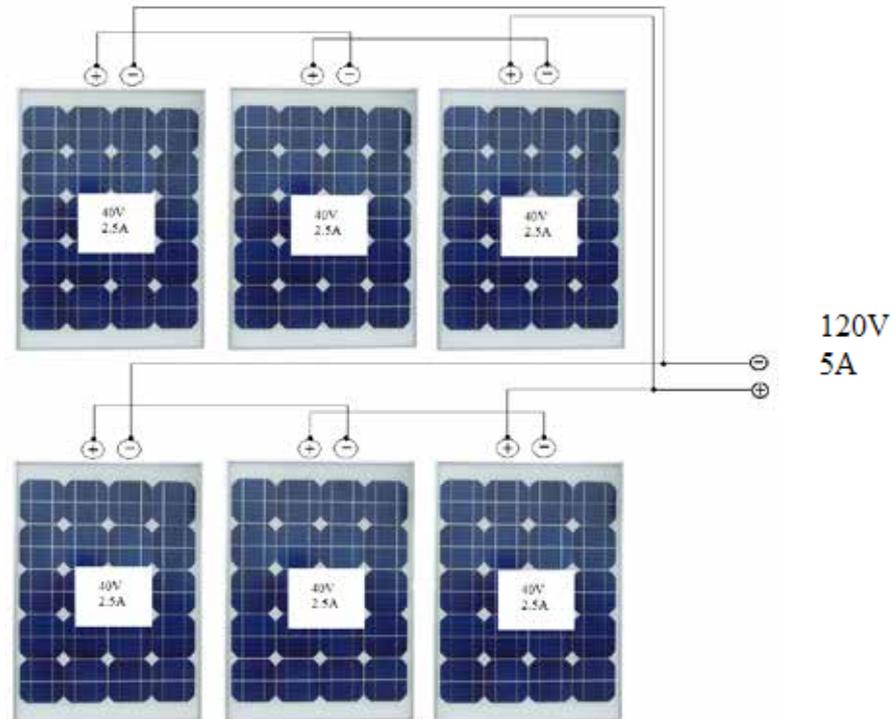
# Configuring a Solar Array



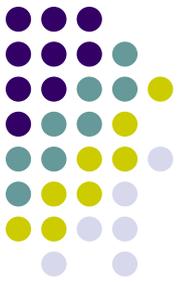
# Configuring a Solar Array



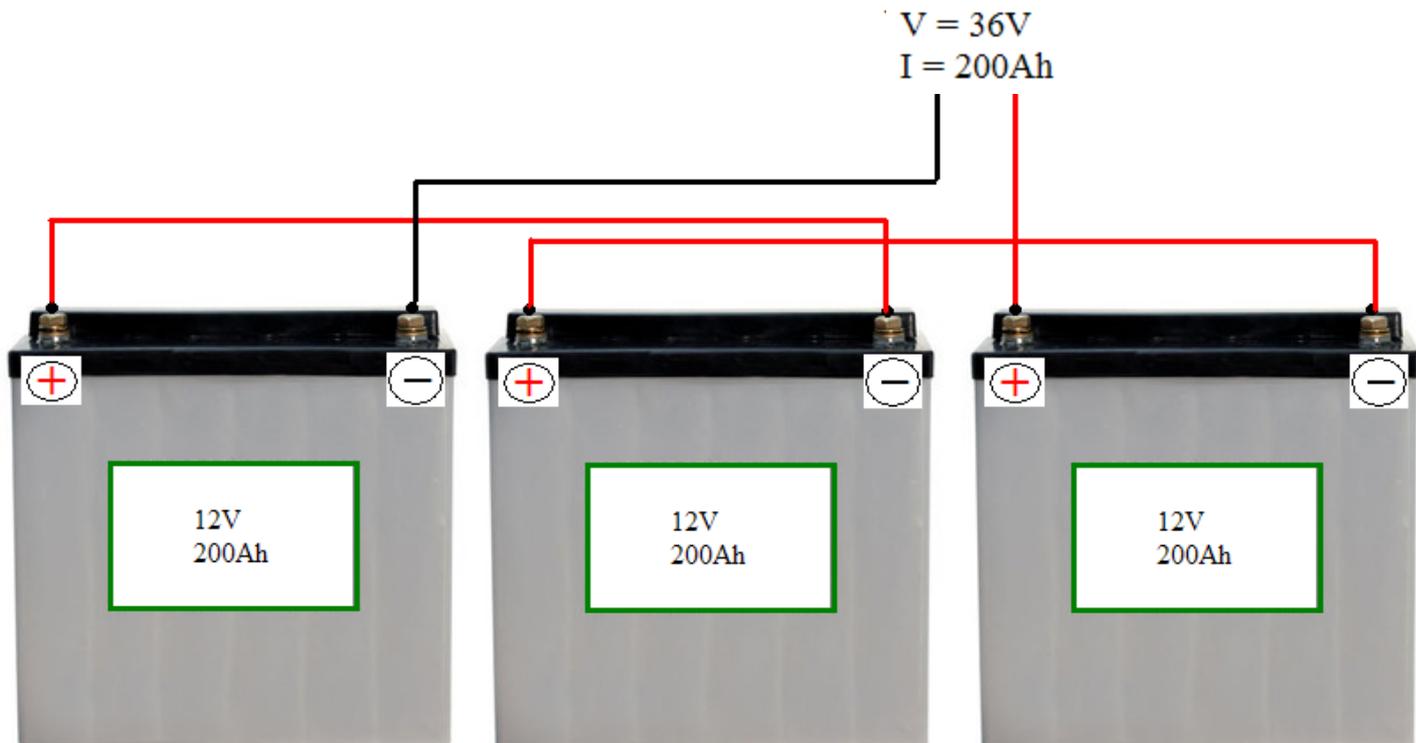
- | Increase voltage
  - | Connecting panels in series strings (source circuits)
- | Increase current
  - | Connect the strings in parallel



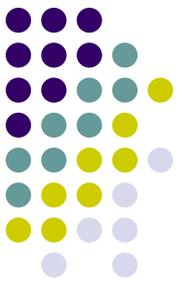
# Configuring a Battery Bank



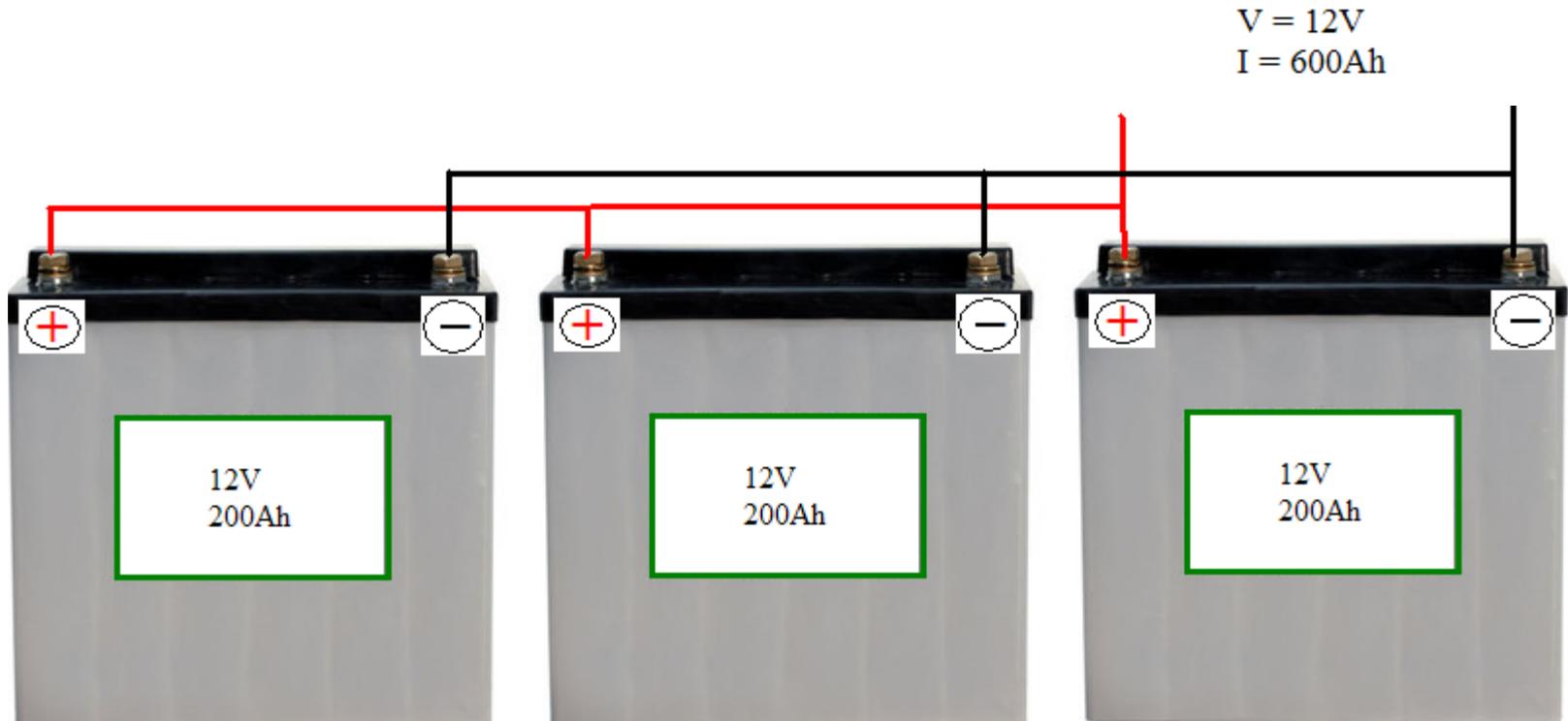
- | Increase voltage
  - | Connect batteries in series
  - | Current (storage capacity) - same as the rating for one battery



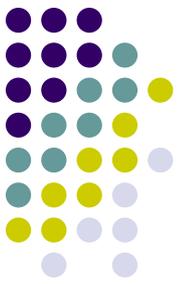
# Configuring a Battery Bank



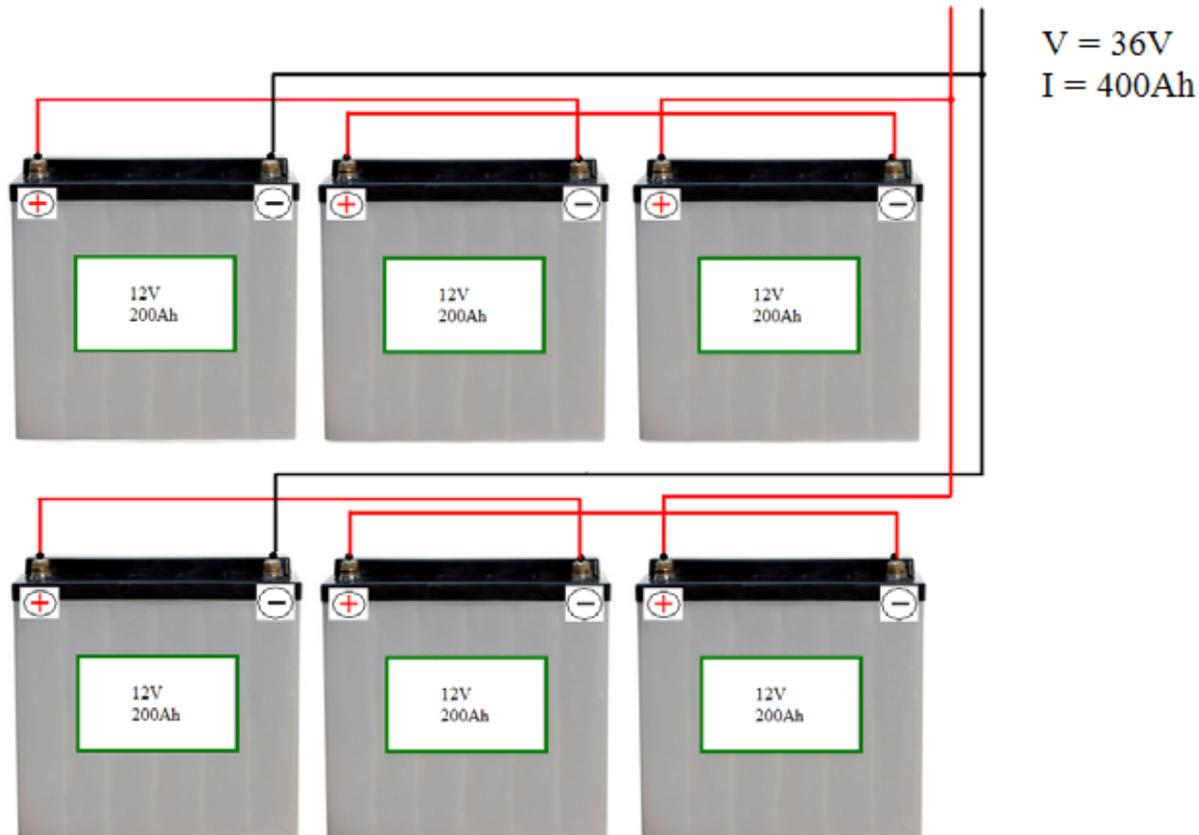
- | Increase current (storage capacity)
  - | Connect batteries / or strings of batteries in parallel
  - | Voltage is same as the rating for one battery



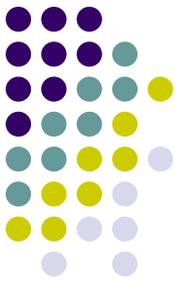
# Configuring a Battery Bank



- | Increase both voltage & current (storage capacity)
  - | Connect batteries in series to increase voltage
  - | Connect series strings in parallel to increase storage capacity

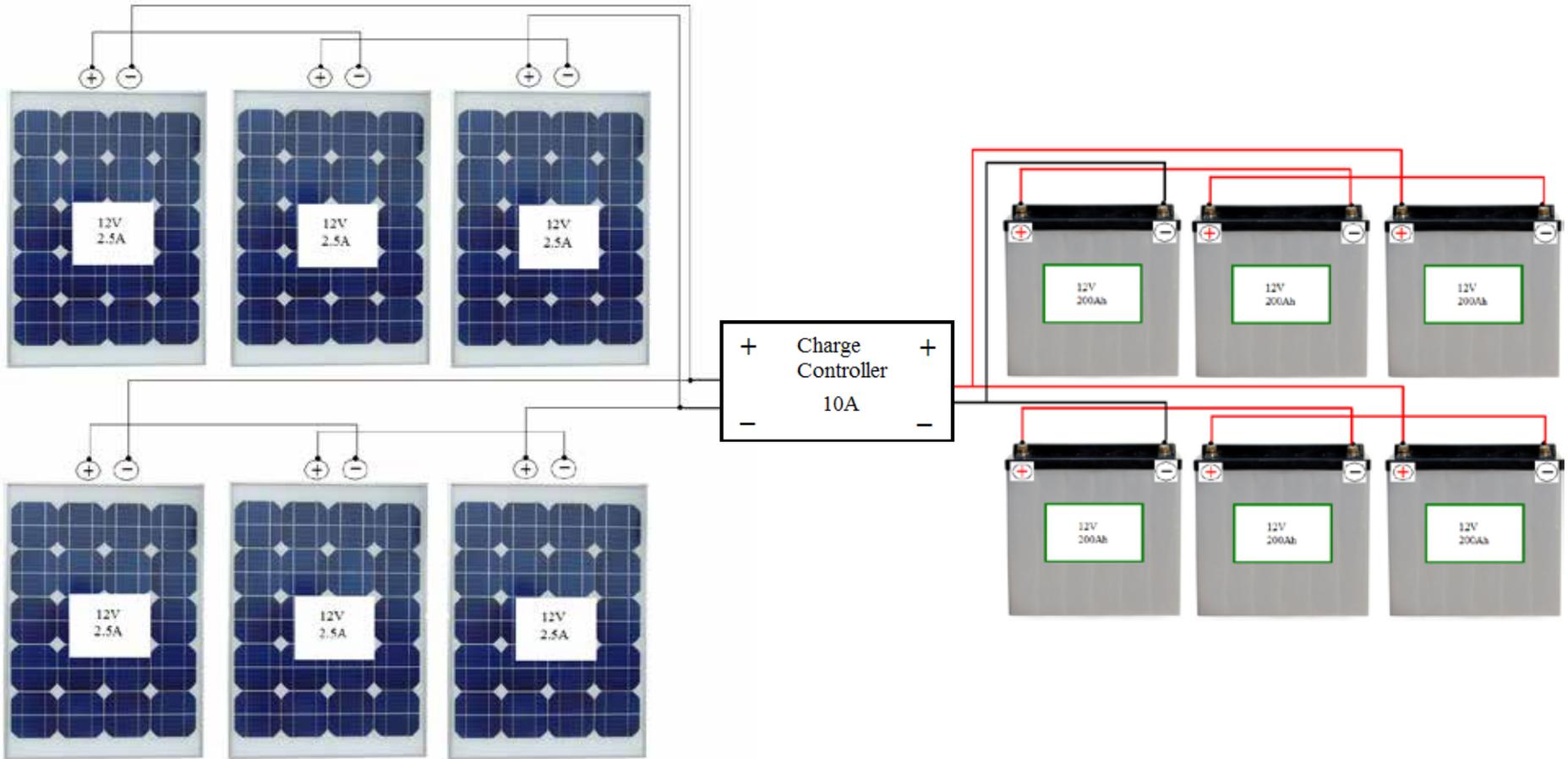
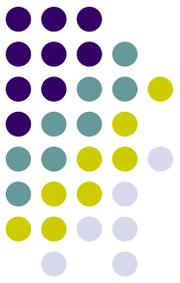


# Inter-connecting Panels to Batteries

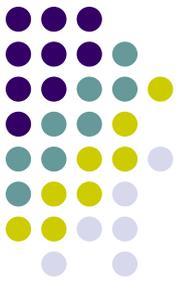


- | Voltage characteristics for components should match
  - | Array DC Output voltage
  - | Charge controller
  - | Battery Bank
- | Inter-connection is made through a charge controller
- | Output amperage of the array
  - | Rated not to exceed charge controller specified amperage

# Inter-connecting Panels to Batteries



# Assessing Comprehension



Questions before the test???

Old Reliable - Written Exercise

Printed Mock Up Exercise

Small Scale Solar PV Array Exercise

# References

Duncan, P.D. (1996). Mr. Holland's Opus. Disney Studios.

Hughes, J. (1986). Ferris Bueller's day off. Paramount Pictures.

Jones, C. (1948). Marvin the Martian. Looney Tunes & Merrie Melodies cartoons.

