

2013 MITRE SED Prerequisites

Astronomy (1/2 day – 3 ½ hours)

Prerequisite

0. Read Merit Badge Book

4 (c) Make two sketches of the Big Dipper. In one sketch, show the Big Dipper's orientation in the early evening sky. In another sketch, show its position several hours later. In both sketches, show the North Star and the horizon. Record the date and time each sketch was made.

5 (a) List the names of the five most visible planets. Explain which ones can appear in phases similar to lunar phases and which ones cannot, and explain why.

5 (b) Find out when each of the five most visible planets that you identified in requirement 5a will be observable in the evening sky during the next 12 months, then compile this information in the form of a chart or table.

5 (c) (Be prepared to) Describe the motion of the planets across the sky.

5 (d) Observe a planet and describe what you saw

6 (a) Sketch the face of the Moon and indicate at least five seas and five craters. Label these landmarks.

6 (b) Sketch the phase and the daily position of the Moon, at the same hour and place, for a week. Include landmarks on the horizon such as hills, trees, and buildings. Explain the changes you observe.

7 (c) Identify at least one red star, one blue star, and one yellow star (other than the Sun). Explain the meaning of these colors.

8. Do **ONE** of the following and be prepared to share it with the group.

a. Visit a planetarium or astronomical observatory. Submit a written report, a scrapbook, or a video presentation afterward to your counselor that includes the following information:

1. Activities occurring there
2. Exhibits and displays you saw
3. Telescopes and instruments being used
4. Celestial objects you observed.

b. Plan and participate in a three-hour observation session that includes using binoculars or a telescope. List the celestial objects you want to observe, and find each on a star chart or in a guidebook.

Prepare an observing log or notebook. Review your log or notebook with your counselor afterward.

c. Plan and host a star party for your Scout troop or other group such as your class at school. Use binoculars or a telescope to show and explain celestial objects to the group.

d. Help an astronomy club in your community hold a star party that is open to the public.

e. Personally take a series of photographs or digital images of the movement of the Moon, a planet, an asteroid or meteoroid, or a comet. In your visual display, label each image and include the date and time it was taken. Show all positions on a star chart or map. Show your display at school or at a troop meeting. Explain the changes you observed.

Aviation (Full Day – 7 hours)

0. Read Merit Badge Book

Chemistry (1/2 day – 3 ½ hours)

Prerequisite

0. Read the Merit Badge Book

1 c. Obtain an MSDS for both a paint and an insecticide. Compare the toxicity, disposal, and safe-handling sections for these two common household products. Be prepared to discuss with the group.

2 a. Predict what would happen if you placed an iron nail in a copper sulfate solution. Locate the formula for the reaction that you described.

2 b. Find out how you would separate sand from water, table salt from water, oil from water, and gasoline from motor oil. Be prepared to discuss with the group.

4 a. Cut a round onion into small chunks. Separate the onion chunks into three equal portions. Leave the first portion raw. Cook the second portion of onion chunks until the pieces are translucent. Cook the third portion until the onions are caramelized, or brown in color. Taste each type of onion. Describe the taste of raw onion versus partially cooked onion versus caramelized onion. Explain what happens to molecules in the onion during the cooking process. Be prepared to share with the group.

4 b. Describe the chemical similarities and differences between toothpaste and an abrasive household cleanser. Explain how the end use or purpose of a product affects its chemical formulation. Be prepared to discuss with the group.

4 c. Find a substance that will help water and oil combine, Explain how that substance works to combine the oil and water. Be prepared to discuss with the group.

6 a. Locate two government agencies that are responsible for tracking the use of chemicals for commercial or industrial use. Pick one agency and briefly describe its responsibilities to the public and the environment. Be prepared to discuss with the group.

6 b. Find out what pollution is. Locate the chemical effects of ozone, global warming, and acid rain. Pick a current environmental problem as an example. Briefly describe what people are doing to resolve this hazard and to increase understanding of the problem. Be prepared to discuss with the group.

7. Do ONE of the following activities: Be prepared to discuss what you found.

a. Visit a laboratory and talk to a practicing chemist. Ask what the chemist does and what training and education are needed to work as a chemist.

b. Using resources found at the library and in periodicals, books, and the Internet (with your parent's permission), learn about two different kinds of work done by chemists, chemical engineers, chemical technicians, or industrial chemists. For each of the four jobs, find out the education and training requirements.

c. Visit an industrial plant that makes chemical products or uses chemical processes and describe the processes used. What, if any, pollutants are produced and how are they handled?

d. Visit a county farm agency or similar governmental agency and learn how chemistry is used to meet the needs of agriculture in your county.

Composite Materials (Full Day – 7 hours)

Prerequisites

0. Read Merit Badge Book

2b Determine the physical, electrical, mechanical, corrosive, flammability, cost, and other such properties. For each of these raw materials, give one example for how it can be shaped and used for a specific application. Be prepared to discuss what you found

3a. Locate three different composite reinforcement materials, their positive and negative characteristics, and their uses. Obtain the MSDS for each one and discuss the toxicity, disposal, and safe-handling sections for these materials. Be prepared to discuss what you found

3 b. Discuss three different resins used in composites, their positive and negative characteristics, and their uses. Obtain the MSDS for each one and discuss the toxicity, disposal, and safe-handling sections for these materials. Include thermoset resins and thermoplastic resins in your discussion. Be prepared to discuss what you found

4. With your parent's permission and your counselor's approval do ONE of the following: Be prepared to discuss what you found

- a. Visit a company that manufactures or repairs products made with composites. Discuss what you learn with your counselor.
- b. Find three composites-related Web sites. Share and discuss what you learn with your counselor.

Computers (Canceled)

Drafting (1/2 Day – 3 ½ hours)

Prerequisites

0. Read Merit Badge Book
6. Do ONE of the following (a or b): Be prepared to discuss what you found.
 - a. Visit a facility or industry workplace where drafting is part of the business. Ask to see an example of the work that is done there, the different drafting facilities, and the tools used.
 1. Find out how much of the drafting done there is manual, and how much is done using CAD. If CAD is used, find out what software is used and how and why it was chosen.
 2. Ask about the drafting services provided. Ask who uses the designs produced and how those designs are used. Discuss how the professionals who perform drafting cooperate with other individuals in the drafting area and other areas of the business.
 3. Ask how important the role of drafting is to producing the end product or service that this business supplies. Find out how drafting contributes to the company's end product or service
 3. Discuss whether the types of media have changed such that there are new uses for the drawings, or other outputs, produced by designers. Briefly discuss how new media types are used in the industry today.

Electricity (1/2 day – 3 ½ hours)

Prerequisites

1. Read Merit Badge Book
2. Req 2. Complete an electrical home safety inspection of your home, using the checklist. Be prepared to discuss what you found
3. Req 8. On a floor plan of a room in your home, make a wiring diagram of the lights, switches, and outlets. Show which fuse or circuit breaker protects each one. Be prepared to discuss what you found
4. Req 9a. Read an electric meter and, using your family's electric bill, determine the energy cost from the meter readings. Be prepared to discuss what you found
5. Req 10. Look up the following electrical terms: volt, ampere, watt, ohm, resistance, potential difference, rectifier, rheostat, conductor, ground, circuit, and short circuit. Be prepared to discuss what you found

Electronics (Full day – 7 hours)

Prerequisites

1. Read Merit Badge Book

2. Req 2a. Draw a simple schematic diagram. It must show resistors, capacitors, and transistors or integrated circuits. Use the correct symbols. Label all parts.
3. Req 2b. Tell the purpose of each part. Resistor, Capacitor, Transistor, Integrated circuit, Other?
4. Req 6. Find out about three career opportunities in electronics that interest you. Discuss with and explain to your counselor what training and education are needed for each position.

Energy (1/2 day – 3 ½ hours)

Prerequisite

1. Read Merit Badge Book
2. Req 1a. Find an article on the use or conservation of energy.
3. Req 4. Conduct an energy audit of your home.
4. Req 4. Keep a 14 day log that records what you and your family did to reduce energy use.
5. Req 5. In a notebook, identify and describe five examples of energy waste in your school or community. Suggest in each case possible ways to reduce this waste.

Engineering (1/2 day – 3 ½ hours)

Prerequisite

1. Read Merit Badge Book
2. Select some manufactured item in your home (such as a toy or an appliance) and, under adult supervision, investigate how and why it works as it does. Find out what sort of engineering activities were needed to create it. Be ready to discuss what you found.
3. Req 2 Select an engineering achievement that has had a major impact on society. Use the resources available to you to research it. Look for who made it possible, the special obstacles they had to overcome, and how this achievement has influenced the world today.

Model Design and Building (1/2 day – 3 ½ hours)

Prerequisite

1. Read Merit Badge Book
2. Req 2. Determine the uses for each of the following types of models: architectural, structural, process, mechanical, and industrial. Do research into the different types of materials that could be used in making these models. . Be prepared to discuss what you found
3. Req 3. Examine the plumbing system of your house paying careful attention to hot and cold water supplies, waste returns, and vents.
4. Req 5. Give some thought to building a special-effects model of a fantasy spacecraft.
5. Req 5a. In line with No. 4, study aircraft, submarines, and naval ships for ideas for your spacecraft.
6. Req 5c. Prepare a sketch of your fantasy spacecraft.

Nuclear Science (1/2 day – 3 ½ hours)

Prerequisites

1. Read Merit Badge Book

2. Req 3b. Look up three particle accelerators and describe several experiments that each accelerator performs.

Oceanography (

Prerequisite

1. Read Merit Badge Book
2. Req 4. Investigate underwater topography paying particular attention to continental shelf, continental slope and the abyssal plain. Locate an underwater map and examine seamounts, guyots, rift valley, canyons, trenches, and oceanic ridges. Compare the depths of the ocean to the heights of mountains on land.
3. Req 8. Do One of:
 - (a) Write a 500-word report on a book about oceanography.
 - (b) Visit one of the following: (1) an oceanographic research ship or (2) an oceanographic institute. Write a 500-word report about your visit.
 - (c) Prepare a five-minute prepared speech "Why Oceanography Is Important" or describe "Career Opportunities in Oceanography".

Radio (1/2 day – 3 ½ hours)

Prerequisites

1. Read Merit Badge Book
2. Req 3. Do the following
 - a. Draw a chart of the electromagnetic spectrum covering 100 kilohertz (kHz) to 1000 megahertz (MHz).
 - b. Label the MF, HF, VHF, UHF, and microwave portions of the spectrum on your diagram.
 - c. Locate on your chart at least eight radio services such as AM and FM commercial broadcast, citizens band (CB), television, amateur radio (at least four amateur radio bands), and public service (police and fire).
3. Req 8. Find out about three career opportunities in radio. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.
4. Req 9. Research what Q signals are and what they mean.
5. Req 9. Research the Technician, General, and Extra Class license requirements and privileges and how to earn them.

Robotics (Full day – 7 hours)

Prerequisites

1. Read Merit Badge Book

Space Exploration (Full day – 7 hours)

1. Read Merit Badge Book
2. Req 2. Research space pioneers and collect information on your favorite and four others. Collect enough information (and material) to create a trading card.

3. Req 5. Do ONE

a. Research a space mission, manned or unmanned, and find out about its major discoveries, its importance, and what we learned from it about the planets, moons or regions of space explored. Be prepared to share your results.

b. Create a scrapbook about a current planetary mission using magazine photographs, news clippings, and articles from online. Be prepared to share with the group.

4. Req 6. Do ONE

a. Research the Space shuttle and be prepared to talk about its purpose, operation, and components.

b. Research the International Space Station and be prepared to talk about its purpose, operation, and components.

5. Req 8. Research two possible careers in space exploration that interest you. Find out the qualification, education preparation requires, and the major responsibilities of the career. Be prepared to discuss with the group.

Weather

Prerequisites

1. Read Merit Badge

2. Req 8. Keep a daily weather log for 1 week using information from this instrument as well as from other sources such as local radio and television stations or NOAA Weather Radio, and Internet sources (with your parent's permission). Record the following information at the same time every day: wind direction and speed, temperature, precipitation, and types of clouds. Be sure to make a note of any morning dew or frost. In the log, also list the weather forecasts from radio or television at the same time each day and show how the weather really turned out.

3. Req 9. Prepare a 5 minute talk on one of the following

a. Outdoor safety rules in the event of lightning, flash floods, and tornadoes.

b. Acid rain using articles you have found.

4. Req 10. Find out about a weather-related career opportunity that interests you. Be able to explain to the group what training and education are required for such a position, and the responsibilities required of such a position.