



**TRAIL
LIFE
USA®**

Model Rocketry

Name _____

Do all of the following requirements (1-7)

- ____1. Explain the following about model rocketry:
 - ____a. History
 - ____b. The governing body that provides the rules
 - ____c. New technologies being used

- ____2. Describe Newton's Three Laws of Motion and how each applies to rockets and rocket motors.

- ____3. Explain the safety concerns and considerations in:
 - ____a. Designing a model rocket
 - ____b. Building a model rocket
 - ____c. Launching a model rocket
 - ____d. Recovering a model rocket

- ____4. Describe the purpose of each of the following components (a-i)
 - ____a. Body tube
 - ____b. Engine mount
 - ____c. Fins
 - ____d. Igniter
 - ____e. Launch lug
 - ____f. Motor
 - ____g. Nose cone
 - ____h. Payload
 - ____i. Recovery system

- ____5. Design a rocket using one of the following methods:
 - ____a. Using open source software such as OpenRocket,
 - ____b. Design a rocket using an online rocketry basic building class
 - ____c. Design a model rocket kit using RockSim software

- ____6. Build the rocket you designed using commercially available model rocket components.

- ____7. Launch and recover the rocket you designed and built using one or more of the following techniques:
 - ____a. Parachute
 - ____b. Streamer
 - ____c. Glide or heli-blade



Do three of the following optional requirements (8-20)

- _____8. In addition to the required launch and recovery of a model rocket, participate in a troop, local or club sponsored competition where you launch a rocket in at least one competition type.
- _____9. Research the National Association of Rocketry (NAR) rules for competitions. Describe rules for one competition such as highest altitude single-stage, highest altitude multi-stage, egg loft competition, rocket golf, or boost glider duration.
- _____10. Give an oral or written report how the sport of model rocketry can be applied to a career in Science, Technology, Engineering, or Mathematics.
- _____11. Attend a local NAR club meeting.
- _____12. Attend a NAR competition as a spectator and describe what you saw and learned. This must not be the same competition as used for any launch for this Trail Badge.
- _____13. **Explain Newton's third law of motion to a Woodlands Trail Patrol or Unit and lead them through launching Alka-Seltzer Rockets.**
- _____14. **Explain Newton's third law of motion to a Woodlands Trail Patrol or Unit and lead them through launching Water Rockets.**
- _____15. Assist a Woodlands Trail Patrol or Unit in building model rockets from a kit and launching them in accord with all safety rules and state and local laws.
- _____16. Research two famous engineers or scientists in rocketry and report what degrees they earned, their major accomplishments, and what organizations they led or for which they performed significant engineering or science.
- _____17. With a parent, attend a meeting of a local professional society in your locality related to rocketry, such as the American Institute of Aeronautics and Astronautics (AIAA). List any scholarships or special opportunities for youth and young engineers or scientists that the Society may sponsor.
- _____18. Modern engineering specialties related to rocketry include aerospace, chemical, computer, control systems, electrical, electronics, mechanical, metallurgical and materials, software, and systems engineering. Choose two specialties you have not used for another Science and Technology Trail Badge and do the following:
 - _____a. Describe what type of work is done in those two engineering specialties and how the work of those two specialties is related.
 - _____b. Choose one specialty, and explain the education, training, and experience required to serve successfully in that profession.
- _____19. *Note: This requirement is listed in multiple Trail Badges, but may only be used for one Trail Badge.* Explain what it means to be an Engineer Intern and a Licensed Professional Engineer. List the requirements to become a Licensed Professional Engineer in your state.

_____20. *Note: This requirement is listed in multiple Trail Badges, but may only be used for one Trail Badge.* Read the Code of Ethics or Professional Conduct for Professional Engineers for your state (or NSPE Code of Ethics for Engineers if your state does not have one). One role of the engineer is providing society with accurate facts in order to make the best possible decisions.

_____a. Explain how the code you read relates to the Trailman Oath and good stewardship.

_____b. List possible consequences to the public if an engineer does not follow this Code.

Resources:

National Association of Rocketry (NAR) web site: www.nar.org - Provides information of model rocketry, competitions, rules, and local clubs.

Newton's Three Laws of Motions

- Law of Inertia: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced force.
- Acceleration is produced when a force acts on a mass. The greater the mass (of the object being accelerated) the greater the amount of force needed (to accelerate the object). For a constant mass, Force = mass times acceleration. Note that a rocket has a decreasing mass.
- For every action (force), there is an equal and opposite reaction (force).

Trail Badge Mentor Signature

Date

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