NATIONAL ASSOCIATION of ROCKETRY

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JUNIOR HIGH POWER LEVEL 1 PARTICIPATION PROGRAM

STUDY GUIDE

Exam Details		
Section A	**NAR Jr. HPR Level 1 Participation Program**	**5 Questions from 10**
Section B	**FAA Regulations; FAR 101 Subpart C**	**5 Questions from 10**
Section C	**NAR High Power Rocketry Safety Code**	**10 Questions from 20**
Section D	**Technical**	**5 Questions from 10**
Total Questions		**25 Questions from 50**
Passing Grade	**88%**	**Minimum 22 Correct Answers out of 25**

Document Version History		
Date	**Version**	**Description**
12/15/2019	**V1**	**Initial Document Release.**
12/16/2019	**V2**	**Corrected answers to questions B3 & B8.**

Note: Any mistakes or omissions found in this document should be directed via email to the current HPR Services Committee Chairman at hprservices@nar.org

Section A: NAR Jr. HPR Level 1 Participation Program (5 Questions from 10)

A1) What qualifies a NAR member to participate in the Junior L1 certification program?

A) 14-17 years of age
B) Junior/Leader NAR member in good standing
C) Both “A” and “B”

The answer is “C”. Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

A2) Who qualifies as a member of the Junior L1 applicant’s certification team?

A) Two NAR members in good standing, both at least 18 years old, at least one L1 certified
B) One L2 certified NAR member in good standing
C) Either “A” or “B”

The answer is “C”. Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

A3) Youth teams may use the same rocket for multiple individuals to attempt Junior L1 certification flights.

A) True
B) False

The answer is “B”. Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

A4) NAR Junior L1 certification attempts may use altimeter-based ejection and dual-deployment as long as the adult supervisor prepares the deployment charges.

A) True
B) False

The answer is “B”. Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

A5) Post-certification, the Junior L1 member may build and fly multiple-motor (staged or clustered) rockets as long as the total installed impulse does not exceed 640.0 Newton-Seconds.

A) True
B) False

The answer is “A”. Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

A6) Who is allowed to conduct the pre-flight safety inspection for the Junior L1 certification flight?

A) Launch Range Safety Officer (RSO)
B) Certification attempt supervising adult
C) Junior L1 applicant's parent

The answer is "A". Refer to NFPA 1127, paragraph 4.9.2.

A7) Can a NAR Junior L1 certified flier launch at Tripoli HPR Launches with L1 motors?

A) Yes, without restriction
B) Yes, but this requires the Tripoli Prefect and launch LCO/RSO team's acceptance of the Jr. HPP sponsor's acceptance of liability
C) No, the NAR Jr. HPP flier must join Tripoli and complete the Tripoli Mentoring Program

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The answer is "B". Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

A8) Junior L1 certification flights require the use of active recovery. The definition of active recovery <u>DOES NOT</u> include _____.

A) Parachutes
B) Streamers
C) Airframe drag recovery that does not deploy a recovery device that changes the physical configuration of the model

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The answer is "C". Refer to the formal NAR Junior HPR Level 1 Participation Procedures and the NAR's Definition of Active Recovery found at https://www.nar.org/high-power-rocketry-info/definition-of-active-recovery/

A9) After certification, a Junior L1 member may fly a motor that exceeds the NAR L1 certification total impulse (640 Newton-Seconds) limit with an adult supervisor's concurrence.

A) True
B) False

The answer is "B". Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

A10) As a Junior L1 certified NAR member, if I let my membership lapse over one year, I must do the following:

A) Get my parents' permission before flying with my Junior L1 certification
B) Obtain a waiver from the FAA to fly L1 HPR rockets once I renew my license
C) Re-qualify for Junior L1 HPR status once I renew my license

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The answer is "C". Refer to the formal NAR Junior HPR Level 1 Participation Procedures.

Section B: FAA Regulations; FAR 101 Subpart C (5 Questions from 10)

B1) The Federal Aviation Administration (FAA) regulations (FAR) governing amateur rockets is:

A) FAR 101 Subpart C
B) FAR 91.103
C) FAR 61.58

The answer is “A”. Refer to FAR 101.21.

B2) The FAA Class 1 Model Rocket definition includes:

A) A rocket that weighs no more than 2000 grams
B) A rocket that uses no more than 125 grams (4.4 ounces) of propellant
C) A rocket that uses fast- or slow-burning propellant

The answer is “B”. Refer to FAR 101.22.

B3) A Class 1 Model Rocket could be a NAR-defined rocket requiring L1 certification.

A) True
B) False

The answer is “A”. Refer to FAR 101.22.

B4) Launching Class 2 High Power rockets requires the following:

A) Equal or greater than 5 (five) miles horizontal visibility at any altitude
B) Separation from persons or property not involved in the operation of the greater of 457 meters (1500 feet) or one-quarter (1/4) of the expected altitude
C) Both “A” and “B”

The answer is “C”. Refer to FAR 101.25.

B5) Does the planned launch of a Class 1 model rocket require ATC notification?

A) Yes
B) No

The answer is “B”. Refer to FAR 101.25.

B6) You are visiting your uncle's ranch in Montana that shares a border with Canada. You want to launch rockets there to show your uncle that it's a cool hobby. The winds there are normally out of the south, and there is a good chance the rockets will drift into your uncle's neighbor's property in Canada. What should you do?

A) Go ahead and launch, your uncle and his Canadian neighbor are good friends
B) Contact the local sheriff's office for coordination with the Canadian Mounties
C) Do not launch unless you can verify that there is an agreement between the US and Canadian governments that allows the activity

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The answer is "C". Refer to FAR 101.23.

B7) For a Class 2 rocket launch, appropriate information must be provided to the FAA ATC facility nearest to the intended launch operation:

A) No earlier than three days prior to the launch operation
B) No later than 24 hours prior to the launch operation
C) Both "A" and "B"

The answer is "C". Refer to FAR 101.27.

B8) The next day after your L1 certification flight, you want to fly it again on the same motor. Your recording altimeter verified the pre-flight simulation result that the rocket achieved an altitude of approximately 3,500 feet above ground. Now overcast cloud layers have been verified at 3,000 feet above ground over the launch area. What is NOT an appropriate course of action per the FAA requirements for Class 2 rockets?

A) Fly the rocket if the RSO approves it
B) Wait until the cloud cover moves or is verified at or above 3,500 feet
C) Choose a lower-power motor that you verify with simulation software will safely fly to an altitude at or below 3,000 feet

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The answer is "A". Refer to FAR 101.25.

B9) Flying a Class 2 rocket between the hours of sunset and sunrise does NOT require prior FAA authorization.

A) True
B) False

The answer is "B". Refer to FAR 101.25.

B10) Whose responsibility is it to avoid creating a hazardous situation with aircraft with a rocket?

A) The airplane pilot – he or she must remain vigilant to avoid threats posed by amateur rockets
B) The operator of an amateur rocket is responsible for avoiding the creation of a hazardous situation for other aircraft
C) No one - it's a big sky and there's no hazard that can be created for an aircraft by a amateur rocket

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The answer is "B". Refer to FAR 101.23.

Section C: NAR HPR Safety Code (10 Questions from 20)

C1) You may attempt to catch your Junior L1 certification rocket to prevent damage on landing.

A) True
B) False

The answer is “B”. Refer to Section 13 of the NAR High Power Rocket Safety Code.

C2) After a misfire, how long after the last launch attempt should you wait before approaching a high power rocket?

A) 30 seconds
B) 45 seconds
C) 60 seconds

The answer is “C”. Refer to Section 5 of the NAR High Power Rocket Safety Code.

C3) When launching a High Power rocket, I will do the following in the event of a misfire:

A) Remove the launcher’s safety interlock or disconnect the battery
B) Wait 45 seconds after the last launch attempt before allowing anyone to approach the rocket
C) Both “A” and “B”

The answer is “A”. Refer to Section 5 of the NAR High Power Rocket Safety Code.

C4) My high school shop teacher told me he’ll make me a set of titanium fins for my L1 rocket –this is OK because plywood fins won’t survive the thrust of the I-impulse motor I’m planning to fly.

A) True
B) False

The answer is “B”. Refer to Section 2 of the NAR High Power Rocket Safety Code.

C5) Substituting regular toilet paper for non-flammable recovery wadding is OK because the toilet paper will burn out before it hits the ground

A) True
B) False

The answer is “B”. Refer to Section 12 of the NAR High Power Rocket Safety Code.

C6) What is the largest angle away from vertical that can be used to launch a high power rocket?

A) 10 degrees
B) 15 degrees
C) 20 degrees

The answer is “C”. Refer to Section 7 of the NAR High Power Rocket Safety Code.

C7) What regulation contains additional requirements on the simultaneous launch or “drag race” of high power rockets?

A) NFPA 1130
B) NFPA 1127
C) FAR101

The answer is “B”. Refer to Section 6 of the NAR High Power Rocket Safety Code.

C8) What is a/are launch safety requirement(s) when launching High Power rockets?

A) Use a 5-second countdown
B) Ensure that a means is available to warn participants and spectators in case of a problem
C) Both “A” and “B”

The answer is “C”. Refer to Section 6 of the NAR High Power Rocket Safety Code.

C9) Your L1 certification model lands on a power line (recovery harness draped over a wire). You should:

A) Attempt to grab the fin can if it’s hanging down low enough
B) Borrow a fiberglass pole to knock it down as fiberglass doesn’t conduct electricity
C) Wait for the power company to retrieve it

The answer is “C”. Refer to Section 13 of the NAR High Power Rocket Safety Code.

C10) What is the minimum safe distance between commercial rocket motors and open flames, smoking, or heat sources?

A) 10 feet
B) 25 feet
C) 50 feet

The answer is “B”. Refer to Section 3 of the NAR High Power Rocket Safety Code.

C11) You must use a recovery system, such as a parachute, that safely returns all parts of the rocket undamaged.

A) True – the rocket should be able to be flown again
B) False – if your rocket is damaged, just buy a new one so the kit manufacturers can stay in business

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The answer is “A”. Refer to Section 12 of the NAR High Power Rocket Safety Code.

C12) After two flight racks at your club’s launch, the winds are now causing the rockets to arc over the spectator area before recovery system deployment. You should:

A) Continue launching, the RSO check ensured that any rocket will recover safely
B) Suspend launching and adjust launch pad angles to prevent future flights from arcing over the spectator area
C) Have the LCO announce every flight as “heads-up” until the wind changes again

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The answer is “B”. Refer to Section 9 of the NAR High Power Rocket Safety Code.

C13) Your high power flying field is on a local hay farm. There is a hay barn located within 1,000 feet of your launch pad area that is normally unoccupied. One launch weekend the barn is busy with workers and equipment baling and storing hay. You should:

A) Launch anyway, the workers have indicated that they like watching the launches
B) Demand that the farmer move the haying operations farther away
C) Suspend launch operations or move the launch pad area at least 1,500 feet away from the barn

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The answer is “C”. Refer to Section 11 of the NAR High Power Rocket Safety Code.

C14) You are attending a Tripoli launch, and your friend offers you an experimental "I” motor to fly in your rocket. He says it’s OK because Tripoli recognizes NAR certifications, and you’re Jr. L1. You can fly the motor in your rocket.

A) True
B) False

The answer is “B”. Refer to Section 3 of the NAR High Power Rocket Safety Code.

C15) What is the maximum wind speed permitted when launching high-power rockets, in miles per hour (MPH)?

A) 15
B) 20
C) 25

The answer is “B”. Refer to Section 9 of the NAR High Power Rocket Safety Code.

C16) You have built a cluster rocket that you plan to fly on three Aerotech single-use G80 motors, total impulse each of 120 Newton-Seconds. What is the required minimum personnel distance and minimum diameter of cleared area around the launch pad?

A) 100 feet, 50 feet
B) 200 feet, 75 feet
C) 200 feet, 50 feet

The answer is “C”. Refer to the Minimum Distance Table in the NAR High Power Rocket Safety Code.

C17) The flight from question C16 was a spectacular success, and now you want to fly the rocket on three Aerotech G75M “sparky” motors. What is the required minimum diameter of cleared area around the launch pad?

A) 50 feet
B) 75 feet
C) 100 feet

The answer is “B”. Refer to Section 7 and the Minimum Distance Table in the NAR High Power Rocket Safety Code.

C18) It is permissible to launch a high power rocket :

A) Into clouds
B) Near airplanes
C) Neither “A” or “B”

The answer is “C”. Refer to Section 9 of the NAR High Power Rocket Safety Code.

C19) You really want to launch your high power rocket, but the club’s only battery for the electrical launch system is dead. One of the spectators has some green fuse from his last pyrotechnics show. It’s OK to launch using the green fuse as long as you observe double the safe distance table requirements.

A) True
B) False

The answer is “B”. Refer to Section 4 of the NAR High Power Rocket Safety Code.

C20) Your launch pads are located 1,200 feet from public highway 99. How much traffic flow, not related to the launch, is allowed for safe launch operations?

A) No more than 7 vehicles per hour
B) No more than 10 vehicles per hour
C) No more than 15 vehicles per hour

The answer is “B”. Refer to Section 11 of the NAR High Power Rocket Safety Code.

Section D: Technical (5 Questions from 10)

D1) The rocket's Center of Pressure (CP) is defined as:

A) The point where the rocket will fail at Max Q
B) The single point where the average of all aerodynamic forces acts through the rocket
C) The point where the rocket balances with the motor installed

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The answer is "B". Refer to https://www.nar.org/nar-products/rocket-stability/.

D2) The following will increase the stability of a model rocket:

A) Adding nose weight
B) Reducing fin area aft of the rocket's Center of Gravity (CG)
C) Adding fin area forward of the rocket's Center of Gravity (CG)

The answer is "A". Refer to https://www.nar.org/nar-products/rocket-stability/.

D3) The following is a good rule-of-thumb to ensure a rocket's stability:

A) The Center of Gravity is located at least one body diameter forward of the calculated Center of Pressure
B) The Center of Gravity is located at least one body diameter aft of the calculated Center of Pressure
C) The Center of Gravity is located the length of the nose cone forward of the aft end of the body tube

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The answer is "A". Refer to https://www.nar.org/nar-products/rocket-stability/. The report references a minimum of ½ body diameter (caliber). Most fliers use 1 caliber as a rule of thumb.

D4) Which of the following is considered to be a complex rocket?

A) One with a cluster of more than one motor
B) A staged rocket with motors in each stage
C) Both "A" and "B"

The answer is "C". Refer to the Minimum Distance Table Note in the NAR High Power Rocket Safety Code.

D5) Your current certification rocket has flown several times, in calm winds, with an 8-second delay deploying the parachute right at apogee. In launch conditions with winds at 15 knots, which is the best choice?

A) Use the same delay
B) Use a longer delay
C) Use a shorter delay

The answer is “C”. Refer to https://www.nar.org/standards-and-testing-committee/ Time Delay - A rocket launching at an angle will reach apogee sooner than one that flies straight up. A rocket flying in 15-knot winds will weathervane into the wind and reach apogee earlier. Choose a shorter delay to compensate.

D6) What are methods to increase the stability of a model rocket?

A) Increase fin size aft of the Center of Gravity, add nose weight
B) Add more epoxy to the fins to make them stronger, reduce nose weight
C) Move the fins forward (closer to the Center of Gravity), fly the rocket on a higher-thrust motor

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The answer is “A”. Refer to https://www.nar.org/nar-products/rocket-stability/.

D7) Your simulation program indicates that your rocket will achieve safe velocity, with the planned motor, just as it leaves the top of a 10-foot launch rail. At the current launch, with winds over 5 MPH, only 8-foot rails are available. What should you do?

A) Angle the launch rail into the wind to increase the effective velocity over the fins
B) Re-run your simulation using an appropriate higher-thrust motor to achieve safe velocity with the 8-foot rail
C) Launch on the 8-foot rail without concern if your CG is more than 1.5 body diameters forward of the CP

The answer is “B”. Refer to Section 7 of the NAR High Power Rocket Safety Code.

D8) The Center of Gravity (CG) or Mass of a rocket is the point at which:

A) The rocket is the heaviest
B) Aerodynamic forces acting on the rocket balance
C) There is an equal amount of mass forward and aft of this point

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The answer is “C”. Refer to https://www.nar.org/nar-products/rocket-stability/.

D9) If the shoulder of your rocket's nosecone is a loose fit in the body tube, what is the most likely problem during the flight?

A) The nose cone could drag separate from the body tube possibly accompanied by a high-speed recovery system deployment at motor burnout
B) The ejection charge gases might leak out around the nosecone shoulder and fail to deploy the recovery device
C) The rocket flight might be characterized by a loud whistling noise

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The answer is "A". At motor burnout, parts of the rocket that are not securely connected will decelerate at different rates due to mass and drag differences. If the nose cone is loose, the force of friction with a loose fit may not be sufficient to overcome forces caused by different drag on it and the rocket body. Even with a loose fit, the momentary high pressure on the base of the nosecone from the ejection charge will separate the nosecone before the gases have time to fully leak out around the shoulder. Typically whistling noises on the boost portion of the flight are not themselves inherently hazardous… ☺

D10) Assuming that each motor delivers the full impulse associated with its letter class, which motor has the shortest burn time?

A) H100
B) H200
C) I200

The answer is "B". Refer to https://www.nar.org/standards-and-testing-committee/.