Please attach a narrative (not to exceed 4 pages, excluding appendices) addressing the following:

☐ What are the student learning outcomes? Please provide a numbered list.

1. Graduates of the program are expected to be successful in pursuing careers in the direct practice of physics or further education in more advanced programs in physics or related fields.

2. Graduates of the program are ready to be team contributors or leaders, capable of collaboration and thinking independently.

3. Graduates of the program are trained to be effective communicators (both orally and in the written word) professionally and socially.

4. Graduates of the program are prepared through coursework and cutting-edge research to be professional problem solvers.

5. Graduates are expected to possess the ability to work in the laboratory, understand how to take and analyze experimental data and/or generate
Which learning outcomes were assessed? All outcomes were assessed (1-5).

How were they assessed? (Programs must use at least one direct assessment of student learning.) Our primary tools of assessment lie in the thesis requirement. The masters candidate presents his/her thesis work in written form (the thesis) and in oral form (the defense). Outcomes 1-5 are assessed during this time. We also conduct an exit interview with all of our students to partially-assess outcome 1 and via subsequent contact with the students after graduation.

Undergraduate programs should assess at least one University Undergraduate Learning Outcome (UULO) each year, which may or may not overlap with a program learning outcome. Not applicable as this is a graduate degree.

Graduate programs should assess at least one outcome related to one of the following graduate level requirements each year:
6. student engagement in research, scholarship, creative expression and/or appropriate high-level professional practice.
7. activities requiring originality, critical analysis and expertise.
8. the development of extensive knowledge in the field under study.

For the doctor of philosophy in physics degree, we assess outcome 6 in particular and, to a lesser extent, outcomes 7 and 8.

Though students are not required to publish peer-reviewed papers for their thesis, we strongly encourage it. With few exceptions that I am aware of, most of our students do publish at least some of their work in peer-reviewed science journals (e.g. Physical Review and Journal of Chemical Physics). Ph.D students are also strongly encouraged to present their research at various local, regional, national and international conferences. Graduate students also participated in various summer schools/workshops as well as were awarded research internships at Los Alamos and Lawrence Livermore National Laboratories (LANL and LLNL). These experiences are intended to aid the students in developing their thesis projects, improving their research skills, and exposing them to US Department of Energy facilities and research challenges that are worked on by these facilities.

During the student’s career, they are expected to hold yearly meetings with their thesis committee and discuss progress (both course-related and thesis-related) by giving a presentation discussing their progress. The student’s progress is judged during these meetings by private conversations amongst the committee members.

Finally, our department has also instituted a policy (agreed upon formally by the Department during the Fall of 2015) to have the Assessment Coordinator interview all graduating undergraduates one-by-one. Questions from a standard template are asked and recorded.

The Physics and Astronomy department requires its Ph.d.-seeking students to pass a written exam. They are allowed two attempts to pass the exam. If they do not, they are asked to leave the program.

What was learned from the assessment results?
The faculty have made great strides in improving the quality and expectations of the masters thesis. We have found that the requirement of graduate students to meet with their thesis committee at least yearly has been very instrumental in identifying potential problems early and help them develop their thesis project and focus on the
From the exit interview data gathered, students have complained about the lack of offerings of important upper-level courses that they need to graduate. This is in part due to a paucity of professors as a number have either retired or passed away. There was also some criticism of the varying level of teaching and supervisory quality with some professors (allegedly) leaving class early (e.g.). As result, some students didn’t feel that they learned as much as they should have for some classes. Some students explained that they like professors who teach via the blackboard rather than powerpoint. Some courses used math which some of students explained that they had not formally had yet. Various textbooks were criticized as being too outdated.

On the positive side, students in general felt that by having significant research experience and exposure as an undergraduate, they were well prepared for pursuing graduate studies and lifelong learning. All students interviewed felt that their UNLV physics education would help them succeed. In general, the students felt that their UNLV physics undergraduate education was excellent and were all largely satisfied. We also are developing an excellent track record of having our students who graduate with Ph.D.s obtain top positions as physicists (e.g. Steve Mitchell, Brian Hostermann).

The High Pressure Science and Engineering Center (HiPSEC) within our physics and astronomy department continues to receive feedback from the US Department of Energy (DOE)/NNSA on our efforts to train the next generation of America’s weapons scientists based on regular site visits/reviews. The feedback has in general been very positive. The NNSA reviewers suggested that we expand our efforts to expose students to national facilities and NNSA problems of interest by encouraging them to seek internships and fellowships outside of UNLV. We have been doing this. We have had a number of students (e.g. Ph.D. student Jason Baker) who have participated in DOE-sponsored workshops at Lawrence Livermore National Laboratory and Los Alamos National Laboratory to expose them to research and “real world” problems that are of interest to the DOE. Many of our students regularly travel to national and international laboratories such as the Advanced Photon Source and Canadian Light Source. Faculty members are explicitly encouraged to bring students with them to conduct experiments. In fact, due to a recent increase in HiPSEC-wide competition for beamtime at the Advanced Photon Source, faculty have a much higher chance to receive beamtime if they bring students with them. This gives faculty an incentive to involve students in research.

We have also learned that more often than not, students who graduated in physics from UNLV as undergraduates generally pass the qualifying Ph.D. exam whereas students from other schools often do not (at least on the first time that they take the exam). This is an important issue for us as we seek Tier 1 status and are working to accept higher quality students.

How did the program respond to what was learned?

The Assessment coordinator has met with the Chair to discuss results of the exit interviews. We have also hired a tenure-track experimental condensed matter physicist (Ashkan Salamat), a tenure-track astrophysicist (Jason Steffen) and tenure-track theorist (Quiang Zhu). These hires were instituted to replace retired or deceased faculty and help ease the burden for teaching graduate-level courses.

Due to the suggestions made by the NNSA reviewers, we have made more efforts encourage our students to apply for research-based internships (e.g. at Los Alamos or Lawrence Livermore National Labs) as well as summer school workshops for our graduate
students. We feel that the efforts will aid the students in making positive contacts with scientists at these DOE-run facilities which may aid them when later seeking employment.

It should be noted that during the post-presentation phase of the Ph 493 course last December 2016, a vigorous discussion followed pertaining to formally training students on public speaking and the process of researching, reading and digesting peer-reviewed papers. The late Prof. Lon Spight taught a one credit graduate-level seminar in the past but has since passed away. Prof. Ashkan Salamat organizes a “Condensed Coffee” for students (mostly from his research group) where the latest state-of-the-art research papers are presented by one of the students (including graduate students) once a week and discussed. HIPSEC also organizes a seminar every week where, barring an invited speaker, one student talks about a paper or topic. The problem with these efforts is that they are voluntary and often students don't participate. We are actively discussing means to encourage student participation in these types of educational events which may include making a new seminar course for credit.

We strongly encourage applying students to take the GRE Physics exam but for a variety of reasons, we have in the past accepted students into the program who had not taken the GRE. With Prof. Victor Kwong (Graduate physics coordinator), we are working to ameliorate this issue. The topic is also frequently discussed among our faculty.

Please limit the narrative portion of your report to no more than four pages. You may attach appendices with data, tables, charts, or other materials as needed. Please explain the relevant conclusions from any appendices in your narrative. Please contact the Office of Academic Assessment if you have questions or need assistance.