

Physicist (1310) Competency Model
07/13/2009

Standard Definition of Series:

Performs research or other professional and scientific work in the field of physics; investigates and applies the relationships among space, time, matter, and energy in the areas of mechanics, sound, optics, heat, electricity, magnetism, radiation, or atomic and nuclear phenomena.

General Competencies

Creative Thinking: Uses imagination to develop new insights into situations and develops innovative solutions to problems; designs new methods where established methods and procedures are inapplicable or are unavailable.

Sample Tasks (evidence a person has this competency):

- Identifies how current research can be applied to emerging high priority technologies and national needs.
- Devises ways to use technical discipline in novel ways or in ways never considered previously.
- Develops innovative solutions to problems.
- New ideas or directions for research are inspired from review of scientific literature.
- Creates new ways of framing problems.

Oral Communication: Expresses information (for example, ideas or facts) to individuals or groups effectively, taking into account the audience and nature of the information (for example, technical, sensitive, controversial); makes clear and convincing oral presentations; listens to others, attends to nonverbal cues, and responds appropriately.

Sample Tasks (evidence a person has this competency):

- Presents scientific findings/results at technical conferences.
- Communicates with people from other technical disciplines.
- Presents scientific concepts/ideas to non-scientific audiences in a meaningful way (using plain language).
- Participates in or conducts group meetings, committees, and/or internal reviews.
- Orients new and other staff; freely shares knowledge of laboratory functions (e.g., lab instruments, safety techniques, cross-training, best practices, institutional knowledge)
- Clearly articulates ideas and research to colleagues and supervisors.

Writing and Editing: Recognizes or uses correct English grammar, punctuations, and spelling communicates information (for example, facts, ideas, or messages) in a succinct and organized manner; produces written information, which may include technical material that is appropriate for the intended audience.

Sample Tasks (evidence a person has this competency):

- Writes internal technical reports.
- Keeps a clear and thorough written record of experiments so that others may replicate experiments.
- Writes and edits technical material for refereed journals, web publication, technical memoranda, and book chapters.
- Writes and edits internal and external grants, proposals.
- Writes and edits patent applications, cooperative agreements, memoranda of understanding.
- Reviews other staff members' written work and makes constructive suggestions for improvement.
- Uses email appropriately and professionally as a means to communicate with customers, colleagues, partners, managers, and stakeholders.

Problem Solving: Identifies problems; determines accuracy and relevance of information; uses sound judgment to generate and evaluate alternatives, and to make recommendations

Sample Tasks (evidence a person has this competency):

- Makes connections or sees interrelationships between disparate concepts.
- Demonstrates broad scientific interests to allow for use of different approaches toward solving problems.
- Uses innovative yet sound reasoning (i.e., thinks “out of the box” when needed); troubleshoots methodically and with an open mind.
- Continually evaluates reasoning to ensure that answers are correct and well-reasoned.
- Uses sound judgment to decide validity of methods and results when results from different experiments disagree.
- Uses logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
- Differentiates cause from effect, conducts cause analyses.

Planning, Evaluation and Execution: Organizes work, sets priorities, and determines resource requirements; determines short- or long-term goals and strategies to achieve them; coordinates with other organizations or parts of the organization to accomplish goals; monitors progress and evaluates outcomes.

Sample Tasks (evidence a person has this competency):

- Develops strategies and plans research agenda and activities.
- Prioritizes work and competing projects; coordinates activities with other groups using the same/similar resources.
- Manages time efficiently and effectively; creates a project plan with timelines and milestones for accomplishing tasks to meet goals.
- Designs experiments by determining what specific approaches will be used:
 - Identifies resources (people, equipment, supplies, etc.) necessary to accomplish goals;
 - Searches literature and consults with experts for best approaches and methods;
 - Evaluates new techniques to see how they compare to older, more established techniques, including those used within organization;
 - Considers adequacy of existing equipment and considers new purchase needs.
- Communicates with others involved in project and schedules work to be done as needed by others, such as ancillary analyses.
- Brings projects to completion while continually assessing progress.
- Evaluates success of outcome.

Technical Competence: Uses knowledge that is acquired through formal training or extensive on-the-job experience to perform one's job; works with, understands, and evaluates technical information related to the job; advises others on technical issues.

Sample Tasks (evidence a person has this competency):

- Apply knowledge of physics to practical matters, such as the development of computers, transistors, laser beams, microwave appliances, communications satellites, and a wide variety of other devices and fields.
- Observe the structure and properties of matter, and the transformation and propagation of energy, using equipment such as masers, lasers, and telescopes, in order to explore and identify the basic principles governing these phenomena.
- Develop theories and laws on the basis of observation and experiments, and apply these theories and laws to problems in areas such as nuclear energy, optics, and aerospace technology.

- Effectively utilizes machines, tools, instruments, and/or equipment
- Modifies and adapts standard methods and procedures that detect, identify and quantify research proposals. Performs analyses using computer modeling or basic research to validate theories and proposals. Prepares and writes articles for publication and/or reports describing the method or procedure and the findings and/or changes that are made.

Self-Management: Sets well-defined and realistic personal goals; displays a high level of initiative, effort, and commitment towards completing assignments in a timely manner; works with minimal supervision; is motivated to achieve; demonstrates responsible behavior and determines responsible behavior.

Sample Tasks (evidence a person has this competency):

- Demonstrates persistence, patience and a willingness to learn when faced with obstacles, setbacks and frustrations that arise while doing research.
- Accepts the bad with the good and learns from mistakes and failures.
- Demonstrates focus, drive and intellectual curiosity.
- Demonstrates willingness to solve problems independently, i.e., works with minimal supervision, but seeks advice and asks questions to learn new things as needed.
- Uses efficient learning techniques to acquire and apply new knowledge and skills; uses training, feedback, or other opportunities for self-learning and development. Remains up-to-date technically and applies new knowledge on the job.
- Sees the big picture and is able to focus on delivering an appropriate result without becoming bogged down in the details; recognizes level of effort (whether lesser or greater) needed to complete a task satisfactorily.

Technical Competencies

Education and Training: Knowledge of the concepts, principles, and theories of instructional methods such as teaching, coaching, training, research, making presentations, lecturing, and testing.

Sample Tasks (evidence a person has this competency):

- Assesses knowledge gaps and training needs of entry-level staff.
- Develops learning aids and/or activities that are appropriate to a variety of learning styles, e.g., visual, auditory, kinesthetic.
- Reports experimental results by presenting information at scientific conferences.

Visualization: Is able to mentally organize and process symbols, pictures, graphs, objects, or other information.

Sample Tasks (evidence a person has this competency):

- Arranges things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of data, numbers, letters, words, pictures, mathematical operations).
- Sees an instrument from blueprints and drawings, or sees the flow of work activities from reading a work plan.

Engineering and Technology: Knowledge of engineering concepts, principles, and practices, and of equipment, tools, mechanical devices, and their uses to produce motion, light, power, technology, and other applications.

Sample Tasks (evidence a person has this competency):

- Apply engineering science and technology principles, techniques, procedures, and equipment to the design and production of various goods and services.
- Develop manufacturing, assembly, and fabrication processes of lasers, masers, infrared, and other light-emitting and light-sensitive devices.
- Uses computers and computer applications to analyze and communicate information in the appropriate format.

Mechanical: Knowledge of and skill using machines, tools and instruments, including their design, benefits, repair, and maintenance.

Sample Tasks (evidence a person has this competency):

- Based on detailed knowledge of tools (instruments), evaluates options and troubleshoots problems.
- Understands data generated by instrument; identifies artifacts of instrumentation/experiment versus a new finding.
- Designs, builds, modifies and/or maintains instrumentation/equipment, as needed.
- Conducts research to identify the most appropriate equipment and defines the technical specifications for purchase.

Physics: Knowledge of the concepts, principles, theories, and methods to investigate and apply the relations between space, time, matter, and energy in the areas of gravity, atomic principles, mechanics, heat, light, sound, electricity, magnetism, and related natural phenomena.

Sample Tasks (evidence a person has this competency):

- Identifies important or emerging physics problems while keeping abreast of the technological issues relevant to the organization's mission.

- Demonstrates expertise in one or more of the following discipline(s) of physics: condensed matter, biophysics, astrophysics, thermodynamics, relativity, quantum mechanics, quantum information science, biochemistry, atomic, molecular and optical.

Related Scientific and Technical Disciplines: Because the work of physicists is increasingly interdisciplinary, some understanding of other scientific disciplines relevant to one's field of research as well as information technology is needed.

Sample Tasks (evidence a person has this competency):

- Applies knowledge of physical sciences, life sciences and engineering (e.g., meteorology, astronomy, biology, chemistry, chemical engineering, electrical engineering, and nanotechnology).
- Uses knowledge of information technology to accomplish research activities (e.g., database management, hardware, software, computer networking, computer security, computer programming, document management).