

APS DISTRICT HIGH SCHOOL SCIENCE CURRICULUM FRAMEWORK

Course Title: Nursing Science II Course Number: SEE BELOW

Department: Science/Health and Human Services ADS Number: 15057244

Prerequisites: Successful completion of Nursing Science I

Length of Course: One Year Credit/PRI Area: .5 Science Elective and 1.0 Practical Arts per Sem Grade Level(s): 12

Course and ADS Numbers:

Nursing Science II 447C1

Nursing Science II 825C2

Important Notes: A course that provides 1.5 credits per semester allows the student additional opportunities for in-depth study and application of the course content. The student must be able to lift 50 pounds. This course provides .5 science elective per semester and 1.0 practical arts credit per semester.

COURSE DESCRIPTION: In Nursing Science II the student continues to build on the foundations of knowledge attained in Nursing Science I. The emphasis is on pharmacology and its applications related to the gastrointestinal, cardiac, and neurological systems. The student learns what medications are used to treat disorders in each system, the reasons to dispense the medications, the properties of the medications, their side effects and adverse reactions, nursing interventions, and patient and family teaching. Literacy strategies are integrated throughout the curriculum.

References in parentheses following each performance standard align with the State of New Mexico Science Standards (NM), the State of New Mexico Career Readiness Standards (CR), the Albuquerque Public Schools Mathematics Standards (APS – MA), and the Albuquerque Public Schools Language Arts Standards (APS - LA).

STRATEGIES:

The “Illustrations” column in the *Program of Studies* provides exemplars of the performance standards, strategies, and best practices suggested by nursing teachers in the Albuquerque Public Schools (APS).

ASSESSMENTS:

Assessments may include the following: authentic and performance-based assessment, cooperative learning, teacher observations, checklists, tests and exams, formal and informal writing, small group and full class discussions, oral and multimedia presentations, projects, demonstrations, and portfolios. Assessments are based on appropriate rubrics.

SUGGESTED TEXTBOOKS AND INSTRUCTIONAL MATERIALS:

- *Introductory Medical-Surgical Nursing* (8th edition) Barbara K. Timby and Nancy E. Smith, Lippincott, Williams & Wilkins, Philadelphia, PA, 2003.
- *Davis Drug Guide for Nurses* (9th edition) Judith Hopfer Deglin and April Hazard Vallerand, F.A. Davis, Philadelphia, PA, 2003.
- *Introductory Clinical Pharmacology* (6th edition) Sally S. Roach and Jeanne C. Scherer, Lippincott, Williams & Wilkins, Philadelphia, PA, 2000.
- *Diagnostic and Laboratory Test Reference* (5th edition) by Kathleen D PhD, RN and Timothy J. Pagana MD, FACS; Mosby Inc. St. Louis, 2001.
- *Clinical Companion to Medical Surgical Nursing* (2nd edition) by Dirksen, S. R., Lewis, S.M. & Heitkemper, M. M.; Mosby Inc. St Louis, 2000.
- *Nursing Diagnosis Reference Manual* (5th edition). Sparks, S.M. & Taylor, C.M.; Springhouse Corp. Pennsylvania, 2001.
- *Taber’s Cyclopedic Medical Dictionary* (19th edition) Donald Venes, MD MSJ Editor. F.A. Davis Co. Philadelphia, 2001.

SUGGESTED TITLES/AUTHORS WEB SITES:

Approved by HSCA: March 17, 2005

STRAND I: SCIENTIFIC THINKING AND PRACTICE**CONTENT STANDARD:** The student understands the processes of scientific investigations and uses inquiry and scientific ways of observing, experimenting, predicting, and validating to critically.

- BENCHMARKS:**
- A. The student uses accepted scientific methods to collect, analyze, interpret data and observations, and design and conduct scientific investigations and communicate results.
 - B. The student understands that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.
 - C. The student uses mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ol style="list-style-type: none"> 1. Describes the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions (NM – I.I.I.1). 2. Uses appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes) (NM – I.I.I.3). 3. Conveys results of investigations using scientific concepts, methodologies, and expressions, including (NM – I.I.I.4; APS MA IV.5E): <ul style="list-style-type: none"> • scientific language and symbols, • diagrams, charts, and other data displays, • mathematical expressions and processes (e.g., mean, median, slope, proportionality), • clear, logical, and concise communication, and • reasoned arguments. 4. Understands how scientific processes produce valid, reliable results, including (NM – I.I.II.1): <ul style="list-style-type: none"> • consistency of explanations with data and observations, • openness to peer review, • full disclosure and examination of assumptions, • testability of hypotheses, and • repeatability of experiments and reproducibility of results. 	<p>NOTE: Illustrations include suggested activities for attaining each performance standard. A check (√) refers to a key feature to look for while assessing student performance.</p> <p>1 – 3. Through a variety of activities, the student begins to acquire medical administrative experiences. He/She:</p> <ul style="list-style-type: none"> • performs labs PO, IM, IV, SQ, SL where the student uses a variety of syringe sizes and appropriate needles for various administration routes, • applies safety practices through dosage calculation, administration, drug interactions, side effects, and adverse reactions, • calculates dosages, does patient weight on balanced scales, and converts pounds to kilograms, and • documents medication administration on patient flowcharts and graphs weights. <ul style="list-style-type: none"> √ application of proper methodologies √ safety measures √ accuracy (e.g., dosages, charting, use of instruments) √ clarity in communication <p>4 - 6. The student compares patient responses to older medications with responses to new medications and makes charts comparing the medications in classifications.</p> <ul style="list-style-type: none"> √ analysis of information

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>5. Uses scientific reasoning and valid logic to recognize (NM – I.I.II.2):</p> <ul style="list-style-type: none"> • faulty logic, • cause and effect, • the difference between observation and unsubstantiated inferences and conclusions, and • potential bias. <p>6. Understands how new data and observations can result in new scientific knowledge (NM – I.I.II.3; APS – MA IV.1E).</p> <p>7. Critically analyzes an accepted explanation by reviewing current scientific knowledge (NM – I.I.II.4).</p> <p>8. Examines investigations of current interest in science (NM – I.I.II.5).</p> <p>9. Creates multiple displays of data to analyze and explain the relationships in scientific investigations (NM – I.I.III.1).</p> <p>10. Uses technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling) (NM – I.I.III.3).</p> <p>11. Identifies and applies measurement techniques and considers possible effects of measurement errors (NM – I.I.III.4).</p>	<p>7. The student develops a medication care plan for a patient after researching all aspects of the medications (See #4 - #6).</p> <ul style="list-style-type: none"> √ thoroughness of research √ thoughtful plan √ accuracy √ safety considerations <p>8 - 10. The student uses current journal articles and Internet to investigate medications currently being investigated and presents the research to peers in a post conference using a graphic organizer or some other type of visual.</p> <ul style="list-style-type: none"> √ thorough research √ relevant information √ effective presentation √ display of information √ use of technology <p>11. The student works in small groups to do medication and intravenous calculations and compares answers with peers. He/She then discusses the effects of errors in medication calculation.</p> <ul style="list-style-type: none"> √ skills/technique development √ accuracy √ individual participation in discussions √ collaboration/cooperation √ reasoning √ understanding of the impact of errors

STRAND II: THE CONTENT OF PHYSICAL SCIENCE**CONTENT STANDARD:** The student understands the structure and properties of matter, the characteristics of energy, and the interaction between matter and energy.**BENCHMARKS:** A. The student understands the transformation of energy and how energy and matter interact.

B. The student understands the motion of objects and waves and the forces that cause them.

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ol style="list-style-type: none"> 1. Understands how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators (NM - II.I.II.4). 2. Understands that electromagnetic waves carry energy that can be transferred when they interact with matter (NM - II.I.II.7). 3. Understands the concept of equilibrium (i.e., thermal, mechanical, and chemical) (NM - II.I.II.11). 4. Knows that materials containing equal amounts of positive and negative charges are electrically neutral, but that a small excess or deficit of negative charges produces significant electrical forces (NM – II.I.III.3). 5. Understands the relationship between force and pressure, and how the pressure of a volume of gas depends on the temperature and the amount of gas (NM - II.I.III.4). 6. Explains how electric currents cause magnetism and how changing magnetic fields produce electricity (e.g., electric motors, generators) (NM - II.I.III.5). 7. Describes wave propagation using amplitude, wavelength, frequency, and speed (NM - II.I.III.10). 8. Explains how the interactions of waves can result in interference, reflection, and refraction (NM - II.I.III.11). 9. Describes how waves are used for practical purposes (e.g., seismic data, acoustic effects, Doppler effect) (NM - II.I.III.12). 	<ol style="list-style-type: none"> 1, 3. The student discusses medications in relationship to the concepts of conduction, convection, and radiation and how medications and IV's play a role in maintaining fluid and electrolyte balance. <ul style="list-style-type: none"> √ understanding of scientific principles √ articulation and expression of ideas √ individual participation in discussions 2, 4 – 9. The student develops and presents a pharmacology care plan related to cardiac medications given on the clinical unit. He/She teaches the patient how medications affect the cardiovascular system, processes, and functioning (e.g., how antiarrhythmics affect electrical forces, activity, and magnetic fields in the heart, and how antihypertensives regulate the force and pressure of blood in the arteries). The student evaluates medications given by discussing the EKG patterns including the cardiac cycle and how the electrical forces are noted on the EKG pattern. <ul style="list-style-type: none"> √ viable pharmacology plan √ connections (e.g., medications to scientific principles) √ analysis √ active participation in discussions √ effective communication

STRAND III: THE CONTENT OF SCIENCE - LIFE**CONTENT STANDARD:** The student understands the properties, structures, and processes of living things and the interdependence of living things and their environments.

BENCHMARKS: A. The student understands how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy.

B. The student understands the genetic basis for inheritance and the basic concepts of biological evolution.

C. The student understands the characteristics, structures, and functions of cells.

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ol style="list-style-type: none"> 1. Explains how matter and energy flow through biological systems (e.g., organisms, communities, ecosystems), and how the total amount of matter and energy is conserved but some energy is always released as heat to the environment (NM – II.II.1.5). 2. Understands and explains the hierarchical classification scheme (i.e., domain, kingdom, phylum, class, order, family, genus, species), including (NM – II.II.1.8): <ul style="list-style-type: none"> • classification of an organism into a category, • similarity inferred from molecular structure (DNA) closely matching classification based on anatomical similarities, and • similarities of organisms reflecting evolutionary relationships. 3. Knows how DNA carries all genetic information in the units of heredity called genes, including (NM – II.II.1.1): <ul style="list-style-type: none"> • the structure of DNA (e.g., subunits A, G, C, T), • information-preserving replication of DNA, and • alteration of genes by inserting, deleting, or substituting parts of DNA. 	<ol style="list-style-type: none"> 1, 2, 6, 7. The student learns drug classifications and subclassifications, groups' drug classifications according to similarities in action, nursing interventions, patient teaching, side effects, or adverse reactions and justifies categorizations. <ul style="list-style-type: none"> √ accurate classification √ support for classifications √ clear communication 3, 4. The student collects data from classmates and family members and distinguishes inheritance of traits based on phenotypic ratios. He/She describes/explains in an oral or written format why some traits are present in higher numbers than others or why the trait is in some family members but not others. The student looks for a trait (e.g., attached lobe, interlacing fingers, widow's peak), compares the actual ratio to the expected ratio, does a Punnett Square, and analyzes the results. Prior to this activity the student learns the proper vocabulary. <ul style="list-style-type: none"> √ understanding of vocabulary √ correct ratios √ identification of traits √ trait understudy is the result of dominant/recessive √ genes are segments of DNA √ analysis of results

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>4. Knows how genetic variability results from the recombination and mutation of genes, including (NM – II.II.II.5):</p> <ul style="list-style-type: none"> • sorting and recombination of genes in sexual reproduction results in a change in DNA that is passed on to offspring, and • radiation or chemical substances can cause mutations in cells, resulting in a permanent change in DNA. <p>5. Knows that DNA directs protein building (e.g., role of RNA) (NM – II.II.III.6).</p> <p>6. Describes the mechanisms for cellular processes (e.g., energy production and storage, transport of molecules, waste disposal, synthesis of new molecules) (NM – II.II.III.3).</p> <p>7. Describes how most cell functions involve chemical reactions, including (NM – II.II.III.7):</p> <ul style="list-style-type: none"> • promotion or inhibition of biochemical reactions by enzymes, • processes of respiration (e.g., energy production, ATP), and • communication from cell to cell by secretion of a variety of chemicals (e.g., hormones). 	<p>4. The student explains the action and how antineoplastics and antivirals affect the DNA of the cell.</p> <ul style="list-style-type: none"> √ comprehension √ effective communication <p>5 – 7. The student researches the cell given a specific organelle. When the research is completed, the student writes a paper based on his/her findings, makes a cell model, and presents orally to the class.</p> <ul style="list-style-type: none"> √ writing conventions √ effective writing elements √ accurate model √ organization √ research strategies √ key concepts √ effective presentation

STRAND IV: SCIENCE IN SOCIETY**CONTENT STANDARD:** The student understands how scientific discoveries, inventions, practices, and knowledge influence, and are influenced by, individuals and societies.**BENCHMARK:** The student examines and analyzes how scientific discoveries and their applications affect the world and explains how societies influence scientific investigations and applications.

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ol style="list-style-type: none"> 1. Knows how science enables technology but also constrains it, and recognizes the difference between real technology and science fiction (e.g., rockets vs. antigravity machines, nuclear reactors vs. perpetual-motion machines, medical X-rays vs. Star-Trek tricorders) (NM – III.I.I.1). 2. Understands how advances in technology enable further advances in science (e.g., microscopes and cellular structure, telescopes and understanding of the universe) (NM – III.I.I.2). 3. Evaluates the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects, and some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod) (NM – III.I.I.3). 4. Understands the scientific foundations of common technologies (e.g., kitchen appliances, radio, television, aircraft, rockets, computers, medical X-rays, selective breeding, fertilizers and pesticides, agricultural equipment) (NM – III.I.I.4). 	<ol style="list-style-type: none"> 1. The student uses his/her knowledge of the physiology of the human body to understand and explain how various pharmaceutical preparations work to correct or treat pathological conditions. <ul style="list-style-type: none"> √ understanding of how drugs work √ clear communication 2. The student learns about the various “generations” of antibiotics as science and technological advances produce more and stronger versions capable of treating ever increasing pathological conditions. He/She selects one technological advance that impresses him/her and shares the choice with the class along with his/her reason why that particular instance was chosen. <ul style="list-style-type: none"> √ understanding of technological impact on pharmacology √ rationale for choice √ effective communication 3. The student relates changes in patient care from historical perspectives (e.g., mustard plasters for “chest colds”) to current use of techniques of culture and sensitivity studies with selection of specific antibiotics to treat diseases such as pneumonia. <ul style="list-style-type: none"> √ historical perspective √ relevant examples √ effective communication 4, 7. The student reflects on his/her understanding of applicable scientific technologies after reviewing radiology findings (e.g., x-ray, CAT scan, MRI and laboratory results). He/She synthesizes the information with pharmacological approaches to treatment. The student also utilizes computer distribution systems (e.g., Pyxis, scanner devices) to administer medication. <ul style="list-style-type: none"> √ applications

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>5. Understands that applications of genetics can meet human needs and can create new problems (e.g., agriculture, medicine, cloning) (NM – III.I.I.5).</p> <p>6. Analyzes the impact of digital technologies on the availability, creation, and dissemination of information NM – III.I.I.6).</p> <p>7. Describes uses of radioactivity (e.g., nuclear power, nuclear medicine, radiometric dating) (NM – III.I.I.8).</p> <p>8. Describes major historical changes in scientific perspectives (e.g., atomic theory, germs, cosmology, relativity, plate tectonics, evolution) and the experimental observations that triggered them (NM – III.I.I.10).</p> <p>9. Identifies how science has produced knowledge that is relevant to individual health and material prosperity (NM – III.I.I.15).</p> <p>10. Understands that reasonable people may disagree about some issues that are of interest to both science and religion (e.g., the origin of life on Earth, the cause of the Big Bang, the future of Earth) (NM – III.I.I.16).</p>	<p>√ personal reflection √ connections</p> <p>5. The student recognizes “generations” of medications with advancing technology’s influence on detecting changing needs within the population and understands genetic engineering of various pathogens to improve usefulness. √ insights √ understanding of key concepts</p> <p>6. The student learns through on-the-job training and daily activities how computerized dispensing systems are able to track and record medication administration to all patients within health care systems, allowing caregivers to determine names, amounts, dosages and routes of medications the patient is taking. √ technology skills √ safety precautions √ accuracy √ conveyance of information to patients</p> <p>7. The student explains germ theory relative to pharmacologic preparations (e.g., antibiotics, antifungals, antivirals). √ historical background √ articulation of ideas</p> <p>8. The student discusses in small or large groups how technological advances have benefited patient care by decreasing hospital stays, decreasing costs of care, and decreasing co-morbidities associated with extended hospital stays. √ individual participation in discussions √ relevant information √ clear communication</p> <p>9. In the student’s daily activities and regimen, he/she cares for patients from a variety of backgrounds, cultures and religions in a non-judgmental way ensuring that each patient cohort receives the best possible care and optimal outcomes. √ quality care √ objectivity/open-mindedness</p>

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>11. Understands that scientists have characteristics in common with other individuals (e.g., employment and career needs, curiosity, desire to perform public service, greed, preconceptions and biases, temptation to be unethical, core values including honesty and openness) (NM – III.I.I.18).</p> <p>12. Knows that science plays a role in many different kinds of careers and activities (e.g., public service, volunteers, public office holders, researchers, teachers, doctors, nurses, technicians, farmers, ranchers) (NM – III.I.I.19).</p>	<p>11, 12. The student explores a variety of careers in the health care fields while participating in clinical rotations. He/She uses the practical nursing background as a “springboard” into other health care careers. Based on the “people skills” gained while participating in the nursing program, the student matures and performs functions far above those of his/her peers.</p> <ul style="list-style-type: none"> √ personal growth √ career skills development √ understanding of expectations

STRAND V: LITERACY**CONTENT STANDARD:** The student communicates nursing principles through multiple reading, writing, speaking, and research opportunities.**BENCHMARK:** The student demonstrates proficiency in critical thinking, reading comprehension, specialized vocabulary, and a variety of writing, speaking, and research opportunities.

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>The following performance standards are aligned with the Albuquerque Public Schools 12th grade Language Arts Standards.</p> <ol style="list-style-type: none"> 1. Demonstrates command of reading strategies across content areas (APS – LA I.1). 2. Evaluates the effectiveness of increasingly more sophisticated vocabulary in a variety of texts (APS – I.2). 3. Reads a wide variety of informational texts (APS – LA I.3). 4. Identifies and analyzes concepts in works as they relate to the reader (APS – LA II.5). 5. Demonstrates fluency in using the writing process to create a final product (APS – LA III.1). 6. Demonstrates fluency in using elements of effective writing (APS – LA III.2). 7. Demonstrates fluency in using a variety of technology (APS – LA III.3). 8. Demonstrates fluency in using writing conventions (APS – LA III.4). 	<p>1 – 4. Through the varied assignments the student completes throughout the program and in every strand, he/she proficiently uses drug guides, nursing care plan references, and medical-surgical textbooks to collect and synthesize relevant information to create or individualize care plans for specific patient populations. The basis for a good part of what the student learns in nursing is reading and analyzing and interpreting what is read.</p> <p>5 – 8, 10. Writing is another area where the student has multiple opportunities to demonstrate and further develop his/her skills. He/She:</p> <ul style="list-style-type: none"> • identifies various clinical conditions utilizing working knowledge of medical terminology with applicable prefixes, suffixes, • develops nursing care plans based on recognitions of expected sequela relative to medical-surgical and psychological conditions, • writes nursing care plans in draft form, critiques, corrects and re-writes in complete and finalized form for use in clinical setting when administering patient care, • teaches patients and peers verbally and in writing relevant information regarding pharmaceutical preparations, purposes, concerns, • answers questions posed by instructor regarding pharmaceutical preparations, and • uses Drug Guide, Drug Cards, CD ROM and online drug information (PIXIS based) to verify, validate and correlate

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>9. Demonstrates fluency with speaking strategies (APS – LA IV.1).</p> <p>10. Critiques text delivered electronically or visually (APS – LA V.1):</p> <ul style="list-style-type: none"> • determines the source(s) of the information, • appraises the accuracy, purpose, and value of the messages, and • selects information to incorporate, use, and convey ideas in new ways. <p>11. Uses a variety of sources to gather information (APS – LA VI.1).</p> <p>12. Continues to attribute sources of information in a variety of ways (APS – VI.3).</p> <p>13. Evaluates and defends research questions and topics (APS – LA VI.4).</p>	<p>pharmaceutical preparations to the patient’s medical and surgical patient care information.</p> <p>9. The student is engaged regularly in small and large group discussions. This is demonstrated in every stand in specific activities. See Strand III, the illustration for performance standards #3, #4 and Strand IV, the illustration for performance standard #9.</p> <p>11 – 13. The student meets theoretical objectives relative to pharmacology by doing class presentations on specific aspects of various pharmacological preparations, educating patients and families about prescribed and administered medications, and using references and patient data to develop informed opinions that guide patient care planning and outcomes. See also Strand III, the illustration for performance standards #5 and #7.</p>

STRAND VI: CAREER READINESS**CONTENT STANDARD:** The student prepares for entering the professional arena in a health-care setting.**BENCHMARKS:** A. The student explores the expectations, guidelines, and roles of a medical professional.

B. The student applies the principles of professional behavior in the health-care setting.

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ol style="list-style-type: none"> 1. Examines responsibilities, activities, and practices of a practical nurse (CR – 1B). 2. Develops short term and long term professional goals (CR – 2A). 3. Examines personal strengths and areas of professional growth (CR – 2B). 4. Demonstrates technological skills (CR – 3D). 5. Discusses positive behavior, conduct, and social manners within the school, workplace, and community (CR – 4A). 6. Integrates ability to work cooperatively to accomplish objectives (CR – 4B). 7. Examines appropriate and legal behaviors necessary to obtain and maintain employment (CR – 4C). 8. Investigates and analyzes safety standards related to the school, community, and workplace (CR – 4D). 9. Identifies and utilizes individual interests, aptitudes, and skills within the group to accomplish goals (CR – 5A). 10. Demonstrates ability to work with others from diverse backgrounds (CR – 5C). 11. Develops leadership skills within a group through effective communication, ability to motivate team members, and effective delegation of responsibility (CR – 5D). 	<p>1 – 13. The Level II student continues to build on basics skills and becomes more proficient in the care of the patient, working with peers, and begins to work more independently. The student needs less constant supervision. See Strand VI of Nursing I.</p>

GRADE 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>12. Applies critical thinking and problem-solving skills or identifies problems and uses critical thinking skills and team skills to solve problems (CR – 5E).</p> <p>13. Discusses the results of the process (CR – 5F).</p>	