STUDENT WORKBOOK

for

RADIOGRAPHY
IN THE DIGITAL AGE

Third Edition

Student Workbook for

RADIOGRAPHY IN THE DIGITAL AGE

By

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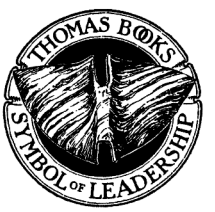

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INTRODUCTION

How to Use this Student Workbook

This **Student Workbook *for* Radiography in the Digital Age** is designed for use in the following typical radiography courses:

1. Physics of Radiography

   A. Radiation Production and Characteristics
   B. Imaging Equipment

2. Principles of Imaging

3. Digital Image Acquisition and Display

4. Radiation Biology and Protection

The **Workbook** is entirely organized in a "fill-in-the-blank" format. The wording of each question closely matches both the textbook and the lecture slide series for each course. This format is designed for *short-term* reinforcement of the student's retention of lecture and reading material by focusing on key words. The **Workbook** should therefore be used on a *daily basis,* not as a self-test or review after whole units have been covered. The following are specific recommendations on how the student can most fully benefit from the Workbook and other ancillaries:

1. IN-CLASS USE:

   This is the most recommended method, for use with the **Lecture Slides *for* Radiography in the Digital Age**. The sequence and wording of questions closely matches the slides. The questions have been kept short, with most blanks for filling in only with *key words* from the slide series. This is an effective "note-taking" tool that strikes a perfect balance between allowing the student to concentrate on the lecture by doing minimal writing, and still provoking the student to *participate* in classroom learning.

   Instructors may elect to require this type of classroom participation and award points for completing each unit.

   Some additional space at the bottom of each page is provided for any other notes the student might wish to take during lectures.

2. HOMEWORK USE:

   If the **Workbook** is used as a reinforcement tool for *homework,* it is strongly recommended that the student answer the corresponding questions after reading *each major section* of a chapter. To facilitate this, the major unit subheadings are included in the **Workbook**. Do not wait until completing the entire chapter, or you may have trouble recalling the **key words** that are elicited by each question.

3. UNIT REVIEW AND SELF-TESTING:

   For the purposes of review, self-testing or preparation immediately prior to a test, ***Chapter Review Questions*** are available at the end of each chapter in the textbook. Answer keys to these questions may be made available from your instructor. These are better suited for unit review than the workbook material.

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Chapter 1

AN INTRODUCTION TO RADIOGRAPHIC SCIENCE

The Scientific Approach

1. Fill in the terms for the following definitions:

_____: The attempt to simplify concepts and formulas, to economize explanations; the philosophy that simple explanations are more likely to be true than elaborate, complex ones.

_____: The requirement that proofs (experiments) can be duplicated by different people at different times and in different locations with precisely the same results.

_____: The requirement that any theory or hypothesis can logically and logistically be proven false. Anything that cannot be proven false is not science, but belongs in another realm of human experience.

_____: The requirement that experiments and their results can be directly observed with the human senses.

_____: The requirement that results can be quantified mathematically and measured.

Additional NOTES:

2. Perhaps the strongest aspect of the scientific method is that when it is used correctly, it is _____-_____.

3. Radiography is primarily a science because the radiographic image contains a _____ amount of diagnostically useful details, a _____ amount of information.

4. The standard of practice for all radiographers is to use good _____ _____, sound _____, logical _____ and objective _____ in providing the best possible care for their patients.

A Brief History of X-Rays

5. In 1895, Wilhelm Roentgen was one of several researchers studying _____-rays which streamed across their _____ tubes when electricity was applied.

6. Roentgen accidentally discovered x-rays on November ____, _____ in _____, Germany.

7. The following year, Becquerel discovered natural _____ which was later found to consist of 3 distinct types, _____ particles, _____ particles, and _____ rays.

The Development of Modern Imaging Technology

8. The first fluoroscope was invented by _____ _____.

9. Early fluoroscopes required high doses of radiation to patients, and were not substantially improved upon until 1948 when the _____ _____ was developed.

10. A dentist, William Rollins, developed both the first _____ and the first _____.

Additional NOTES:

11. The high-efficiency hot-filament x-ray tube was invented by _____.

12. American professor _____ sandwiched x-ray film between fluorescent intensifying screens (developed by Thomas Edison) to create the first x-ray cassette.

The Development of Modern Digital Imaging

13. The first digital imaging technology to be demonstrated, in 1979, was digital _____, using the TV camera signals from image intensifiers.

14. "PACS" stands for "_____ _____ and _____ system."

15. _____ was appropriately dubbed as "cassette-less radiography."

16. Compared to film-based radiography, the main advantage of all digital imaging systems is their capacity for _____-_____ of images, which spares repeated exposures to the patient.

Living with Radiation

17. Radiation can be broadly divided into three types:

    1. _____

    2. _____

    3. _____

18. One example of #1 above is _____

19. One example of #2 above is _____

20. One example of #3 above is _____

Additional NOTES:

21. To be particularly harmful, radiation must be capable of _____ atoms.

22. Nature accounts for about _____ of all radiation we receive.

23. Although radiography is defined as a safe profession, radiographers must use good common sense to protect themselves from accumulating unnecessary amounts of radiation and keeping both their own exposure and every patient's exposure *ALARA,* which stands for:

    _____.

Additional NOTES:

Chapter 2

BASIC PHYSICS FOR RADIOGRAPHY

The Base Quantities and Forces

1. The three standards for measurement are: Standard Unit:

    1. _____ : _____

    2. _____ : _____

    3. _____ : _____

2. The difference between mass and weight is that mass remains _____, regardless of its location..

3. An example of a derived unit is _____, defined as _____.

4. The four fundamental forces in the universe are:

    1. _____

    2. _____

    3. _____

    4. _____

Additional NOTES:

Unit Systems

5. One _____ has traditionallty been the standard tabletop distance for the center of the x-ray tube.

6. One _____ is about the width of your smallest fingernail.

7. One _____ is about the width (diameter) of a pinhead.

8. For length: 1 centimeter = _____ inches

   1 meter = _____ inches

   1 kilometer = _____ miles

9. For mass: 1 kilogram = _____ pounds

10. A special unit for measuring such extremely small lengths as x-rays have is the _____, abbreviated _____.

11. The angstrom is _____ meters, read as “one ten-_____ of a meter.”

12. In Table 2-1, the angstrom falls between _____ (billionths of a meter) and _____ (trillionths of a meter).

The Physics of Energy

13. Energy is the ability to do _____.

14. The generic unit for energy is the _____.

15. Within a closed system, energy is a _____ quantity, so the total energy contained must always be the same.

Additional NOTES: