COUNCIL FOR ACCREDITATION IN OCCUPATIONAL HEARING CONSERVATION

HEARING CONSERVATION CURRICULUM GUIDE©

This Curriculum Guide contains instructional support information for the **domains** and **tasks found in the Occupational Hearing Conservationist (OHC) Standardized Exam Blueprint**. It was designed to be used by Course Directors (CDs) to supplement their OHC course instruction for the standardized certification and recertification exams.

The Curriculum Guide was created by CAOHC's OHC Committee, a working group of active and highly experienced CDs. Although the working group did not have access to any of the OHC standardized exam contents, they did review the Job Task Analysis (JTA) and Exam Blueprint to provide CD' with both guidance and focus as they prepare learners for the standardized exams.

Information contained in this Curriculum Guide is not presented in the same sequence as the exam blueprint. It does, however, contain all of the domains and associated tasks. The CD should not feel limited by the information found in this Guide and is encouraged to supplement, rearrange, or emphasize his or her course lecture.

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CAOHC®
Council for Accreditation in Occupational Hearing Conservation

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Occupational Hearing Conservation

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Domain 1: Hearing Conservation (overall)

TASKS	SUGGESTED REVIEW INFORMATION
1a. Learner understands the mission of CAOHC and its significance to the roles of an Occupational Hearing Conservationist (OHC), Course Director (CD) and Professional Supervisor of the Audiometric Monitoring Program (PS)	Explain that the mission of the Council for Accreditation in Occupational Hearing Conservation is to promote hearing loss prevention by enhancing the quality of occupational hearing loss prevention practices, with focus on: • Primary activity: — Provide the Occupational Hearing Conservationist **(OHCs)** with the resources and guidance to facilitate the practice of hearing loss prevention through standardized training and credentialing. • Secondary activities: — Provide the Course Director **(CD)** with adult education training resources, curriculum oversight, and professional support to assist in assuring the competence of **OHCs**. — Provide the Professional Supervisor of the Audiometric Monitoring Program **(PS)** with training, credentialing and professional support to assist in the supervision of **OHC** and other responsibilities under regulatory requirements. — Increase quality and consistency among hearing loss prevention programs. **Chap. 1 Occupational Hearing Conservation Team** **Chap. 11 The Audiometric Monitoring Program** **Chap. 12 The "Problem Audiogram" the Occupational Hearing Conservationist and the Professional Supervisor**
1b. Learner understands the relationship between **Hearing Conservation Program (HCP)** regulations and compliance to best practices	Explain the difference between the requirements of the **Occupational Safety and Health Administration (OSHA)** and the recommendations of the **National Institute of Occupational Safety and Health (NIOSH)**. In addition, raise awareness of the variety of hearing conservation regulations the **OHC** may encounter and guidance as to where to find the specifics. For example: • Company/facility hearing conservation rules • Individual state hearing conservation requirements • Mine Safety and Health Administration (MSHA) regulations • Federal Railroad Administration (FRA) regulations • Department of Defense (DoD) and service branch specific Hearing Conservation Instructions **Chap. 7 Standards and Regulations** **Chap. 16 Recordkeeping and Program Evaluation**

Domain 1: Hearing Conservation (overall) • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
1c. Learner understands the elements of an effective Hearing Conservation Program (HCP).	Review the major elements of the HCP: • Record of occupational noise exposure • Noise control • Audiometric monitoring • Hearing protection principles and devices (HPDs) • Hearing protection types and uses • Hearing protection fitting • Worker education, training, and motivation • Recordkeeping • Program evaluation **Chap. 3 The Hearing Conservation Program** **Chap. 9 Planning the Audiometric Monitoring Program** **Appendix C in CAOHC Manual: OSHA 29 CRF 1910.95**
1d. Learner understands the effects of noise.	Explain auditory and non-auditory effects of noise, including damage risk criteria: • Hearing loss • Tinnitus and hyperacusis • Communication interference • Effects on job performance • Temporary Threshold Shift (TTS) • Non-auditory effects (hypertension) **Chap. 2 The Effects of Noise and the Conservation of Hearing**
1e. Learner identifies potential sources of hazardous noise in both occupational and nonoccupational work settings.	Identify common noise exposures that are considered harmful when shouting is required at a distance of 3 ft or less from the source of the exposure: • Occupational — Industrial machinery, construction equipment, railroad cars and equipment, mining equipment, explosives, farming equipment, instruments in an orchestra or band • Non-occupational — Motorcycles, sporting guns, carpentry and lawn equipment, personal listening devices (eg, MP3, iPod) **Chap. 6 Introduction to Sound** **Chap. 8 Noise Measurement and Control**

Domain 1: Hearing Conservation (overall) • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
1f. Learner understands the impact of hearing loss, tinnitus and associated disorders on quality of life, along with the social and psychological consequences.	Explain the impact of the lasting effects of **noise induced hearing loss (NIHL)**: • Hearing loss (high-frequency) • Tinnitus • Difficulty communicating (especially in background noise) • Social withdrawal, frustration, anger • Effects on private life **Chap. 2 The Effects of Noise and the Conservation of Hearing**
1g. Learner will identify the professional disciplines and their roles in hearing conservation programs (HCPs).	Explain the roles of each member of an HCP team (including but not limited to): • OHC • Audiologist • Occupational Health Nurse • Otolaryngologist, Physician • Safety Engineer • Noise or Acoustical Engineer • Industrial Hygienist • Company management (Owners, HR department, Supervisors) **Chap. 1 Occupational Hearing Conservation Team, Worker**

Domain 1: Hearing Conservation (overall) • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
1h. Learner understands the historical background of hearing conservation and the role of CAOHC in establishing best practices	Review HCPs from a historical perspective and how CAOHC's Component Professional Organizations (CPOs) interact in that context: Scope of the problem: • Highly industrialized society; 22 million plus workers exposed to hazardous noise on the job — Sociological and economic impact to Noise Induced Hearing Loss (NIHL) — Standardized approach needed to develop, teach, and promote best practices in occupational hearing conservation • Prevention of NIHL involves a variety of professional disciplines. CAOHC's approach to addressing NIHL: • CAOHC formed over 40 years ago with a principal focus to train and credential OHCs and to collaborate with organizations that have a common interest in all aspects of occupationally-related NIHL. — The role of the Council is to create comprehensive programs that promote best practices in occupational hearing conservation. Two representatives from each of these organizations form the Council. ▪ American Academy of Audiology ▪ American Academy of Otolaryngology-Head and Neck Surgery ▪ American Association of Occupational Health Nurses ▪ American College of Occupational and Environmental Medicine ▪ American Industrial Hygiene Association ▪ American Society of Safety Engineers ▪ American Speech-Language-Hearing Association ▪ Institute of Noise Control Engineering ▪ Military Audiology Association — Further information on the formation of this organization can be found within the history section of the CAOHC website (www.caohc.org/about-caohc/history). • Educational programs were established to prepare individuals to carry out the various HCP roles — Curriculum and standards for the Course Director (CD) — Curriculum and standards for the OHC — Curriculum and standards for the PS of the Audiometric Monitoring Program **Chap. 1 Occupational Hearing Conservation Team**

Domain 1: Hearing Conservation (overall) • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
1i. Learner can estimate the prevalence of NIHL in different populations	Review the populations most at risk for NIHL: • Manufacturing accounts for approximately 14% of U.S. workforce but accounts for approximately 80% of incidence of NIHL. The National Occupational Research Agenda (NORA) specifically cites the following industries: — Beverage and tobacco — Food, wood products — Primary metals — Fabricated metal products — Transportation equipment — Furniture — Chemical manufacturers • Mining has the highest prevalence of hazardous noise exposure of any major industry sector. Mining is second only to the railroad industry in the prevalence of workers reporting hearing difficulty. (http://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/hlitmi.pdf) • Military veterans are 30% more likely to have hearing loss than non-veterans • The rate of hearing loss growth is greatest during the first 10 years of exposure. • The majority of sensorineural hearing loss can be attributed to hazardous noise exposure **Chap. 2 The Effects of Noise and the Conservation of Hearing**

Domain 2: Anatomy, Physiology and Diseases of the Ear	
TASKS	SUGGESTED REVIEW INFORMATION
2a. Learner can identify the major parts of the ear and describe their function	Explain the functions of the major parts of the ear: • **Outer**—Collects sound waves, allows for localization of sound waves, protects middle ear components and provides resonant amplification. Outer ear includes the pinna/auricle and the external auditory ear canal/meatus. • **Middle**—Acoustic transformer and impedance matching system, provides pressure equalization and protects the inner ear. Learners should be familiar with the terms tympanic cavity, hammer/malleus, anvil/incus, stirrup/stapes, and Eustachian tube. • **Inner**—Provides intensity, frequency and temporal coding that is relayed via the auditory nerve for further processing. Inner ear includes the cochlea, perilymph, endolymph, stereocilia, and hair cells. Damage to the ear from noise exposure most often occurs in the cochlea. **Chap. 4 Anatomy and Physiology of the Human Ear**

Domain 2: Anatomy, Physiology and Diseases of the Ear • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
2b. Learner understands the relationship between tinnitus and noise-induced hearing loss (NIHL).	Identify ringing or buzzing in the ear (tinnitus) as a common warning sign of over-exposure to hazardous noise which may be noticeable immediately after removal of the noise source. Effects of tinnitus maybe constant or intermittent. Primary side effects of tinnitus may include sleep deprivation, possible concentration issues, anxiety, depression and social withdrawal. A major percentage of the workforce is affected by tinnitus. **Chap. 2 The Effects of Noise and the Conservation of Hearing** **Chap. 5 Causes and Management of Hearing Disorders**
2c. Learner will differentiate between a normal audiogram and an audiogram configuration which is typical of NIHL.	Explain the pattern of audiograms for various types of hearing loss (note that the type of hearing loss cannot be determined by just an air conduction audiogram alone) and relate these audiograms to corresponding diseases/ disorders of the ear. The most typical audiometric configuration associated with NIHL • Sensorineural hearing loss • Temporary Threshold Shift – Dullness in hearing, temporary hearing loss, and possible tinnitus. • Early stage – Identifiable notch at 3-6 kHz. • Advanced stage – Notched configuration progressing to a high-frequency sloping hearing loss involving additional frequencies. • Classification of hearing in terms of degree of loss: — Normal (0-25 dB) — Mild (26-40 dB) — Moderate (41-55 dB) — Moderately severe (56-70 dB) — Severe (71-90 dB) — Profound (91 dB or more) • Conductive loss is generally flat and often worse at low frequencies. • Presbycusic loss is gradually sloping and worse in the high frequencies. **Chap. 10 Understanding Audiograms** **Chap. 12 The "Problem Audiogram," the Occupational Hearing Conservationist and the Professional Supervisor**
2d. Learner will identify the typical symptoms associated with various types of hearing loss.	Explain the symptoms of the different types of hearing loss: — **Conductive** – fullness, pressure, muffled hearing and clarity when sound is loud enough — **Sensorineural** – difficulty discriminating speech (especially in background noise) or tinnitus — **Mixed** – combination of conductive and sensorineural components **Chap. 5 Causes and Management of Hearing Disorders**

Domain 2: Anatomy, Physiology and Diseases of the Ear • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
2e. Learner understands medical conditions that can cause hearing loss.	Explain common medical causes of hearing loss and review examples: • **Outer** – wax impaction, collapsed canal and foreign body, external otitis • **Middle** – ear infection, Eustachian tube dysfunction, otosclerosis, etc. • **Eighth Cranial Nerve/Central** – acoustic neuroma, tramatic brain injury (TBI) **Chap. 5 Causes and Management of Hearing Disorders**
2f. Learner can identify other disorders of the ear and the associated types of hearing loss (i.e. mixed conductive and sensory).	Discuss the typical disorders and their site of lesion (in contrast to NIHL) and discuss loss of peripheral vs central functions: • **Located in the outer and/or middle ear** – conductive hearing loss • **Located in the inner ear** – sensorineural hearing loss — Cochlea - sensory hearing loss (most common type of hearing loss caused by hazardous noise exposure) — Eighth Cranial Nerve – neural hearing loss • **Located in the Auditory Cortex** – central hearing loss **Chap. 5 Causes and Management of Hearing Disorders** **Chap. 10 Understanding Audiograms**
2g. Learner understands other types of audiogram configurations.	Identify and explain common audiogram configurations, serial vs. graphic audiograms and the associated types of hearing loss associated with each (conductive, sensorineural, mixed). **Chap. 10 Understanding Audiograms**

Domain 3: Hearing and the Physics of Sound and Performing and Explaining a Hearing Test	
TASKS	SUGGESTED REVIEW INFORMATION
3a. Learner understands the definition of frequency (Hz)/pitch and its relationship to noise measurement and hearing threshold data.	Explain, in depth, the concepts associated with **frequency (Hz)** and its subjective interpretation as **pitch.** Also explain how frequency relates to noise measurement, hearing and the audiogram: • **Audible frequency range of human hearing** – 20-20,000 Hz • **Low/high frequency Hz** – subjectively interpreted as Low/High pitch • **Audiometric monitoring frequencies:** — Required – 500-6,000 Hz (FRA requires 8,000 Hz) — Recommended – 500-8,000 Hz • **Speech range** (for most communication) – 250-4,000 Hz • **Noise-induced hearing loss** (earliest affected frequencies) – 3,000-6,000 Hz **Chap. 6 Introduction to Sound** **Chap. 10 Understanding Audiograms**

Domain 3: Hearing and the Physics of Sound and Performing and Explaining a Hearing Test • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
3b. Learner understands the definition of intensity (dB)/ loudness and its relationship to noise measurement and hearing threshold data.	Explain, in depth, the concepts associated with **amplitude (dB) hearing level (HL)** and its subjective interpretation as **loudness**. Explain how amplitude relates to noise measurement and the audiogram: • **Low/high intensity (dB)** – subjectively interpreted as low/high loudness — *(intensity corresponds to loudness)* • **Action level (AL)* – 85 dB(A) Time weighted average (TWA)** (=50% dose) • **Permissible Exposure Level (PEL)* – 90 dB(A) TWA** (=100% dose) * as required by regulatory agencies **Chap. 6 Introduction to Sound** **Chap. 7 Standards and Regulations** **Chap. 10 Understanding Audiograms**
3c. Learner understands sound by its temporal characteristics (intermittent, steady state, impulse/impact).	Explain the basic concepts of noise and how they are used in OSHA regulations: • **Steady state** – Long duration (> .5 second) *(e.g., engine noise)* — Generally measured in dB(A) — Maximum allowed by OSHA is 115 dB(A) • **Intermittent** – Noise that comes and goes and is sometimes cyclical *(e.g., vehicle warning backup noise or hydraulic lift)* • **Impact** *(e.g., hammer to nail)*/**Impulse** *(e.g., gunshot)* — Short duration (< 1 second) — Not measured using a weighted sound pressure scale ▪ Measured using sound pressure level dB(P) — Maximum allowed by OSHA 140 SPL dB(P) • **Pure tone vs complex signals** **Chap. 6 Introduction to Sound** **Chap. 7 Standards and Regulations**
3d. Learner understands sound weighting scales and how they apply to a hearing conservation program (HCP).	Explain the various weighting scales and their uses in a HCP: • **dB(A)** – used for measuring human exposures to noise for the purpose of achieving regulatory compliance in hearing conservation (OSHA, MSHA, FRA, DoD) • **dB(C)** – used for determinations of Noise-Reduction Rating (NRR); is more linear over the frequency range • **Linear** – dB SPL, no weighting applied, (*e.g., Impact/Impulse)* **Chap. 3 The Hearing Conservation Program** **Chap. 6 Introduction to Sound** **Chap. 7 Standards and Regulations**

Domain 3: Hearing and the Physics of Sound and Performing and Explaining a Hearing Test • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
3e. Learner understands and can explain thresholds and how they apply to an HCP.	Explain, in depth, the concepts associated with **amplitude (dB) hearing level (HL)** and the subjective interpretation of **loudness**, the basic physics of sound and how sound relates to hearing, the audiogram and audiometric equipment: • **0 dB HL** – HL scale constructed to represent the average softest sound a young adult can hear at each test frequency. — 0 dB HL does *not* mean there is no sound present at that level • **0-25 dB HL** – "normal" hearing range • **90 dB HL** – typically the highest output level on a pure-tone air-conduction screening audiometer. **Chap. 6 Introduction to Sound** **Chap. 10 Understanding Audiograms**

DOMAIN 4: Federal and State Regulations Related to Occupational Noise-Induced Hearing Loss	
TASKS	SUGGESTED REVIEW INFORMATION
4a. Learner understands federal hearing conservation regulations, (i.e., OSHA, MSHA, FRA, and DoD) and can describe how they differ in application.	Explain that there are multiple regulations related to hearing conservation and that the OSHA Hearing Conservation Amendment (29 CFR 1910.95, c-p) serves as the basis for all other U.S. hearing conservation regulations and thus is the basis of the OHC course instruction: • Within their own job responsibilities, learners should understand that they must be familiar with the federal, state and other applicable regulations that pertain to their worker's jurisdiction (e.g., record retention, allowance for aging, etc.). Note: The CD does not need to review or compare the various regulatory differences for examination purposes. **Chap. 7 Standards and Regulations**
4b. Learner understands how state and local regulations apply in contrast to the federal regulations.	Familiarize learners with U.S. hearing conservation regulations and the recommendations table in the Hearing Conservation Manual 5th Edition: • Explain the differences between regulatory bodies (federal, state and local). — State and local requirements must meet or exceed federally mandated Hearing Conservation (HC) requirements — OHCs/employers must follow the more stringent requirements • Explain the differences between regulatory minimum requirements for compliance and recommended (best) practices. **Chap. 1 Occupational Hearing Conservation Team** **Chap. 7 Standards and Regulations** **Chap. 16 Recordkeeping and Program Evaluation**

DOMAIN 5: Audiometer and Testing Environment	
TASKS	SUGGESTED REVIEW INFORMATION
5a. Learner understands when use of manual audiometry testing is needed.	Explain how to recognize and when to employ manual audiometry: • Slow/inappropriate responses • No response — Holding down hand switch — Guessing — Inconsistent response • Unilateral hearing loss • Functional hearing loss **Chap. 9 Planning the Audiometric Monitoring Program** **Chap. 10 Understanding Audiograms** **Chap. 11 The Audiometric Monitoring Program**
5b. Learner can identify the parts and functions of the different settings on audiometers. (manual, microprocessor and computer controlled).	Explain and display the major components associated with the basic pure tone air conduction audiometer. Additionally, learners will review, practice using and verify the functionality of the following audiometer components during the audiometric practicum: • Power switch • Audiometer display • Stimulus switch • Pulsed/continuous switch • Frequency control • Attenuator control • Left/right switch • Earphone assembly • All connection jacks and cables **Chap. 9 Planning the Audiometric Monitoring Program**
5c. Learner understands the process of performing pure tone air conduction threshold hearing testing.	Explain and demonstrate the procedures associated with pure tone air conduction audiometric testing per ANSI S3.21. Recognize that the main purpose of monitoring audiometry in a HCP is to identify threshold shifts due to noise exposure and to recognize when to use manual audiometry. Additionally, learners will practice and then demonstrate their proficiency with audiometric testing during the audiometric practicum: • Threshold testing procedure — Test instructions — Earphone placement — Required test frequencies — Presentation levels — Appropriate response recognition — Recording responses ▪ The lower the threshold level the better the hearing **Chap. 11 The Audiometric Monitoring Program**

DOMAIN 5: Audiometer and Testing Environment • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
5d. Learner understands the variables that affect the reliability and validity of the audiometric monitoring exam.	Explain and emphasize the circumstances that interfere with valid audiometric monitoring: • Background noise • Testing environment (e.g., ventilation, lighting, seating, etc.) • Pre-testing noise exposure (time away from noise) — Baseline: 14 or more hours (required) — Annual: No restrictions — Standard Threshold Shift (STS) retest ▪ 14 or more hours (OHSA recommended/DoD required) • Response instructions — Language challenges — Clarity/completeness • Earphone placement • Medical issues — Active allergies — Medications (e.g., ototoxic drugs) — Tinnitus • Otoscopic findings (notification of clear or not clear ear canals) — Impacted cerumen or other abnormalities — Collapsed ear canals • Equipment — Flattened earphone cushions — Inappropriate headband pressure • Worker Focus — Fatigue — Medications — Anxiety — Claustrophobia • Tester Focus (OHC) **Chap. 10 Understanding Audiograms** **Chap. 11 The Audiometric Monitoring Program**

DOMAIN 5: Audiometer and Testing Environment • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
5e. Learner understands the steps necessary to troubleshoot equipment malfunction.	Explain and demonstrate how to conduct a functional check: • Examine audiometer components — Is power present to the audiometer? — Is tone audible? ▪ In the ear selected? ▪ No crosstalk at high intensity. — Is there static or a 60 cycle hum? — Is response switch functioning normally? — Are patch cords fully/firmly seated? — Are earphones properly functioning? ▪ Cords connected to appropriate jacks? • Examine the testing environment — Is ambient noise appropriate for testing? — Is power present to the testing environment? — Is the testing area free from visual distractions? ▪ Audiometer controls visible to test subject? ▪ Is tone presentation by technician inappropriately visible to test subject? ▪ Appropriate material? ▪ Worker traffic? — Is the ventilation fan and lighting functioning properly? — Are the door gaskets sealed properly? — Are the patch cords and jacks fully/firmly seated? • Verify that all calibrations have been successfully completed. **Chap. 9 Planning the Audiometric Monitoring Program**
5f. Learner understands audiometer calibration requirements.	Explain and demonstrate: • Daily calibration check — Functional listening check — Biological check (biological simulator or human listener) • Acoustic calibration (1910.95 Appendix E) — Yearly • Exhaustive calibration — Every two years — Required whenever audiometer fails acoustic calibration • When calibrations are required and the pass/fail criteria for each methodology **Chap. 7 Standards and Regulations**

DOMAIN 5: Audiometer and Testing Environment • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
5g. Learner understands and can perform a Daily Biological Calibration (functional check/ listening check) for an audiometer.	Explain, identify the differences between, and the requirements for functional and biological checks as referenced in OSHA (1910.95 h (5)(i)): • Functional Check (refer to list in Task 5e) • Biological Check — Conduct a hearing test on a bio-acoustic simulator or a human listener with known stable thresholds ▪ Test all required frequencies. ▪ Check for deviations that may require an acoustic or exhaustive calibration. – Understands the required schedule for acoustic and exhaustive calibrations. ▪ Acoustic calibration occurs yearly. ▪ Exhaustive calibration occurs every two years. — Understand that if an audiometer does not pass the daily inspection, the OHC should arrange for professional acoustic calibration of the audiometer. • Use the proper hygiene procedures for cushion covers, ear phone cushion cleaning. **Chap. 9 Planning the Audiometric Monitoring Program** **Chap. 11 The Audiometric Monitoring Program**

DOMAIN 5: Audiometer and Testing Environment • *continued*

TASKS	SUGGESTED REVIEW INFORMATION

5h. Learner understands the advantages and disadvantages of using a microprocessor versus a manual audiometer.

	Microprocessor/Computer	Manual
Testing method	Technician independent	Technician dependent
Threshold determination	Consistent	Dependent upon tester
Data transcription	• Input required initially • Minimal errors after successful transcription	• Required at every visit • Subject to numerous errors
Instructions	Available in different languages	Limited to technician translation ability
Instructions	Consistent	Dependent upon tester
Test/retest reliability	Dependent upon initial input/setup	Dependent upon input during each test
Testing capability	Individual or multiple at one time	Limited to one at a time
Standard Threshold Shift (STS) notification	• Computing STS—automatic • Generating STS notice can be automatic	• Calculation of STS—manual • STS notification must be manually generated
Other functions	Multiple options available to tester (e.g., testing set up, training information, scheduling, notifications)	NA
Specific programming criteria	Limited to manufacturer specifications/features and specific codes unique to the manufacturer	NA
Manual testing	Requires switching audiometer from "automatic" to "manual mode" • Potential challenges for untrained tester	NA
Daily calibrations	Automatically conducts internal system checks, however manual verification for daily functional check is required.	All calibration checks must be done manually

Chap. 9 Planning the Audiometric Monitoring Program
Chap. 11 The Audiometric Monitoring Program

DOMAIN 5: Audiometer and Testing Environment • *continued*

TASKS	SUGGESTED REVIEW INFORMATION
5i. Learner can identify the appropriate ambient noise standards for the testing environment.	Familiarize learners with SPL octave band level limits to be OSHA compliant: (29 CFR 1910.95 App D) versus the best practice (ANSI S3.1) SPL octave band levels.

Octave-band center freq.	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
OSHA Table D-1			40 dB	40 dB	47 dB	57 dB	62 dB
ANSI S3.1	49 dB	35 dB	21 dB	26 dB	34 dB	37 dB	37 dB

- Identify the instrumentation necessary to evaluate ambient noise level
  - — Octave band sound level meter
- Identify obvious problems; unexplained elevation of low frequency hearing thresholds (500 Hz)
- Discuss obvious trouble-shooting items
  - — Door seal (missing, loose, worn)
  - — Ventilation fan (faulty bearings)
  - — Light fixture ballast (buzz or hum)
  - — Changing ambient noise levels (eg, waiting room, outside vehicle traffic)

Chap. 8 Noise Measurement and Control
Chap. 11 The Audiometric Monitoring Program

DOMAIN 6: Audiometric Techniques & Audiometric Testing

TASKS	SUGGESTED REVIEW INFORMATION
6a. Learner understands the audiogram in terms of frequency/pitch (Hz); intensity/loudness (dB) and configuration.	Explain the various forms in which audiometric data can be displayed (i.e., frequency, intensity and configuration): • How audiometric data is displayed — Graphic audiogram (symbols and lines) — Serial audiogram (numbers) • Definition of frequency and intensity • Distinction between hearing threshold level (HTL/HL) and sound pressure level (SPL) **Chap. 6 Introduction to Sound** **Chap. 10 Understanding Audiograms**

DOMAIN 6: Audiometric Techniques & Audiometric Testing • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
6b. Learner understands the challenges associated with audiometric monitoring and the procedures for overcoming those challenges	Explain the challenges of audiometric monitoring and how to overcome them: • Instructions and language issues • Time frame for completing baseline periodic and termination audiograms • Hearing aids and glasses • Anatomical issues and fashion (jewelry, head covering, wigs, multiple ear piercings) • Quiet period before baseline testing **Chap. 9 Planning the Audiometric Monitoring Program** **Chap. 11 The Audiometric Monitoring Program** **Chap. 12 The "Problem Audiogram," the Occupational Hearing Conservationist and the Professional Supervisor**
6c. Learner identifies the components and understands the importance of an aural history	Discuss the aural case history and its components: • Explain that the purpose of the aural history (including any significant head injuries/traumatic brain injury (TBI)) is to help the OHC in performing the test and the professional supervisor in deciding if follow-up is necessary. • Secure the appropriate information from the person being tested understanding the Genetic Information Nondiscrimination Act (GINA) restrictions. — Workplace noise exposure — Exposure to ototoxins — History of ear disease or significant medical issues, including treatment — History of prior or current military noise exposures (including National Guard and Reserves) • History of recreational noise exposures • History of active and prior medications • History of hearing protection use • Family history of hearing loss (GINA-restricted question) **Chap. 11 The Audiometric Monitoring Program** **Chap. 12 The "Problem Audiogram," the Occupational Hearing Conservationist and the Professional Supervisor**
6d. Learner understands the benefit and importance of performing an otoscopic screening.	Discuss rationale for and demonstrate proper techniques for otoscopy and discuss possible findings: Rationale: • To visualize the size and shape of the ear canal for earplug fitting • To visually examine the ear for obstruction • Identify contraindications for performing audiometric tests • Documentation of occluding or non-occluding (+/-) foreign bodies Technique • Selection of proper size specula • Careful insertion (hand braced against head) • Visualize tympanic membrane **Chap. 5 Causes and Management of Hearing Disorders** **Chap. 11 The Audiometric Monitoring Program**

DOMAIN 7: Audiometric Review & Evaluation	
TASKS	SUGGESTED REVIEW INFORMATION
7a. Learner understands the limitations of the OHC as they relate to the review referral and counseling process.	A complete list of OHC roles and responsibilities can be found on the CAOHC website. Specific to review, referral and counseling, OHC certification has limitations. Certification and training does not prepare individuals (unless a licensed audiologist, physician or otolaryngologist) to: • Assume the role of a Professional Supervisor of the Audiometric Monitoring Program (PS). • Assume the role of an instructor or other non-certified medical personnel. • Interpret audiograms • Diagnose hearing disorders • Independently evaluate HCP effectiveness **Chap. 1 Occupational Hearing Conservation Team** **Appendix A OHC Scope of Practice** **CAOHC Website: Occupational Hearing Conservationist Scope of Practice**
7b. Learner will identify problem audiograms for PS review.	Explain how to identify problem audiograms: • Reference and understand PS referral/sorting criteria (relationship and communication with PS) • Provide examples of various audiometric configurations that would normally require referral to a PS: — Conductive — Asymmetrical — Functional/exaggerated — Sudden • Understands the procedure for initiating PS follow-up **Chap. 9 Planning the Audiometric Monitoring Program** **Chap. 10 Understanding Audiograms** **Chap. 12 The "Problem Audiogram," the Occupational Hearing Conservationist and the Professional Supervisor**
7c. Learners will calculate a standard threshold shift (STS) with and without using age correction.	Demonstrate how to calculate Standard Threshold Shift (STS) • Demonstrate how to find age correction tables in 29 CFR and apply age corrections. • Discuss ramification of applying age correction. • Identify recordability/reportability criteria by agency (OSHA, MSHA, FRA). • Discuss why age adjustments are not recommended by NIOSH nor permitted by Department of Defense (DoD). **Chap. 12 The "Problem Audiogram," the Occupational Hearing Conservationist and the Professional Supervisor**

DOMAIN 8: Noise Measurement and Control	
TASKS	SUGGESTED REVIEW INFORMATION
8a. Learner understands the importance of Action Levels (AL) and Permissible Exposure Limits (PEL).	Explain that regulations vary by jurisdiction. The following apply specifically to the basic OSHA, MSHA and FRA regulations. **Learners must understand which regulations apply to their specific worker population (federal, state and local).** Explain Action Level (AL) – OSHA 29 CFR 1910.95(c) • The level, 85 dB(A) TWA, which requires HCP implementation — Program inclusion — Hearing testing — HPD must be made available Explain Permissible Exposure Level (PEL) – OSHA 29 CFR 1910.95(b)(2), Table G-16 • The level, 90 dB(A) TWA, which requires additional HCP measures — Consideration of feasible engineering controls — Consideration of administrative controls — Mandatory HCP use — Explain exchange rate (or doubling rate): ▪ The increase or decrease in decibels (dB) corresponding to twice (or half) the noise dose. The OSHA, MSHA and FRA exchange rate is 5 dB. Exchange rate for NIOSH and DoD is 3 dB. **Chap. 5 Causes and Management of Hearing Disorders** **Chap. 7 Standards and Regulations**

DOMAIN 8: Noise Measurement and Control • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
8b. Learner understands the purpose of noise-measurement and control strategies related to the overall HCP.	Introduce and discuss noise measurement and control strategies: Explain the purpose of noise measurement (OSHA 29 CFR 1910.95(d)(1)(i)) • Identify employees for inclusion in the HCP • Enable selection of proper hearing protection Explain noise control strategies (OSHA 29 CFR 1910.95(b)) Noise control strategies can be implemented at the source, in the pathway of sound or at the receiver. • **Administrative controls** (changes in the workplace or schedule that reduce or eliminate the worker exposure to noise) Examples include: — Operating noisy machines during shifts when fewer workers are exposed — Limiting the amount of time a worker spends at a noise source — Providing quiet areas where workers can gain relief from hazardous noise sources — Controlling noise exposure through distance • **Engineering controls** (modifying or replacing equipment, or making related physical changes at the noise source or along the transmission path to reduce the noise level at the worker's ear) Examples include: — Changing to lower-noise tools and machinery — Maintaining/lubricating machinery and equipment — Erecting barriers between noise source and worker — Enclosing or isolating the noise source **Chap. 8 Noise Measurement and Control**

DOMAIN 8: Noise Measurement and Control • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
8c. Learner understands the types of instrumentation used to measure noise and the circumstances in which they would be used.	Identify and discuss (and if possible, demonstrate) the types of instruments used for noise measurement (OSHA 29 CFR 1910.95, Appendix A) • Sound level meter (SLM) — Type I (precision) — Type II (general purpose) • Noise dosimeters Introduce terms associated with instrumentation used for noise measurement and when used • Weighting networks (Octave Bands) — dB(A) ▪ Predominantly for HCP and conducting workplace noise surveys — dB(C) ▪ Determining low frequency exposure ▪ Computing NRR — Octave bands (e.g., full, 1/3 octave) ▪ Evaluate audiometric test room ambient noise levels ▪ Engineering considerations • Types of noise — Continuous — Intermittent/periodic — Impulse/impact • Methods of analysis — Real-time spectrum ▪ Snap-shot — Data-logging ▪ Recording over period of time — Integrating ▪ Incorporating multiple spectrum and intensity levels **Chap. 8 Noise Measurement and Control**

DOMAIN 8: Noise Measurement and Control • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
8d. Learner understands the meaning and importance of time weighted average (TWA).	• Meaning — TWA is the average noise-exposure level for an 8-hour workday, calculated by measuring the noise levels and time spent at each noise level to derive a single exposure value. • Importance — Identifies the level where noise exposure becomes a potential risk. • Associated concepts: — Exchange rates ▪ 5 dB, per OSHA regulation vs 3 dB, per NIOSH recommendation • PEL and AL (see Task 8a.) • Damage risk criteria (DRC) **Chap. 6 Introduction to Sound** **Chap. 8 Noise Measurement and Control**

DOMAIN 9: Hearing Protection Device Fitting	
TASKS	SUGGESTED REVIEW INFORMATION
9a. Learner understands and can explain the rationale for using hearing protection.	Explain why hearing protection is used: • Reduces noise at ear level • Reduces risk of NIHL when used properly • Reduce exposure levels when engineering controls fail **Chap. 13 Hearing Protection Devices** **Chap. 14 Use and Care of Hearing Protection Devices**
9b. Learner understands the NRR and its relationship to actual attenuation.	Explain the concept of NRR: NRR is a laboratory value assigned to the individual product and is not a reflection of what kind of attenuation the worker will ultimately receive Review • Distinction between laboratory vs field measurements of HPD performance — NRR vs Personal Attenuation Rating (PAR) • Field use of NRR • Characteristics that affect attenuation • Derating methods — OHSA — NIOSH • Double HPD computation — 5 dB more than the better NRR **Chap. 13 Hearing Protection Devices**

DOMAIN 9: Hearing Protection Device Fitting • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
9c. Learner understands the proper selection of a variety of hearing protection devices (HPDs).	Explain the different types and selection criteria for types of HPD: • Types of HPD — Disposable/hand-formed earplugs — Premolded/reusable earplugs — Canal caps/banded earplugs — Earmuffs ▪ Passive or active ▪ Ease of use — Electronic communication devices • Selection criteria — Comfort — Attenuation requirements ▪ Under protection ▪ Over protection — Compatibility with other personal protection equipment (PPE) — Ease of use, *less or more dependent on user training* — Sufficient variety — Effect of environment on PPE ▪ Temperature ▪ Radio frequencies ▪ Chemicals, solvents, particles, etc. • Communication needs **Chap. 13 Hearing Protection Devices**

DOMAIN 9: Hearing Protection Device Fitting • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
9d. Learner understands the importance of proper fitting techniques for HPDs.	Explain and provide an overview of fitting and training procedures for HPDs: Note: Always consider individual preferences: comfort, required noise reduction, individual's familiarity, and communication requirements. Earplugs: • Overview of fitting: — Otoscopic exam (to rule out obstructions) — Ear canal size estimate • Training procedures for proper insertion — Straightening of ear canal — Roll-down technique for hand-formed plugs — Depth of insertion for plug type — Personal Attention Rating (PAR) — Visual check — Tug test — Subjective acoustic check — Occlusion effect Earmuffs: • Overview of fitting — Headband ▪ Position (over the head, under chin, behind neck) ▪ Adjustment (support band, if provided) — Earmuff cushions are in contact with skin. Facial hair and head size should be considered. — Use of other PPE should be considered (e.g., respirators, safety glasses, hard hats, etc.) — Space limitations of worker's job environment (confined or tight spaces) • Training procedures — Visual check — Listening check — PAR Infection Control/Hygiene Issues • Otoscopic speculum (OHC) — Cross contamination • Fitting gauges (OHC) • Manipulation of the earplug (worker) • Hand hygiene (OHC or worker) The most effective personal hearing protection device for a noise exposed individual is one that is worn properly and consistently. **Chap. 13 Hearing Protection Devices** **Chap. 14 Use and Care of Hearing Protection Devices**

DOMAIN 9: Hearing Protection Device Fitting • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
9e. Learner understands the care and maintenance of HPDs.	Discuss how to care for HPDs: • Disposable earplugs • Earplug inspection and cleaning • Earmuff cushion inspection and cleaning • Custom molded earplug inspection and cleaning **Chap. 14 Use and Care of Hearing Protection Devices**
9f. Learner identifies strategies to motivate workers and management to use HPDs regularly and effectively.	Explain that the OHC works closely with the HCP manager and PS to provide training and counseling strategies for the HCP: • Appropriate (ethical) incentives for compliance (e.g., small prizes, free food, gift card, competitions). • Explain the relationship of hearing loss prevention to overall health benefits. • HPD policy enforcement must be congruent with established employer safety requirements and should follow the same disciplinary pattern as for the other PPE. **Chap. 13 Hearing Protection Devices** **Chap. 15 Training and Motivation**
9g. Learner understands the various methods of fit verification for HPDs.	Discuss both informal and formal methods used for HPD fit verification. Informal methods of HPD fit verification: • Visual inspection • Tug test (earplugs) • Worker's self-report of occlusion effect • Hands over inserted earplugs while in noise • Worker's experience with fit Formal methods of HPD fit verification: • Personal Attenuation Rating (PAR) — Field microphone in real ear (F-MIRE) — Loudness balancing — Sound field measurement (un-occluded vs. occluded) **Chap. 13 Hearing Protection Devices**

DOMAIN 10: Counseling and Training	
TASKS	SUGGESTED REVIEW INFORMATION
10a. Learner can identify the required HCP training components.	Explain required training components of the HCP. • Annual training, per **OSHA** regulation includes: — The effects of noise — The purpose, advantages, and disadvantages of various types of hearing protectors — The selection, fit, and care of hearing protectors — The purpose and procedures for audiometric testing • Note: **MSHA** same as OSHA, but also must be provided within 30 days of enrollment in the HCP and must also include: — Description of mine operator's and miner's responsibilities for maintaining noise controls • Note: **FRA** same as OSHA, but must be provided within 180 days of enrollment, must be offered yearly and enrollee must complete training at least every 3 years. • Note: State, local and other jurisdictions may have additional training requirements. • Training may also include other topics such as: — An explanation of noise operational controls, where used. — General information concerning the expected range of workplace noise exposure levels. — The purpose of noise monitoring. — Employees rights and responsibilities. — How to file an excessive noise report — Recreational noise risks and precautions. — How to provide input on noise control to management. — Psychosocial and other non-auditory consequences of noise. **Chap. 15 Training and Motivation**

DOMAIN 10: Counseling and Training • *continued*

TASKS	SUGGESTED REVIEW INFORMATION
10b. Learners will identify several different training methods for hearing loss prevention within the workplace.	Discuss training methods, used alone or in combination, based on: • **Audience - Number of Participants** — Single individual – proven to be the most effective training method to change behavior — Small group — Large group • **Delivery Method** — Live presentation — Read/view-only media (no interactivity) ▪ Video presentation – Video presentation, DVD, YouTube – Webinar (live or prerecorded) ▪ Written materials – Booklets with quiz – Posters — Worker-directed, computer-based, self-paced systems ▪ Online or offline ▪ Purchased or self-created • **Tools/Techniques employed** (suggested, incomplete list) — HPDs ▪ Use the employer's actual HPDs to demonstrate insertion techniques ▪ Demonstrate proper earplug insertion techniques – Roll-down model – Funnel and water ▪ How to conduct a self-evaluation of HPD fit ▪ Proper procedure for maintaining or replacing HPDs, including location of replacement devices — Hearing loss ▪ Dangerous Decibels ▪ NASA Buy Quiet Roadmap ▪ NIOSH Hearing Loss Simulator ▪ Testimonials, both user and non-user **Chap. 15 Training and Motivation**

DOMAIN 10: Counseling and Training • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
10c. Learners can provide ongoing training, education and motivation to improve compliance within the HCP.	Discuss ongoing training and motivation: • **Training and Education** — Improving employer performance ▪ **Compliance** – Management must make the hearing conservation program a priority – Management must share the ultimate goal of hearing loss prevention – Management must require and enforce worker attendance at hearing conservation training sessions – Identify the importance of ongoing/periodic training – Establish timelines for regulatory compliance with training requirements per agency (e.g., OSHA, MSHA, FRA) and a penalty structure for worker failure to comply – Management needs to understand their responsibility and liability – Front line supervisor training is necessary – Training should be compliant with the Americans with Disabilities Act (ADA) and be accessible by those speaking different languages ▪ **Best practices** – Evaluate outcomes of training procedures and revise as necessary – Conduct annual review of training program and update it to reflect changes in workers equipment and environment – OHC, PS, guest presenter and management should collaborate on creation and revision of training materials, content and presentations – Awareness training regarding both occupational and recreational noise exposure – Improving worker performance ▪ **Compliance** – Document worker attendance at training sessions – Follow-up on workers who do not attend any required training sessions (new hire, annual or STS retraining) – Compare audiometric database/medical surveillance software to identify workers who missed the annual audiograms; training may have been missed as well – Ensure workers understand the penalty structure for missed training

DOMAIN 10: Counseling and Training • *continued*	
TASKS	SUGGESTED REVIEW INFORMATION
10c. (continued)	• **Motivation** — Identify possible triggers for changes in group behavior ▪ What's your favorite sound? What if you lost your ability to hear it? ▪ Hearing-loss simulations ▪ Tinnitus simulations ▪ Job restrictions or denial of future hearing-sensitive jobs (eg, law enforcement, Department of Transportation (DoT) or Federal Aviation Administration (FAA) ▪ HPD 5 C's (as per NIOSH) – Comfort – Convenience – Communication – Cost – Culture/climate (safety and PPE) — Reasons people are self-motivated to change behavior ▪ Perceived health threat ▪ Perceived threat to family and friends ▪ Decreased work performance/pay ▪ Increased costs ▪ Loss of quality of life ▪ Decrease in personal safety ▪ Interpersonal influences (peer pressure) ▪ Reduction in fatigue and annoyance — Consider adult learning behaviors **Chap. 15 Training and Motivation**
10d. Learner understands the importance of conducting comprehensive worker hearing protection training program on a regular basis.	Describe an effective hearing loss prevention program (HLPP): Importance: • Motivate workers to prevent hearing loss (annual as well as requirements following STS) • Reduction of NIHL Components of a comprehensive program: • Enforce regulatory training schedule for HLPP — Best practice: train new workers as soon as possible • In addition to required subjects, introduce related topics such as: — recreational noise — psychosocial implications of NIHL • Encourage workers to bring HPD to annual audiometric monitoring for reinstruction • Encourage workers active participation in HLPP beyond regulatory responsibilities **Chap. 15 Training and Motivation**

DOMAIN 11: Recordkeeping and Hearing Conservation Team	
TASKS	SUGGESTED REVIEW INFORMATION
11a. Learner can document and maintain accurate worker records	Explain the composition of worker HCP records: • STS, medical referral notification and counseling records • Aural history and audiometric data (make learners aware of restrictions such as GINA and HIPAA) • HPD fitting and educational documentation • Noise exposure Record Retention: • Employer is responsible for retaining and maintaining occupational hearing conservation records as per (OSHA, MSHA, DoD, FRA and other hearing conservation program requirements) regardless of whether a contracted entity generates or maintains the records • Occupational health clinics or contracted health service providers are responsible for maintaining records under medical requirements (OSHA 29CFR 1910.1020, and local or corporate policies). Occupational health clinics or contracted health service providers are responsible for supplying audiometric data to employers **Chap. 12 The "Problem Audiogram," the Occupational Hearing Conservationist and the Professional Supervisor** **Chap. 16 Recordkeeping and Program Evaluation**
11b. Learner understands the role of the Professional Supervisor of the Audiometric Monitoring Program (PS) within the Hearing Conservation Team	Emphasize that the PS must be an audiologist, otolaryngologist or physician (MD or DO). Every OHC must have a PS. • The PSs responsibilities include: — Supervision of the Audiometric Monitoring Program ▪ The PS must maintain timely communication with the OHC — Review of Problem Audiograms ▪ Alerting the OHC and/or employers of the need for: – Any follow-up due to a worker's STS – Any medical or audiological referral ▪ Determining when/if there will be a baseline revision — Determination of Work-Relatedness — Management of the Audiometric Database Note: PS is not necessarily the hearing conservation program manager but may be in certain circumstances. **Chap. 12 The "Problem Audiogram", the Occupational Hearing Conservationist and the Professional Supervisor** **Chap. 16 Recordkeeping and Program Evaluation**

List of Abbreviations

ADA	Americans with Disabilities Act
AL	Action Level
CD	Course Director
CPO	Component Professional Organization
dB(A)	Decibels measured on the A scale of the sound meter
dB(C)	Decibels measured on the C scale of the sound meter
dB(P)	Peak Sound Pressure Level
DoD	Department of Defense
FRA	Federal Railroad Administration
FMIRE	Field Microphone in Real Ear
GINA	Genetic Information Nondiscrimination Act (2008)
HCP	Hearing Conservation Program
HIPAA	Health Information Portability and Accountability Act
HL	Hearing Level
HLPP	Hearing Loss Prevention Program
HPD	Hearing Protection Device
HR	Human Resources
HTL	Hearing Threshold Level
Hz	Hertz
JTA	Job Task Analysis
k	1000 (one thousand)
kHz	Kilohertz
Leq	Equivalent continuous sound level
MSHA	Mine Safety and Health Administration
NIHL	Noise-induced Hearing Loss
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
OHC	Occupational Hearing Conservationist
OSHA	Occupational Safety and Health Administration
PAR	Personal Attenuation Rating
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
PS	Professional Supervisor of the Audiometric Monitoring Program
SPL	Sound Pressure Level
STS	Standard Threshold Shift
TWA	Time Weighted Average

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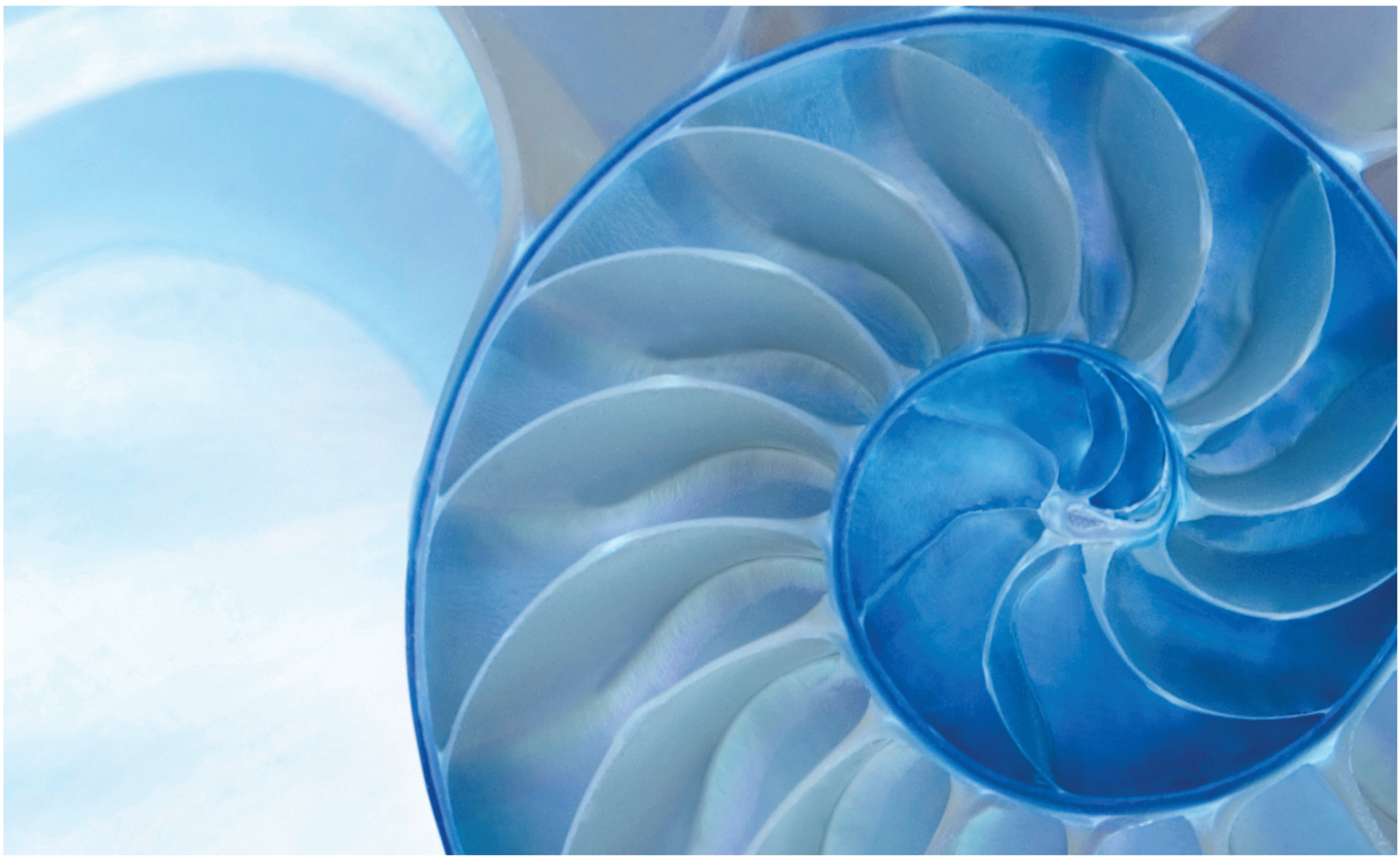

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