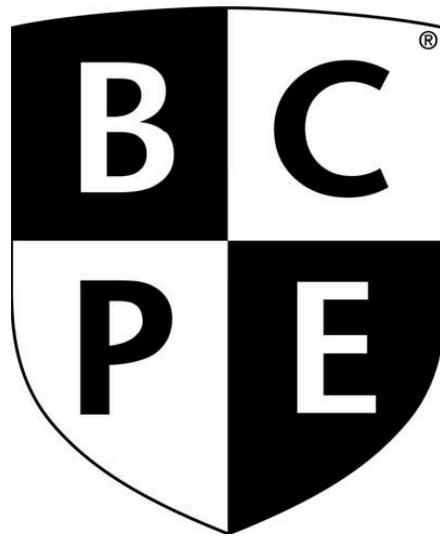


CANDIDATE HANDBOOK

**BOARD OF CERTIFICATION IN
PROFESSIONAL ERGONOMICS**



CERTIFICATION POLICIES, PRACTICES & PROCEDURES

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FOREWORD

The mission of the BCPE is to provide ergonomics certification to protect the public, the profession, and its professionals by assuring standards of competency and advocating the value of certification.

An elected [Board of Directors](#) governs the BCPE. The Board is composed of BCPE certified professionals and a public member, who establish corporate policies and procedures. These volunteers are leaders from within the profession and represent the diverse domains in which HF/E/UX is practiced. Each director is nominated for election by a Nominations Committee and is elected by the Board to a term of three years. Corporate officers (President, Vice President, Secretary, and Treasurer) are elected annually by the Board from among the directors. In addition, the BCPE is managed by an Executive Director and Executive Administrator ([staff](#)) who oversee administration of BCPE's certification program by implementing and abiding by established policies and procedures.

The BCPE adheres to [bylaws](#), which define BCPE's primary objectives and describe how BCPE functions. BCPE's bylaws were first adopted on September 2, 1991 and are consistent with the current practices and legal requirements of Washington State, BCPE's state of incorporation. Subsequent revision of these bylaws has occurred as needed by amendment and is noted at the end of the document.

The BCPE is a non-profit service corporation chartered under the laws of Washington State on 23 July 1990. The BCPE is classified as a tax-exempt organization by the U.S.A. Internal Revenue Service in accordance with IRS Rule 501(c)(6). Corporate Headquarters are located at 2950 Newmarket Street, Ste 101, PMB 244, Bellingham, WA 98226.

The following marks are certification marks and service marks registered to BCPE and can only be used when [authorized](#):

The Board of Certification in Professional Ergonomics®: BCPE®
Certified Professional Ergonomist®: CPE®
Certified Human Factors Professional®: CHFP®
Certified User Experience Professional®: CUXP®
Associate Ergonomics Professional®: AEP®
Associate Human Factors Professional®: AHFP®
Associate User Experience Professional®: AUXP®
Certified Ergonomics Associate®: CEA®



BOARD OF CERTIFICATION IN PROFESSIONAL ERGONOMICS®

THE HUMAN FACTORS/ERGONOMICS PROFESSION

What HF/E/UX Professionals Do

Human Factors/Ergonomics (HF/E/UX) professionals understand the interactions between humans and systems. They apply theoretical principles, data, and methods to design to optimize well-being and overall performance. An HF/E/UX professional is competent in optimizing performance, safety and comfort.

Throughout this document, HF/E/UX will refer to the profession as a whole. The term includes the Certified User Experience Professional (CUXP) who is an HF/E/UX professional primarily conducting user experience research.

BCPE Certification

The BCPE is a non-profit organization providing the gold standard of HF/E/UX certification, recognized nationally and internationally. One professional certification is provided. However, practitioners work in many different domains and the term for HF/E/UX varies by domain. No matter what the area of focus, the underlying knowledge and systems approach remain the same. BCPE certificants obtain professional level of certification through one application process and exam. The certificant chooses one designation that fits their work world.

- CPE — Certified Professional Ergonomist
- CHFP — Certified Human Factors Professional
- CUXP — Certified User Experience Professional

The professionals who hold the Associate designation have demonstrated their educational competency and are gaining the work experience required for full Professional certification.

BCPE also supports certificants who qualified for Certified Ergonomics Associate (CEA) status, a designation for those who work at an interventionist rather than design level of practice. CEA certification is no longer offered; however, the certificants who hold this designation may keep their status current by paying an annual certification [renewal fee](#). CEA certificants are listed in the online directories.

Scope of Practice

HF/E/UX is principally a design discipline, with a focus on solving human performance problems in interactive systems of tasks, jobs, products and environments to ensure compatibility with the needs, abilities and limitations of people.

There are two levels of practice:

Professional (CPE/CHFP/CUXP): A career problem solver who applies and develops methodologies for analyzing, designing, testing, and evaluating systems. A HF/E/UX Professional addresses complex problems and advances ergonomics technologies and methods.

CEA: An interventionist who applies a general breadth of knowledge to analysis and evaluation. A CEA reacts to performance, safety, health and/or quality issues in currently operating work systems.

While the scope of practice for the HF/E/UX Professional covers the entire breadth and depth of ergonomics knowledge, the scope of practice for the CEA is limited to the use of commonly accepted tools and techniques for the analysis and enhancement of human performance in existing systems. The CEA has to be able to recognize those projects that exceed the scope of a CEA and for which the skills of a HF/E/UX Professional must be used. (Note: the CEA certification is no longer offered.)

Operating Philosophy and Code of Conduct

The operating philosophy of HF/E/UX professionals is to apply scientifically established characteristics of people to design. Designs should not be based on unwarranted assumptions about human capabilities and their adaptability. In support of this philosophy, HF/E/UX professionals shall:

- hold paramount the safety, health and welfare of the public in the performance of their professional duties;
- perform services only in the areas of their competence;
- issue public statements only in an objective and truthful manner;
- act in professional matters for each employer or client as faithful agents or trustees, and avoid conflicts of interest;
- build their professional reputation on the merit of their services and shall not compete unfairly with others;
- act in such a manner as to uphold and enhance the honor, integrity, and dignity of the profession;
- continue their professional development throughout their careers and shall provide opportunities for the career development of those ergonomists and support staff under their supervision.

The Body of Knowledge

The body of HF/E/UX knowledge resides in the open literature of textbooks, handbooks, guidelines, standards, journals and databases, as well as from the experience of practitioners. A practitioner acquires HF/E/UX knowledge through formal course work (lectures, labs, workshops, seminars); self-study; supervised fieldwork and practical experience. HF/E/UX professionals integrate knowledge about human function, structure and behavior for practical uses in the design process. Formal courses and degree programs in HF/E/UX are available from universities and colleges throughout the industrialized world, and professional societies have existed since 1949 for educational and information exchange purposes. So, while self-study is possible, formal, advanced education specifically in HF/E/UX is strongly recommended for people wanting a professional career in ergonomics.

HF/E/UX is a multi-disciplinary field that draws on many different sciences during the design process. The unique knowledge base of HF/E/UX derives from the methods and techniques its researchers and practitioners have developed. This knowledge focuses on the systems approach to human integrated design. HF/E/UX is based on science, not conjecture on how people do (or should) function.

Core Competencies

The BCPE core competencies reflect the fundamental knowledge for professional competence in HF/E/UX at entry-level practice of three years of experience. The tasks were derived from Subject Matter Expert (SME) review of previous core competencies derived from a formal job task analysis. The tasks and allocated four categories of core HF/E/UX knowledge were validated through a field survey.

Each core competency category and task has associated knowledge and skills. The percentages of each category and task reflect the weight by criticality to professional practice. This weighting is reflected in the examination specification. Education coursework requirements for certification also reflect the core competencies and weighting. The [Core Competencies](#) with knowledge and skills (Exam Specification) are in the Appendix.

Practitioner Experience

Practitioner knowledge and skills are developed in a large variety of settings and situations leading to specialization in the HF/E/UX's job functions and systems design applications. Specialization can occur along design criteria lines (e.g. health and safety, transport) or job function (e.g. ergonomics analyst, designer, user experience researcher, or manager).

Experience will always involve one or more of the following: analysis, design, validation, implementation, research, consultation or management of human performance in an operational or developmental system context. Experience on one system often will be applicable in another system. Specialization by system can include:

- mobility/transportation systems (ground, water, air and space.)
- industrial systems (processing, manufacturing, distribution, etc.)
- business systems (offices, services, etc.)
- communication systems
- information management systems/computers
- educational systems (instructional systems design)
- regulatory/legal systems
- consumer systems
- architectural systems
- health-care systems

A minimum of three years of practical experience is required to apply for certification. Continuing education by means of active participation in professional society meetings; workshops, seminars and short courses; publishing articles; and being involved in the profession through volunteering are necessary to stay abreast of HF/E/UX advances.

APPLYING FOR CERTIFICATION

A **certification** program tests the knowledge, skills and abilities to perform a job.

A **certificate** program assesses whether a student has learned specific objectives provided in an educational or training program.

Becoming certified in a profession is evidence of a minimum level of professional competence. You should consider getting certified by BCPE for the following reasons:

Enhanced credibility — an independent verification of competency provides a higher level of professional credibility.

Personal satisfaction — proof of professional competence is gratifying.

Recognition by peers — certification increases credibility with your peers as well as your organization.

Increased salary — employers prefer to hire certified professionals: HF/E/UX professional salaries are increasing.

Job promotion — certificants have better opportunity for promotion.

Enhanced job opportunities — 66% of employers prefer certified professionals.

Types of Certification

We offer **one** professional certification, with a **choice** of designation:

Professional

Certified Professional Ergonomist (CPE), or
Certified Human Factors Professional (CHFP), or
Certified User Experience Professional (CUXP)

The certificant pays an annual certification [renewal fee](#) and every five (5) years submits a Continuance of Certification (CoC) form describing continuing education and professional involvement that meets a required standard.

Associate (stepping-stone to professional certification)

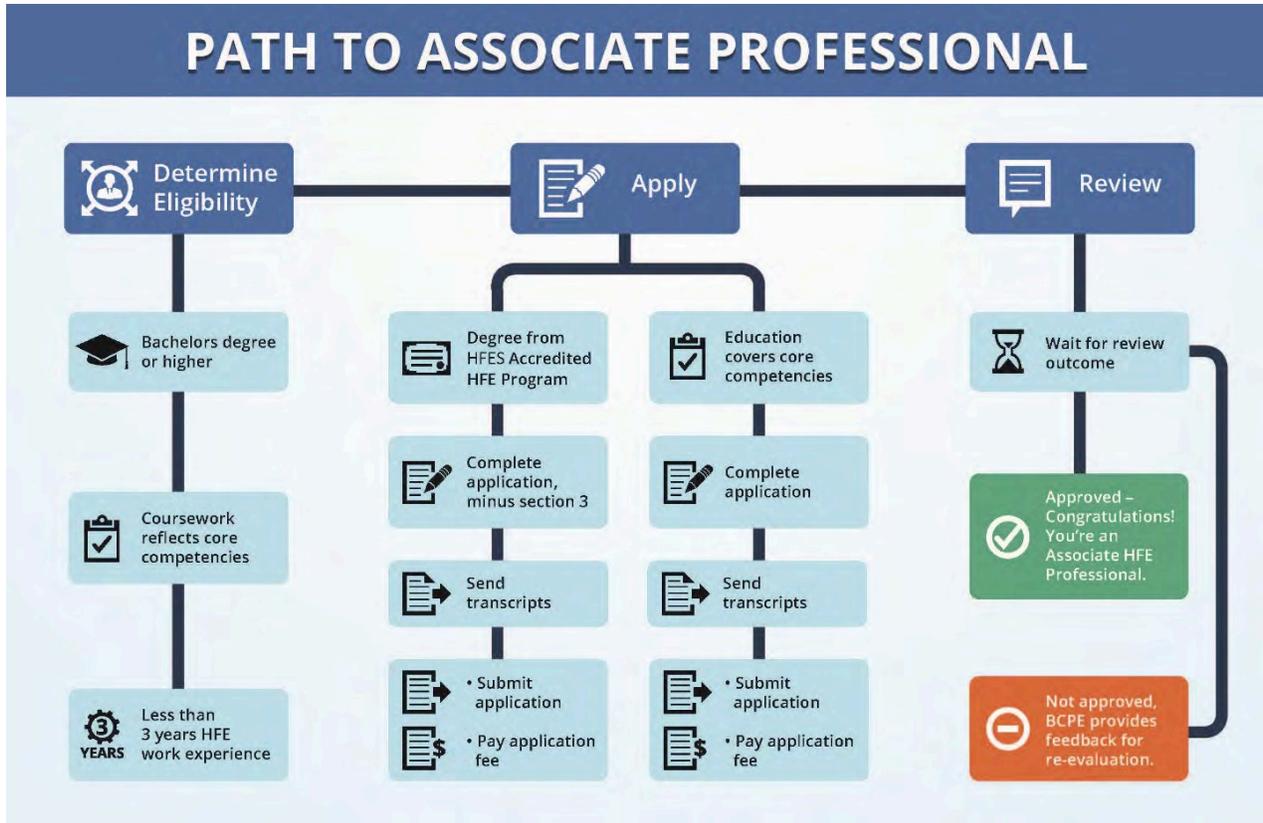
Associate Ergonomics Professional (AEP), or
Associate Human Factors Professional (AHFP), or
Associate User Experience Professional (AUXP)

The certificant pays an annual certification [renewal fee](#) and has six (6) years to transition to Professional certification.

Retired Professional

A certificant may elect retired status (e.g. “CPE ret.” or “CEA ret.”) if he or she no longer practices HF/E/UX, or his/her HF/E/UX practice is limited to only occasional work, totaling no more than 15 hours a month. Requests for retired status must be submitted in writing and are reviewed on a case-by-case basis. There is a [one-time fee](#), after which no additional fees apply. Reinstatement as a CPE, CHFP, CUXP or CEA is achievable as per the [Reinstatement Policy](#). If inactive status is no more than 5 years, reinstatement is possible by paying any difference in renewal fees, meeting CoC requirements where pertinent and continued abidance with the Code of Ethics. Those holding BCPE retired status continue to receive the BCPE newsletter and be listed in the BCPE directory.

Path to Certification



Eligibility

Professional certification requires:

1. Bachelor's degree *and* academic coursework covering BCPE core competencies.
2. Minimum of three years full-time equivalent HF/E/UX work experience.
3. Completes and submits an approved professional certification application.
4. Passing score on the comprehensive certification examination.

Associate certification requires:

1. Bachelor's degree *and* academic coursework covering the BCPE core competencies.
2. Less than three years HF/E/UX experience.
3. Completes and submits an approved associate certification application.

The Associate designation is time limited to six (6) years during which an applicant is expected to gain the experience and work products to apply for full professional certification.

Education

The applicant must have a minimum of a Bachelor's degree from a regionally accredited college or university (for U.S. degrees, recognized by the Council for Higher Education Accreditation (CHEA)). HF/E/UX is a multidisciplinary profession so BCPE focuses the [educational requirement](#) on courses covering the Core Competencies rather than a particular academic degree. However, the minimum amount of academic units is more than what is typical for a Bachelor's degree.

On the application, the applicant must delineate the relevant academic courses taken that cover the topics of the Core Competencies with adequate academic units (credits) for each topic area. Academic courses can be at graduate and postgraduate levels. See Appendix for education section of the application. The minimum total academic contact hours required is 360. See the Appendix for a comparison of expected units (credits) for semester, quarter, continuing education and contact hours. The comparison grid of units/hours is provided for convenience. A core background in HF/E/UX obtained primarily through training (versus education) programs is not acceptable.

Applicants who have graduated from a [HFES accredited degree program](#) do not have to delineate their courses on the application. To confirm your program is HFES accredited, click on the institution name. This will display the program(s) accredited at this university. Transcripts are still required.

Continuing Education Units (CEUs)

- "Academic Credit Hours Required" are preferred to be from undergraduate or graduate courses by accredited* institutions. Acceptable academic courses can also be taken at an accredited* academic institution or its affiliate(s) (such as university "extension" or "continuing education"), and involves lectures and some type of student assessment (e.g., an examination or project).
- Acceptable continuing education (CE) credit hours or "units" include: 1. CE credits that have been historically accepted by universities/colleges as "academic" credits/units; 2. CE credits offered through accredited universities extension/continuing education programs, and 3. CE credits

offered by boards and professions related to our field and are approved by IACET (International Association of Continuing Education and Training).

The CE credits or units assigned to a “short-course” are considered only with provision of official proof of enrollment, course content, contact hours, and assessment information. Attending a conference or symposium that offers CE credits for attendance are not considered educational CEUs and will not be counted towards the educational coursework requirement.

- Academic courses taken as “audit” need to be formally acknowledged by the providing institution (e.g., through transcript notation).
- Online courses (e.g., MOOCs such as Coursera, edX®, and Udacity®) are considered only with provision of official proof of enrollment, course content, contact hours, and assessment information.
- “Training” in areas related to the topics listed above does not constitute formal academic experience and will not be counted towards the educational coursework requirement.

**The BCPE considers a college or university to be acceptable when it holds institutional accreditation from an Accredited Board for Engineering and Technology (ABET) or the Council for Higher Education Accreditation (CHEA). International degrees will be deemed acceptable based on the institution’s accreditation status in the presiding education system.*

A core background in HF/E/UX obtained primarily through training (versus education) programs is not acceptable.

Transcripts

An official transcript of all degrees or courses delineated in the application must be sent directly to BCPE by the college or university. Official transcripts submitted by the applicant are accepted if received in a sealed envelope with the registrar’s stamp across the seal. BCPE also accepts electronic transcripts if they are sent by the college or university using an electronic transcript delivery network such as eSCRIP-SAFE. International degrees (outside the U.S. and Canada) will be accepted based on the institution’s accreditation status in that country. Applicants with international degrees are required to provide reports of the education with translation and interpretation of the credentials. There are international credential evaluation services that provide translation and interpretation of the credentials.

Certificates of Completion are required for all training courses or other miscellaneous education that is written on the application form to be considered for fulfilling a core competency.

Experience

A minimum of three (3) years full time equivalent experience working in the profession of HF/E/UX is required. One (1) year of work experience equivalency will be granted to graduates of a HF/E/UX PhD program from a regionally accredited college or university (to be verified by submitted transcript).

An applicant provides the following information about each work experience covering three years on the application form.

POSITION TITLE	EMPLOYER NAME	EMPLOYER ADDRESS
DATES OF EMPLOYMENT	NAME AND TELEPHONE NUMBER FOR VERIFICATION OF EMPLOYMENT	FULL TIME <input type="checkbox"/> PART TIME <input type="checkbox"/>
DESCRIBE THE RESPONSIBILITIES OF THIS POSITION		

Work Products

Examples of work products are required to show the applicant's HF/E/UX experience and expertise in the profession. At least TWO project examples in each of the following three areas must be provided pertaining to human-machine, human-environment, human-software, human-job, or human- organization interfaces:

- **Analysis** (e.g. conducting a function analysis, function allocation, or task analysis)
- **Design** (e.g. designing a workstation, a software interface, or materials for use in a job)
- **Validation & Implementation** (e.g. acquisitioning performance measures, assessing system performance compared to system requirements, or verifying ergonomics specifications have been met).

At least two of these products must have been completed in the last five years. The remaining work products must have been completed within the past ten years.

Applicants may submit as few as two and as many as six work products. If a project involved two or three content areas, the applicant may use this one project as an example of those areas of analysis, design, and/or validation & implementation to which it applies. Each work product title must be entered on the application form and connected to one or more relevant core competency of which the work product is an example.

Provide titles for your work products and enter this information below. Determine the links between your work products and the four sections of the BCPE Core Competencies <ul style="list-style-type: none"> • Mark the appropriate section boxes (Analysis, Design, Validation, Implementation) for each work product. • Align your work products to the BCPE Core Competencies sections and tasks. 					
Work Products	Core Competency Section(s)	Core Competency Task(s)	Analysis (2)	Design (2)	Validation / Implementation (2)
<i>Example:</i> Company XYZ's Ergonomic Improvement Initiative (2011)	Analysis Design	I-1, I-5 II-4	1	1	
1.					

Types of work products accepted include technical reports, design papers, analysis reports, evaluation reports, and patent applications. Each work product example can be annotated or accompanied by a description to provide context and additional information to help convey your

knowledge and skills used during the project. A thorough written description of a project may be submitted if there is not an existing work product meeting the requirements as outlined above. Each work product (with accompanying description) has a 20-page maximum limit.

BCPE is assessing the HF/E/UX aspect of a work product. The applicant can redact any necessary company or proprietary information, which does not affect a reviewer's understanding of the HF/E/UX work.

Acceptable work products frequently represent the work of two or more professionals. If an applicant cannot provide work product examples solely representing his or her own work, the work products should reflect a major and definable role by the applicant and clearly identify this contribution.

Application

Types of Application

Choose the correct application from the three application types:

- 1) **Professional** (direct application for CPE/CHFP/CUXP)
- 2) **Associate to Professional** (transition application from AEP/AHFP/AUXP to CPE/CHFP/CUXP)
- 3) **Associate** (direct application for AEP/AHFP/AUXP)

The Full Professional application includes all the information described under Eligibility.

Please list the titles of your submitted work products in the space provided on the application form and identify if it is an example of analysis, design or validation & implementation. Connect the work product to one or more core competency.

Compile a **single PDF document** with your work products inserted after the application form. Again, each work project has a 20-page maximum limit. At least two of these work products must have been completed within the past five years. The remaining work products must have been completed within the past ten years.

The Associate to Professional application is an abbreviated form that does not require delineating education or transcripts because they were received and approved for Associate certification. Delineating experience and providing work products is required, as noted above for the Full Professional application.

The Associate application demonstrates satisfaction of the educational requirement for Professional certification. Experience and work products are not necessary for this short-term certification. Transcripts and pertinent certificates of completion are required.

Application Fees

Submit the compiled PDF application on line with payment. Payment is non-refundable.

[Application Fees](#) are available online at the BCPE Website.

There is not application fee for transition from **Associate to Professional Certification** (AEP/AHFP/AUXP to CPE/CHFP/CUXP).

By submitting and paying on line, the applicant agrees to/acknowledges:

- the accuracy of submitted information, including attachments, and authorizes BCPE to verify any information submitted. Falsification of submitted information may be cause for rejection or withdrawal of certification;
- not indicate in any way they are BCPE eligible or that certification is pending;
- hold the BCPE harmless from any and all liability in the event the application is rejected on the basis of information furnished to the BCPE by the applicant, or third persons, which would, in the judgment of the BCPE, make the applicant ineligible for certification;
- an [Appeal Process](#) is available to any applicant whose application is not approved during the review process;
- the [Privacy Policy](#);
- BCPE certification, if and when issued, attests to the achievement of certain prescribed minimum qualifications by peer review and/or examination, but does not attest to professional competency or suitability as to specific occupational performance.
- abide by the [Code of Ethics](#).

The BCPE does not discriminate among applicants as to race, color, religion (creed), gender, gender expression, age, national origin (ancestry), disability, marital status, sexual orientation, or military status.

Applications may be submitted at any time. Applicants for Professional certification should apply by the stated application deadline of their preferred exam administration window:

Spring exam offering:	April – May	Application deadline November 30
Fall exam offering:	September – October	Application deadline April 30

Exception to these deadlines is not possible due to the time needed to process and evaluate each application. Candidates retaking the exam do not have to resubmit an application, but should inform BCPE of which exam they wish to take by the appropriate deadline and pay the \$350 exam fee.

Application Review

Applications are blind reviewed by a review panel. All reviewers sign non-disclosure/conflict of interest agreements. Once an application is approved, the candidate is notified and provided information about the examination (Professional certification) or their certification status (Associate certification). The review process takes 8-10 weeks.

Candidates qualified to take the examination have up to two years after their application is received in which to take the exam, after which a new application must be submitted. The non-qualifying applicant has two years to correct any deficiencies or missing elements in the application as conveyed by the review panel and on approval of the application, to take the exam without incurring additional application fees (the examination fee still applies).

Associate certification is granted upon application approval and demonstrates the certificant has met the educational requirement for full Professional certification. The certificant has six (6) years to complete three (3) years full-time equivalent professional practice in HF/E/UX and transition to the Professional designation. To transition from Associate to full Professional designation, an application has to be submitted that is similar to the application for full Professional certification, but

does not have to include education details. On approval of the transition application, the candidate takes the exam and is certified after receiving a passing score.

Individuals holding the Associate designation who do not meet the criteria for transitioning to full Professional status within the given six (6) year period may petition the Board of Directors for a waiver of the transition deadline. The petition must be in writing, include a basis for the request and a plan towards achieving Professional certification. The Board will consider such petitions on a case-by-case basis.

Choosing and Changing Designation

Choosing Designation

Only one designation may be used. The application form requires the Applicant to choose a designation (CPE or CHFP or CUXP / AEP or AHFP or AUXP). Your decision depends on the work world you are in or wish to be in or wish to convey.

Changing Designation

If you decide to change your designation you may do so:

- when transitioning from Associate to full Professional; you may indicate your new choice on the transition application (no fee)
- when sitting for the exam, before a certificate of certification is issued on passing; email your request to bcpehq@bcpe.org (no fee)
- by paying a [change fee](#) (available under certification fees on line) to cover administrative costs; email your request to bcpehq@bcpe.org

EXAMINATION

There is one examination for Professional certification designed to test an individual's knowledge across the breadth of HF/E/UX. A candidate should expect questions in all sections of the [Core Competencies](#) and are based on the knowledge and skills (see Appendix). The exam contains 125 multiple-choice questions in English selected to reflect the proportions indicated by the percentages on the Core Competency document. These proportions are based on the job analysis from which the Core Competencies are derived. The questions are not grouped by subject area in the examination. The examination is three (3) hours and candidates may go back and review questions at any time during the allotted three (3) hours. The exam provides opportunity to submit comments. BCPE will review all comments; however, due to exam security, the comments will not be discussed with the author.

Scheduling the Exam

The examination for Professional certification is administered electronically twice a year at proctored test sites throughout the U.S., as well as internationally. An [exam site map](#) on the BCPE website shows the locations of available sites.

Spring offering:	April – May	Application deadline November 30
Fall offering:	September – October	Application deadline April 30

After an application is approved, the candidate is sent an invoice for the non-refundable [exam fee](#). Exam registration information is provided by email after payment of the exam fee, 2-3 weeks prior to the start of the exam window. The exam site map gives an opportunity to explore site options prior to signing up. The information is general so that the site can be identified in the list provided during registration. The map is not intended for direct contact with a testing site.

The Exam Registration letter gives instructions on how to register and sign up for a test site online. Registration requires an email address, which must be validated before resuming the registration process. Contact information is required and then an exam site can be requested. Each exam site maintains its own hours of operation and may or may not offer weekend/holiday hours. If there is no site near you or in your country, contact the [BCPE](#).

If a candidate misses their examination appointment, they will **not** be automatically rescheduled and will forfeit the exam fee.

If a candidate is late to their examination appointment, they might not be admitted. Late admission is at the discretion of the testing site.

Candidates needing to reschedule their examination to a future date or examination window, should notify [BCPE](#) as soon as possible. Candidates can change their exam date in the same exam window if the change is made outside of seven (7) days of the exam date. There will be no fee. However, if the change is within seven (7) days of the exam date, request BCPE to reschedule and there is a [rescheduling fee](#).

Exam Day

On the day of the exam, candidates must bring:

- a printed copy of their registration confirmation received by email
- a government issued form of identification (such as a driver's license).

The proctor will set up the exam and the candidate will begin. A timer and calculator are on the exam interface.

No personal items are permitted, including cell phones, watches, calculators or purses.

No breaks are allowed during the (three) 3-hour exam. If leaving is necessary, the exam will end.

Candidates needing accommodation in compliance with the Americans with Disabilities Act (ADA) must advise BCPE of their accommodation need(s) in writing at the time their application is submitted for processing and evaluation. BCPE will assist candidates with identifying sites that can meet their accommodation needs.

Scoring of the Exam

Examinations are scored electronically and converted to a scaled score between 200-500, with 350 as a passing score. All questions have the same score. There is no penalty for a wrong answer, so candidates are encouraged to attempt a response to all questions.

Each examination version is equated with prior exams using standard statistical processes to ensure the difficulty level is the same for each version and that candidates are evaluated according to the same competency standard. A scaled score provides a statistical method to portray a consistent score across different exam versions. More information about [Important Concepts in Test Development](#) is available.

Results

Exam results are provided by email within four (4) weeks of taking the exam. Successful candidates receive a certificate reflecting the designation of their choice and are listed in the public and private directories maintained on the BCPE web site. Certificants agree to abide by the [BCPE Code of Ethics](#).

Examination Retest

Candidates wishing to retake the examination may do so by contacting [BCPE](#). A non-refundable [retake fee](#) applies to each exam attempt. Exam registration information is provided by email after payment of the exam fee, 2-3 weeks prior to the start of the exam window. An exam can only be taken once during a single exam sitting. The exam can be retaken as many times as needed, within a candidate's two-year eligibility period. After this time a new application is required.

Preparing for the Exam

Candidates should consider reviewing the Core Competencies (see Appendix) with knowledge and skills. This is the Examination Specification, which helps a candidate identify the strengths and weaknesses of his or her knowledge and to develop a study guide. A list of recommended [references](#) is provided in the Appendix. [Sample exam](#) questions and answers are also available in the Appendix.

The BCPE does not review, sponsor or endorse any preparation materials or review courses for the certification examination. Separation from courses is a best practice for certification bodies to be sure there is no conflict of interest. The [resources](#) on the website, including exam review courses, are provided only as a service.

MAINTAINING CERTIFICATION

Continuance of Certification

Certification maintenance is important. It conveys certificants' seriousness about their profession. Certification shows employers the individual is aware of current developments in their field and interested in remaining up-to-date with new information. Continuance of certification (CoC) is a form of recertification that helps professionals keep current in their professional practice. Non-compliance with CoC leads to forfeiture of certification.

Benefits of CoC are:

- Recognizing continuing competence in ergonomics and human factors.
- Retaining professional status in the field.
- Remaining engaged in the field through knowledge of state of the art research and applications.
- Assuring the public that ergonomics and human factors principles are properly applied in design and practice.
- Staying connected with a community of professionals who are dedicated to the advancement of the profession.

Individuals holding CPE, CHFP, or CUXP certification must submit continuance of certification evidence every five years from the time certification is awarded. This evidence is documented on the [BCPE CoC Worksheet](#) and submitted to bcpehq@bcpe.org. The due date of a certificant's CoC worksheet is available in the individual's profile information on the BCPE website. BCPE also sends out a reminder e-mail near the time a worksheet is due. However, certificants may submit the form at any time within their five (5) year period.

CoC worksheets are reviewed. On approval, a formal letter is sent and the five-year cycle restarts. Certificants should keep documentation of all CoC activities written on the worksheet in the event of an audit during the process. Attached to the worksheet there are examples of acceptable documentation. Documentation should be kept for one year beyond the time of receipt of approval and recertification, in the event of an audit.

Late CoC Worksheet

Continuance of certification is mandatory.

A Leave of Absence (LOA) option, available for those who have temporarily left ergonomics practice, will be considered on a case-by-case basis per the [LOA policy](#). A request for LOA must be submitted in writing to bcpehq@bcpe.org. An approved LOA will extend a person's CoC cycle by the length of the leave granted. A LOA can only be granted twice in the duration of a certificant's certification. During this time, the certificant must continue to pay his or her annual renewal fee. Only two LOA's can be granted in the duration of a certificant's certification. Certificants who do not submit a worksheet or satisfy the requirements after at least three reminders, will lose their certification. The loss of certification is communicated by certified mail, the individual will no longer be listed in the directories and their name will be published in the BCPE newsletter.

CoC Worksheet

The worksheet provides instructions for fulfilling a minimum total of 100 points over five years. There are 5 sections under which points can be accrued. Points cannot be gained from only one section. At least two sections need to be used for CoC points.

The 5 sections are:

1. **Work:** Active practice as a certified ergonomist. This includes academic, consulting, supervisory, and management positions.
2. **Training:** Receiving or providing ergonomics-related training that is in addition to or above and beyond usual job responsibilities.
3. **Service:** Ergonomics-related service to societies, committees or standards development activities or the public.
4. **Reports/Publications:** Publishing ergonomics-related articles, papers or internal/external company reports.
5. **Meetings/Conferences:** Attendance or participation at ergonomics-related professional meetings/conferences.

Answers to Frequently Asked Questions about Continuance of Certification, are provided in the [CoC FAQs](#).

Certification Renewal Fee and Code of Ethics

Payment of an annual certification renewal fee is required as part of maintaining certification. This fee is invoiced each October and due by December 31 of that same year. A late fee is assessed in January of the following year on any renewal fee not received at year-end. Non-payment will result in the loss of one's certification status.

[Renewal fees and late fees](#) are available on the BCPE webpage.

Certificants are expected to abide by the [BCPE Code of Ethics](#) and agree to uphold this code on acceptance of certification. Failure to comply may result in certification forfeiture.

APPENDIX

A. Core Competencies



BCPE CORE COMPETENCIES

The following Core Competencies is the exam specification, listing the critical tasks necessary for an early career professional (minimum 3 years of experience) to show competence in order to be certified as a BCPE Professional. Under each task are listed knowledge and skills. The main sections and tasks of these competencies are validated with percentages reflecting the importance of each section to practice. The exam content is balanced according to these percentages.

There are some important ideas that the wording of the core competencies currently reflects:

- *Human-centered design* or *design* applies to products, tasks, jobs, organizations and environments.
- *System* applies to recognizing and understanding how humans and non-humans interact and influence one another within an integrated whole.
- The term *user* implies both *individuals and groups* rather than single users to clarify to the reader that there are a variety of settings they may be faced with, and to reduce the potential for the reader to focus on the individual user.
- We used plural forms for products, tasks, organizations, and environments to encourage the idea that persons may be working on one or more aspects of a situation at a time.

Human Factors/Ergonomics discipline is characterized by the following*:

- Takes a systems approach, therefore considers the broader context of the human in the environment even when focusing on a specific type of interaction.
- Is design driven, involving analysis and assessment resulting in recommendations and actions for design.
- Focuses on two related outcomes: performance and wellbeing, which includes efficiency and effectiveness and health and safety.

* J. Dul et al. 2012 *A strategy for human factors/ergonomics: developing the discipline and profession*. *Ergonomics* 55:4, 377-395

Overview

%	Competency Section	Tasks
34%	I ANALYSIS –discover, gather data	7
33%	II DESIGN – develop systems	7
24%	III VALIDATION – testing, evaluation	5
9%	IV IMPLEMENTATION – training, education, communication	2

%	Core Competencies
34%	<p>I ANALYSIS –discover, gather data Analysis determines the criteria for performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</p>
	<p>1. Conduct user research and/or evaluation to identify, document, and prioritize <u>requirements</u> for individuals and groups to achieve their goals.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Ergonomic design principles, regulations, guidelines, and standards, including those that focus on user accessibility • User research, usability testing, field projects, psychometric approaches, ecological and contextual analysis, observational methods, and performance metrics
	<p>2. Identify and apply relevant <u>anthropometric data</u>, including applicable demographic and cultural attributes of individuals and groups, to develop design criteria.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Anthropometric, demographic, cultural, and human development attributes of the user population • Design criteria/strategies for anthropometric data (e.g., ‘design for the extreme’ or ‘design for fit’)
	<p>3. Identify and employ relevant <u>organizational factors</u> impacting individuals and groups interacting within an organization, to produce recommendations to enhance quality of work life, safety, effectiveness and efficiency.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Fundamentals of organizational structure, organizational behavior and group dynamics, and principles of work • Macro-ergonomic analysis methods, sociotechnical systems theory, and methods for assessing work systems
	<p>4. Identify and measure the relevant <u>physiological and biomechanical responses</u> of individuals and groups to their activities and environments with particular reference to health, safety, comfort and effectiveness and efficiency.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Biomechanics, physiology, functional anatomy, circadian rhythm effects, and adaptation to stress and workload • Physical measures and psychophysical/subjective measures

	<p>5. Identify <u>cognitive, behavioral and social characteristics</u> and responses of individuals and groups that impact health, wellbeing, safety, performance, quality of life, attitudes, value belief systems, and motivation.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Cognitive task and error analysis methods • Cognitive function and process measurement methods, workload and situational awareness, social causation, network analysis, and assessment of teams
	<p>6. Identify and apply methods of evaluation of <u>cognitive aspects of human-technology interfaces</u> to reduce human error, optimize mental workload, and enhance health, comfort, safety, effectiveness and efficiency.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Cognitive factors, performance metrics, and evaluation methods for design, systems, and human performance • Human-technology performance modeling, inspection methods, and participatory methods
	<p>7. Identify and apply methods of evaluation of <u>physical aspects of human-technology interfaces</u> to reduce human error, optimize physical workload, and enhance health, comfort, safety, effectiveness and efficiency.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Performance metrics for human-technology interfaces, and evaluation methods for design, systems, and human performance • Measurement techniques in climatic and perceptual environments, analysis of risk factors, workplace assessment tools, and analysis of tasks, scenarios, user profiles, personas, and ROI

33%	<h2>II DESIGN – develop systems</h2> <p>Design applies the criteria for development or change for desired performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</p>
	<p>1. Apply <u><i>ergonomic principles and data</i></u> appropriate to developing and fulfilling a set of requirements to achieve a safe, usable, effective, and efficient human centered design.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Ergonomics design principles, regulations, guidelines, and standards to fulfill design and user requirements • Human centered design techniques and process for conceptual, prototype, and operational model design alternatives
	<p>2. Design the <u><i>hardware product</i></u>, which includes functions, information displays, interactions, communication modalities etc., within the constraints and capabilities, and context to enable individuals and groups to accomplish a particular set of goals.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Requirements, regulations, principles, guidelines, and standards for hardware design • Instructional, safety and warning systems design principles including perceptual environments • Controls and displays design principles, specifications, and methods
	<p>3. Design the <u><i>software product</i></u>, which includes functions, information displays, interactions, communication modalities etc., within the constraints and capabilities of the hardware and the context to enable individuals and groups to accomplish a particular set of goals.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Requirements, regulations, principles, guidelines, and standards for software architecture and design • Software and systems design processes, including prototyping and iterative methods
	<p>4. Design <u><i>tasks</i></u> within human capabilities and limitations, and the workplace context to enable individuals and groups to accomplish a particular set of goals, and manage stress and fatigue.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Designing for physiological, cognitive and biomechanical capabilities and limitations, and stress responses • Individual and group decision making (e.g. formal and naturalistic) and decision making strategies and assessment of teams

	<p>5. Design <u>jobs</u> using systematic procedures, principles, and techniques in developing and combining tasks into jobs to make them safe, efficient, effective, and motivating, to better utilize human capabilities, and manage stress and fatigue.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Principles, guidelines, and regulations of job design, shiftwork and automation effects, and human performance measurement • Job and task analysis methods
	<p>6. Design the <u>organization</u> within human capabilities and limitations, and the social context to enable to accomplish a particular set of goals, and manage stress and fatigue.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Organizational behavior, group dynamics and organizational theory • Design strategies to promote and facilitate individual, team and organizational processes
	<p>7. Design the <u>environment</u>, within human capabilities and limitations, and the wider context to enable to accomplish a particular set of goals, and manage human stress and fatigue.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Environmental design principles, regulations, guidelines, and standards for indoor and outdoor spaces, tools, and equipment (e.g. acoustic, visual, noise, lighting, vibration, acceleration/deceleration, temperature) • Environmental effects on physiological and cognitive systems and responses, and human performance

24%	<p>III VALIDATION – testing, evaluation</p> <p>Validation confirms effective design for desired performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</p>
	<p>1. Evaluate and design an existing <u>product</u> and related systems, for predictive, stable, reliable and effective products.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Test design and analysis methods for products and systems for determining if design criteria are met • Validation and re-design methods for products and systems
	<p>2. Evaluate and design an existing <u>task</u> and related systems, for predictive, stable, reliable and effective tasks.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Test design and analysis methods for independent and integrated tasks and systems • Task assessment tools and human performance measurement techniques for evaluating task design and re-design
	<p>3. Evaluate and design an existing <u>job</u> and related systems, for predictive, stable, reliable and effective jobs.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Test design and analysis methods for independent and integrated jobs and systems • Methods for evaluating human performance with respect to workload balance and structure
	<p>4. Evaluate and design an existing <u>organization</u> and related systems, for predictive, stable, reliable and effective organizations.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Test design and analysis methods for organizations • Organizational analytics, performance metrics, and economic analyses
	<p>5. Evaluate and design an existing <u>environment</u> and related systems, for predictive, stable, reliable and effective environments.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Test design and analysis methods for environments to ensure conformance with relevant regulations, guidelines and standards

9%	<p>IV IMPLEMENTATION – training, education, communication</p> <p>Implementation manages incorporation of the design to attain desired performance of humans in the context of system elements, such as products, tasks, jobs, organizations and environments.</p>
	<p>1. Define the <u>integrative strategies</u> necessary to effectively and efficiently implement design.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Human centered design processes, instructional systems design, training and education processes, feedback processes and methods, and communication methods • Analytics and performance metrics for determining successful implementation
	<p>2. Deliver <u>training/education</u> to support effective and efficient individual, group, and organizational adoption of design.</p> <p>Knowledge and skill in:</p> <ul style="list-style-type: none"> • Instructional systems design, training and education processes, and communication methods • Methods for evaluating and/or measuring effectiveness and efficiency of development and delivery of training

B. Education Section of Application

REQUIRED CATEGORIES AND TOPICS	ACADEMIC CREDIT HOURS REQUIRED*	COURSE TITLES (& brief content if needed)	LEVEL (Graduate or Undergraduate)	CREDIT HOURS
A. Basic Principles of Ergonomics	3 credit hours total	(Ex: HSCI 580-Occup. Ergo I; [Covered Systems Theory])	(Ex: Graduate)	(Ex: 1 credit hr)
1. Systems Concepts	At least 1 credit hour			
2. Design Concepts	At least 1 credit hour			
B. Core Background	6 credit hours total			
1. Human Attributes	At least 2 credit hours			
1.1. Anthropometry & Demography				
1.2. Physiology & Biomechanics				
1.3. Psychology				
2. Environmental Context	At least 2 credit hours			
2.1. Physical				
2.2. Social				
2.3. Organizational				
C. Core Methodology: Analysis & Design of Processes & Products	6 credit hours total			
1. Statistics & Design of Investigations	At least 2 credit hours			
2. Basic Process Analysis	Each at least 1 credit hour			
3. Design Methods				
4. Basic Usability				

D. Application of Analysis, Design, Validations & Implementation Methods	8 credit hours total			
<ul style="list-style-type: none"> 1. Human-Machine Interaction 2. Human-Environment Interaction 3. Human-Software Interaction 4. Human-Job Interaction 5. Human-Organization Interface 	<p>At least 1 credit hour in 3 of the 5 areas of Human Interactions</p>			
E. Professional Issues	1 credit hour total			
<ul style="list-style-type: none"> 1. Ethics 2. Practice Standards 3. Marketing 4. Business Practice 5. Legal Liabilities 				

C. Required Academic Credit Hours Equivalency Table

CATEGORY	Academic Credit Hours (Semester)	Academic Credit Hours (Quarter)	CE Credit Hours*	Contact Hours**
A. Basic Principles	3	4.5	4.5	45
B. Core Background	6	9	9	90
C. Core Methodology: Analysis & Design of Processes & Products	6	9	9	90
D. Application of Analysis, Design, Validation & Implementation	8	12	12	120
E. Professional Issues	1	1.5	1.5	15
Total	24	36	36	360

*See Education section for acceptable CE Credits.

**Note: Each semester credit hour requires 15 contact hours. A CE credit hour is equivalent to one quarter credit hour and both require 10 contact hours. One semester credit hour is equivalent to 1.5 quarter or CE credit hours.

The comparison grid of units/hours is provided for convenience. A core background in HF/E/UX obtained primarily through training (versus education) programs is not acceptable.

D. BCPE References

The lists of references are to assist applicants in their study preparation for the BCPE examination. The books are general references that address topics of the Core Competencies at various levels of depth. Consequently, there is overlap among the topics they cover. Many of the books are available in public, university and/or employer libraries and at online resources.

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- <http://www.design.ncsu.edu:8120/cud/aboutud/udprinciples.htm> Center for Universal Design, Universal Design Principles.
- http://www.bipm.org/en/si/si_brochure/ The International System of Units (SI)

Good Statistical Text

Examples:

Hays, W. L. (2007). *Statistics* (6th Ed). Wadsworth Publishing

Kirk, R. E. (2006). *Experimental Design: Procedures for Behavioral Sciences* (4th Ed.). SAGE Publications, Inc

Online Statistics: A Multimedia Course of Study (this is a free site) <http://onlinestatbook.com>

E. Sample Examination Questions

The following questions are examples of multiple-choice questions across the core competencies, similar to the questions in the BCPE exam. These sample questions are statistically validated.

Answers to the sample questions are on pages following the questions.
Please refer to the [exam reference list](#) for sources of these questions.

Number	Question
1	<p>A systems integrator is designing a control panel and asks about the considerations that would go into grouping controls. Which of the following is NOT typically a consideration when grouping?</p> <ul style="list-style-type: none">a. Shape and color of controlsb. Sequence of usec. Control functiond. Frequency of use
2	<p>What is the MOST common rule of thumb measure for setting work height when standing?</p> <ul style="list-style-type: none">a. Hip heightb. Chest heightc. Elbow heightd. 100 cm (40 in)
3	<p>In the waning hours of daylight, a person falls after tripping over a decorative pot next to a walkway. The pot is made of a blue-green plastic. The person claims that the blue-green color was very difficult to see in the fading daylight. Disregarding other factors, is there a scientific basis for the claim that the color was difficult to see because of the decreased light?</p> <ul style="list-style-type: none">a. Yes, all colors are difficult to see in reduced light.b. No, the human visual system becomes more sensitive to the blue-green part of the spectrum in diminishing light.c. Yes, humans aren't very sensitive to that part of the color spectrum.d. No, as long as the ambient light level is above scotopic levels, all colors are equally easy to see.
4	<p>There is concern that a worker might experience carpal tunnel syndrome. Which strategy will provide the least benefit?</p> <ul style="list-style-type: none">a. Provide gloves to reduce the concentration of forceb. Redesign the job to reduce wrist deviationc. Decrease the hand forces to move, push, or pull objects.d. Decrease the number of times per day the job is performed

5	<p>A worker has a lifting related injury. Which of the following is LEAST likely to have occurred?</p> <ul style="list-style-type: none"> a. Damage to the erector spinae muscles b. Compression damage to the intervertebral disc c. Herniated disc d. Damage to the shoulder rotator cuff
6	<p>A manufacturing company uses an indexing conveyor that stops in front of each operator for a specific time (cycle time) for an assembly operation. The management has asked an ergonomist to predict the effects of reducing the time allocated to the task. Which of the following results is NOT likely to occur?</p> <ul style="list-style-type: none"> a. Increased productivity with reduced quality. b. Increased productivity with increased worker morale. c. Increased productivity with higher occupational safety and health costs. d. Increased productivity at higher payroll costs.
7	<p>An international client is expanding the role of an existing web-based work organization information tool while responding to user difficulties. The client wants a design specification that can also be used by their off-site software quality testing group. Which of the following is an effective and efficient series of steps for an ergonomist to propose to the client?</p> <ul style="list-style-type: none"> a. Interview subject matter experts, gather user difficulty incidents, conduct a task analysis, and initiate personas development, leading to a use case analysis of users at the mouse click/keystroke level b. Interview current users and their management as to both critical incidents and non-critical incidents of user difficulties, document issues, and provide a training program to address problems c. Have current users perform certain tasks to uncover usability problems d. Interview current users and their management as to critical incidents of user difficulties, redesign accordingly, document issues for the software quality testing group, and have current users perform specific tasks to identify usability issues.
8	<p>What type of information should be used with breadcrumb navigation?</p> <ul style="list-style-type: none"> a. Hierarchical information b. Heterogeneous information c. Short lists of any information type as long as it doesn't exceed seven items d. Contextual categories of information
9	<p>Which of the following describes how an ergonomist would design cutting shears to comply with the universal design principle of "flexibility in use."</p> <ul style="list-style-type: none"> a. Provide a variety of sizes to accommodate users' hand sizes. b. Provide handles with long levers to reduce the force required to cut materials. c. Design shears that can be used with either the left or right hand. d. Design shears that are battery or electric powered to minimize repetitive actions and force.

10	<p>How should a warning system be designed to notify workers on an assembly line to evacuate the building?</p> <ol style="list-style-type: none"> Have blinking red text on a white background positioned next to exit doors. Have a speech signal using an emotional female voice speaking at a fast rate followed by five second alarm tone and blinking lights. Have a speech signal using a monotone male voice speaking at a slow, deliberate rate delivering a concise message followed by a ten second alarm tone and blinking lights. Have a minimum ten second alarm tone followed by verbal evacuation message and blinking lights.
11	<p>A recent study of exercise levels involved in golf was undertaken to see if, from a physiological perspective, golf should be considered a sport. Four conditions were tested: carrying one's own golf bag and walking the course, having a caddie carry the bag for the player and walking the course, using a push cart for the golf bag and walking the course, and carrying the golf bag and riding in a golf cart between shots. The study had four groups of the same golfers play on the same course but varied the order of conditions in which they played (caddie, walking, pushing, and riding). What is this technique is known as?</p> <ol style="list-style-type: none"> Counterstressor Countermeasure Counterindication Counterbalancing
12	<p>An ergonomist is invited to be a human factors consultant in a team tasked with a design of an information system for an organization. What should be the ergonomist's FIRST priority in this capacity as the team sets to work?</p> <ol style="list-style-type: none"> Support the other design team members in the conceptual design of the system, acting as a representative of the end user in this process. Start designing usability testing procedures so that they can be ready to test the first functional prototypes of the system. Identify the intended users of the system, their needs, and their prior knowledge and experiences before any other members of the design team begins their tasks. Start designing training and other support materials in parallel with the other aspects of the system design.
13	<p>In a mission-critical human-computer system, which of the following statements BEST describes the difference between the human and the computer when accounting for them in the analysis of the system?</p> <ol style="list-style-type: none"> Humans react to heat and other environmental stressors differently from computers. Human performance is typically far more variable than computer performance in any given circumstance. Humans are more cognitively complex and can better understand the system goals and objectives. Humans take longer than computers to perform most tasks.

14	<p>The majority of users using a multi-line office telephone with call waiting, hold, and forwarding functions and a voice-mail system cannot properly operate most of these features. Ignoring the cost of redesign, where would human factors make the MOST significant contribution to the ultimate usability of the system?</p> <ol style="list-style-type: none"> In the initial stages of the system's design, investigate the users' expectations and experiences to provide natural mappings between the telephone system's functions and users' control actions. In the redesign of the telephone interface, provide the users with labels for each of the telephone's buttons and functions to aid their memory. In the creation of an instruction manual with clearly tabbed sections for each of the telephone's functions and step-by-step instructions for users, provide instructions for the most commonly used functions on a separate "quick reference" card. In the creation of a short, online training module, explain the telephone system's features and their operation.
15	<p>When accidents occur, the human operator is often a contributing factor. However, more often than not, this person may be only the final trigger at the end of a series of earlier events. Factors such as poor interface design, inappropriate sleep schedules and fatigue, management attitudes that overemphasize productivity, and concerns about consequences of self-reporting of incidents represent accidents waiting to happen. These are prevalent in healthcare. These factors could be considered characteristics of which of the following?</p> <ol style="list-style-type: none"> Safety culture Employee characteristics Written warning and warning labels Hazard identification
16	<p>Critical data on nuclear power plant operation is read from printouts using six-point font. The IES Lighting Handbook recommends 1,500 lux of illumination. A light meter indicates the overhead lights provide 500 lux of illumination on the paper. What change would reduce the risk of error?</p> <ol style="list-style-type: none"> Move the worker's desk near a window to increase the amount of light. Change the color of the printing from black to red to maintain the worker's attention. Use a higher watt light bulb to increase the illuminance to 2,500 lux to provide a safety factor. Lower the overhead light fixtures to increase the amount of light.
17	<p>How should an ergonomist design an automated system for a car that will automatically follow the car in front of it?</p> <ol style="list-style-type: none"> The automation should always be engaged so as to prevent human error. A warning light should be provided that will tell the driver when to take control in cases where the automation does not know what to do. Provide the operator with alternative tasks so that they will not get bored during the drive. Provide a manual override and clear presentation of the state of the tasks the automation is performing compared to the goal state.

18	<p>Which of the following is exclusively an interface design process?</p> <ul style="list-style-type: none"> a. Waterfall model b. Agile process c. User centered process d. Participatory design
19	<p>In which of the following situations would an ergonomist NOT expect “contact stress”?</p> <ul style="list-style-type: none"> a. Rowing in a lake b. Competitive swimming c. Jogging in a city d. Watching high school basketball
20	<p>A version of a shareware computer application is designed to ask the user to purchase it before the application runs but allows the user to use the application without paying. The possible options on this start-up message are “Yes” and “No;” however, the location of these two buttons is reversed each time the application is opened. Which of the following BEST describes the probability of selecting an incorrect option (i.e., selecting “Yes” when “No” was the intended response)?</p> <ul style="list-style-type: none"> a. The probability would remain the same over time. b. The probability would increase over time. c. The probability would decrease over time as the users gain experience and learn the pattern of the button locations. d. The probability would vary depending on the level of attention afforded at each use of the product.
21	<p>What type of analysis can be described as the evaluation of software completed by looking at the interface and trying to arrive at opinions of what is good and bad?</p> <ul style="list-style-type: none"> a. Heuristic evaluation b. Retrospective testing c. Focus groups d. Thinking aloud
22	<p>Which of the following would LEAST likely be encountered on a long airplane ride?</p> <ul style="list-style-type: none"> a. Static load b. Metabolic load c. Inadequate clearance d. Pressure points
23	<p>For which industry did Occupational Safety and Health Administration (OSHA) develop its first written ergonomics guidelines?</p> <ul style="list-style-type: none"> a. Meatpacking b. Automotive c. Aeronautics (for cockpit design) d. Service industry (for computer work)

24	<p>Which of the following components does the National Institute for Occupational Safety and Health (NIOSH) lifting equation NOT take into account?</p> <ul style="list-style-type: none">a. Twistingb. Accelerationc. Couplingd. Load lifted
25	<p>Which of the following is a good example of knowledge based behavior?</p> <ul style="list-style-type: none">a. Grabbing a falling footballb. Diagnosing an engine malfunctionc. Responding to an engine light failure with the execution of a checklistd. Manually flying a plane down the glide slope to land

ANSWER KEY

Number	Answer
1	a. Shape and color of controls
2	c. Elbow height
3	b. No, the human visual system becomes more sensitive to the blue-green part of the spectrum in diminishing light.
4	a. Provide gloves to reduce the concentration of force
5	d. Damage to the shoulder rotator cuff
6	b. Increased productivity with increased worker morale.
7	d. Interview current users and their management as to critical incidents of user difficulties, redesign accordingly, document issues for the software quality testing group, and have current users perform specific tasks to identify usability issues.
8	a. Hierarchical information
9	c. Design shears that can be used with either the left or right hand.
10	d. Have a minimum ten second alarm tone followed by verbal evacuation message and blinking lights.
11	d. Counterbalancing
12	c. Identify the intended users of the system, their needs, and their prior knowledge and experiences before any other members of the design team begins their tasks.
13	b. Human performance is typically far more variable than computer performance in any given circumstance.
14	a. In the initial stages of the system's design, investigate the users' expectations and experiences to provide natural mappings between the telephone system's functions and users' control actions.
15	a. Safety culture
16	d. Lower the overhead light fixtures to increase the amount of light.
17	d. Provide a manual override and clear presentation of the state of the tasks the

	automation is performing compared to the goal state.
18	c. User centered process
19	b. Competitive swimming
20	d. The probability would vary depending on the level of attention afforded at each use of the product.
21	a. Heuristic evaluation
22	b. Metabolic load
23	a. Meatpacking
24	b. Acceleration
25	b. Diagnosing an engine malfunction

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