A LLM USAGE

Large Language Models (LLMs) are used to aid in the writing and polishing of the manuscript. Specifically, we use an LLM to assist in refining the language, improving readability, and ensuring clarity in various sections of the paper. The model helps with tasks such as sentence rephrasing, grammar checking, and enhancing the overall flow of the text.

It is important to note that the LLM is not involved in the ideation, research methodology, or experimental design. All research concepts, ideas, and analyses are developed and conducted by the authors. The contributions of the LLM are solely focused on improving the linguistic quality of the paper, with no involvement in the scientific content or data analysis.

The authors take full responsibility for the content of the manuscript, including any text generated or polished by the LLM. We ensure that the LLM-generated text adheres to ethical guidelines and does not contribute to plagiarism or scientific misconduct.

B REFINEMENT METHODS AND OPTIMIZATION ANALYSIS

The refinement methods can be categorized into three levels: (1) Enhancement by Distraction (Low HI), (2) Enrichment by Cross-Disciplinary Integration (Medium HI), and (3) Expert-Driven Refinement (High HI). Below, we present examples of each method, comparing the original questions with their refined versions and analysing the enhancement process. The differences between the original and refined versions are highlighted in red.

1. ENHANCEMENT BY DISTRACTION (LOW HI)

Original Question

Original Question: A protocol suite is ()=.

- A) A set of protocols.
- B) A hierarchical collection of protocols.

Refined Question

Refined Question: Regarding protocol suites, which of the following statements is correct? ()

- A) TCP/IP only includes two protocols.
- B) The OSI model has seven layers, each corresponding to a specific protocol in a suite.
- C) HTTP is not part of any protocol suite.
- D) FTP operates independently of any protocol suite.

Analysis: The refined version builds upon the original options by expanding the abstract terms "a set of protocols" and "a hierarchical collection of protocols" through the inclusion of concrete examples such as TCP/IP, OSI, HTTP, and FTP. This enrichment enhances the informational depth of the question and elevates its professional and technical specificity, thereby reducing the probability of correct guessing and strengthening the assessment's effectiveness in evaluating true conceptual understanding.

2. ENRICHMENT BY CROSS-DISCIPLINARY INTEGRATION (MEDIUM HI)

Original Question

Original Question: Given an element with a maximum oxidation state of +7, determine its period and group.

Refined Question

Refined Question: Elements A, B, C, and D are from period 4:

- A forms a 1:1 compound with an oxidation state of +7;
- B is a d-block element with an oxidation state of +7;
- C is in the same period and has the same oxidation state as B;
- D is the most electronegative element in the set.

Fill in the table below and order the four elements by electronegativity from high to low.

	Element	Symbol	Period	Group	Max Oxidation
A					
B					
C					
D					

Table 4: Element Properties

Analysis: The refined question improves upon the original by integrating cross-disciplinary knowledge and contextual clues, promoting higher-order thinking. While the original question only asked students to identify the period and group of an element with a +7 oxidation state—requiring basic recall—the revised version introduces four elements from period 4, each with specific properties tied to oxidation states, electronegativity, and element classification. Students must analyze multiple clues, apply periodic trends, and reconcile inconsistencies (e.g., fluorine not being in period 4), which fosters critical thinking. They also complete a table and rank elements by electronegativity, combining factual knowledge with synthesis and evaluation. This enhancement increases cognitive demand, integrates multiple chemistry concepts, and reduces guessing, transforming a simple recall question into a comprehensive reasoning task.

3. EXPERT-DRIVEN REFINEMENT (HIGH HI)

Original Question

Original Question: A machine has a 16-bit instruction field and a 6-bit address field. If the opcode is 8 bits long, how many 0-address instructions are possible?

Refined Question

Refined Question: A machine uses 16-bit instruction words and 6-bit operand addresses. Assume the opcode length is fixed, with instructions in three formats: 0-, 1-, and 2-address. Given M 0-address and N 1-address instructions, what is the maximum number of 2-address instructions? If the opcode length is variable, what is the maximum number of 2-address instructions?

Analysis: The refined question improves upon the original by introducing multiple instruction formats (0-, 1-, and 2-address) and asking students to calculate the maximum number of 2-address instructions under both fixed and variable opcode length assumptions. This requires a deeper understanding of instruction encoding and opcode space management. Unlike the original, which involved a simple calculation based on fixed field sizes, the enhanced version tests students' ability to analyze how opcode and address fields are shared across different instruction types, apply multi-step reasoning to maximize opcode space under architectural constraints, and understand advanced encoding techniques such as opcode expansion in variable-length models. By embedding theoretical concepts into a practical design problem, the question promotes higher-order thinking and better assesses students' grasp of computer architecture principles.

C DIFFICULTY-STRATIFIED SAMPLES

Easy Sample

Question:
Regarding the structures of PROM and PAL, which of the following statements are correct? ()

A) PROM has a fixed AND array that is not programmable
B) Both AND array and OR array of PROM are not programmable
C) Both AND array and OR array of PAL are programmable
D) The AND array of PAL is programmable

Answer: AD
Discipline: Engineering and Technological Sciences
Field: Electronics and Communication Technology
Subfield: Electronic Technology

Question:
According to the causes of dyspnea and its manifestations, dyspnea can be divided into _____, _____, _____ three types.
Answer: inspiratory dyspnea, expiratory dyspnea, mixed dyspnea
Discipline: Agricultural Sciences
Field: Animal Husbandry and Veterinary Science
Subfield: Veterinary Medicine

Question:
The main issues to note when designing a social survey research plan are ( ).
A. Practicality B. Systematicness C. Timeliness D. Economy E. Accuracy F. Flexibility
Answer: ABCDF
Discipline: Social Sciences and Humanities
Field: Sociology
Subfield: Sociological Methods

Question:
Among the following drugs, those with optical activity are ( )
A. Ranitidine B. Ephedrine C. Pethidine D. Omeprazole E. Naproxen
Answer: ABCDE
Discipline: Medical Sciences
Field: Pharmacy
Subfield: Medicinal Chemistry

Question:
Judge whether the following statement is correct: According to the change law of the resistance coefficient along the path, the Nikuradse experimental curve is divided into three regions.
Answer: False
Discipline: Natural Sciences
Field: Mechanics
Subfield: Fluid Mechanics

Middle Sample

Question: The Foreign Trade Import and Export Service Company under the Foreign Trade Bureau of City A signed a sales contract with Enterprise B of City A. A dispute arose during the performance of the contract. Later, the Foreign Trade Import and Export Service Company was divided into two separate legal entities: the Foreign Trade Commodity Trading Company of City A and the Import and Export Service Company of City A. No arrangements were made regarding the aforementioned sales contract during the division. Now, Enterprise B has filed a lawsuit in court over the contract dispute. The defendant(s) in this lawsuit should be ( )

A) The Foreign Trade Import and Export Service Company of City A
B) The Foreign Trade Bureau of City A
C) Either the Foreign Trade Commodity Trading Company of City A or the Import and Export Service Company of City A
D) Both the Foreign Trade Commodity Trading Company of City A and the Import and Export Service Company of City A

Answer: C
Discipline: Social Sciences and Humanities
Field: Law
Subfield: Sectoral Law

Question:
Determine whether the following statement is correct: Both the in-duct dilution probe and the out-of-duct dilution probe use critical sonic orifice sampling.
Answer: False
Discipline: Engineering and Technological Sciences

Field: Environmental Science and Technology and Resource Science and Technology
Subfield: Environmental Engineering

Question:
The damage caused by above-zero low temperature to thermophilic plants is generally divided into two steps:
Step 1: _____, Step 2: _____
Answer: Change in membrane phase / Membrane phase transition; Death resulting from metabolic disorder due to membrane damage
Discipline: Agricultural Sciences
Field: Agronomy
Subfield: Basic Agricultural Sciences

Question:
What is the natural reaction method? What is its application value in infant research?
Answer:
1. Definition: By examining the innate reflex activities of infants and young children, make inferences on the development and changes of their psychological abilities and their essence.
2. Application value:
- Many innate reflexes have important survival value
- Typical examples: visual tracking and cliff response
Discipline: Natural Sciences
Field: Psychology
Subfield: Developmental Psychology

Question:
Which of the following statements about weighted imaging is correct?

A) T1WI is the T1 value map of tissue
B) Proton density affects signal intensity in any pulse sequence image
C) The longer the T1 value of tissue, the higher the signal on T1WI
D) The longer the T2 value of tissue, the lower the signal intensity
E) T2WI refers to imaging parameters that extend the tissue's T2 value

Answer: A
Discipline: Medical Sciences
Field: Basic Medical Sciences
Subfield: Radiology

Hard Sample

Question:
A certain machine has an instruction word length of 16 bits, and each operand's address code is 6 bits. Assume the opcode length is fixed, and instructions are divided into three formats: zero-address, one-address, and two-address. If there are M zero-address instructions and N one-address instructions, what is the maximum number of two-address instructions? If the opcode length is variable, what is the maximum number of two-address instructions allowed?
Answer:

1) If a fixed-length opcode is used, the two-address instruction format is as follows: Let K be the number of two-address instructions. Then

$$K = 2^4 - M - N$$

When $M = 1$ (minimum) and $N = 1$ (minimum), the maximum number of two-address instructions is

$$K_{\max} = 16 - 1 - 1 = 14.$$

2) If a variable-length opcode is used, the two-address instruction format is still as shown in 1), but the opcode length can vary with the number of address codes. In this case,

$$K = 2^4 - \left(\frac{N}{2^6} + \frac{M}{2^{12}}\right).$$

When $\frac{N}{2^6} + \frac{M}{2^{12}} \leq 1$, K is maximized. So the maximum number of two-address instructions is

$$K_{\max} = 16 - 1 = 15$$

(leaving one encoding as an extension flag).

Discipline: Engineering and Technological Sciences
Field: Computer Science and Technology
Subfield: Computer System Architecture

Question:
It is known that two of the following four statements are true.
1) Everyone in Class A is from Shanghai.
2) Zhao Yun in Class A is from Shanghai.
3) Some people in Class A are from Shanghai.
4) Some people in Class A are not from Shanghai.
Question: Can we determine whether Zhao Yun in Class A is from Shanghai?
Answer: Cannot be determined
Discipline: Social Sciences and Humanities
Field: Philosophy
Subfield: Logic

Question:
The pharmacological effects of thiazide diuretics include: ( )

A) Antihypertensive effect
B) Decrease in glomerular filtration rate
C) Increase in blood glucose levels
D) Increase in urate excretion
E) Antidiuretic effect

Answer: ABCE
Discipline: Agricultural Sciences
Field: Animal Husbandry and Veterinary Science
Subfield: Veterinary Medicine

Question:
Some Nocardia species are acid-fast positive, but only with _____.
Prolonged decolorization renders them negative, which helps differentiate them from _____ bacteria. **Answer:** 1% hydrochloric acid ethanol; Mycobacterium tuberculosis
Discipline: Medical Sciences
Field: Basic Medical Sciences
Subfield: Medical Microbiology

Question:
Suppose $\{N(t),\ t \geq 0\}$ is a Poisson process with intensity λ, X_n $(n \geq 1)$ represents the time interval between the $(n-1)$st and nth event, then $\mathbb{E}(X_1 \mid N(t) = 1) =$ _____.
Answer: $t/2$
Discipline: Natural Sciences
Field: Mathematics
Subfield: Probability Theory

D THE SUBFIELD OF EESE-POOL

1. NATURAL SCIENCES

Natural Sciences	
Field	**Subfield**
Mathematics	A1: History of Mathematics (35)
	A2: Algebra (48)
	A3: Geometry (34)
	A4: Function Theory (155)
	A5: Ordinary Differential Equations (207)
	A6: Probability Theory (263)
	A7: Mathematical Statistics (80)
	A8: Discrete Mathematics (79)
	A9: Mathematical Logic and Foundations (80)
	A10: Number Theory (80)
	A11: Algebraic Geometry (80)
	A12: Topology (80)
	A13: Mathematical Analysis (85)
	A14: Integral Equations (81)
	A15: Applied Statistical Mathematics (80)
	A16: Operations Research (80)
	A17: Combinatorial Mathematics (80)
	A18: Fuzzy Mathematics (80)
	A19: Computational Mathematics (80)
	A20: Applied Mathematics (80)
Information Science and Systems Science	A21: Basic Disciplines of Information Science and Systems Science (120)
	A22: Systems Science (73)
	A23: Control Theory (80)
	A24: System Evaluation and Feasibility Analysis (80)
	A25: Systems Engineering Methodology (72)
Mechanics	A26: Basic Mechanics (141)
	A27: Fluid Mechanics (1334)
Physics	A28: History of Physics (23)
	A29: Theoretical Physics (59)
	A30: Acoustics (25)
	A31: Thermodynamics (488)
	A32: Optics (30)
	A33: Electromagnetism (404)
	A34: Electronic Physics (108)
	A35: Condensed Matter Physics (95)
	A36: Atomic and Molecular Physics (85)
	A37: Computational Physics (35)
	A38: Applied Physics (202)
Chemistry	A39: Inorganic Chemistry (156)
	A40: Organic Chemistry (24)
	A41: Analytical Chemistry (31)
	A42: Physical Chemistry (604)
	A43: Polymer Physics (30)
	A44: Materials Chemistry (61)
	A45: History of Chemistry (86)
	A46: Chemical Physics (70)
	A47: Polymer Chemistry (71)
	A48: Nuclear Chemistry (80)
	A49: Applied Chemistry (80)

Natural Sciences	
Field	**Subfield**
Astronomy	A50: Celestial Mechanics (72)
	A51: Astrophysics (70)
	A52: Cosmochemistry (70)
	A55: Galaxies and Cosmology (80)
	A53: Stellar Evolution (80)
	A54: Stars and the Milky Way (80)
	A56: The Sun and Solar System (76)
	A57: Astrogeodynamics (80)
	A58: Chronometry (80)
Earth Science	A59: Geology (153)
	A60: Atmospheric Science (70)
	A61: Solid Earth Geophysics (80)
	A62: Space Physics (80)
	A63: Geochemistry (80)
	A64: Geodesy (80)
	A65: Cartography (79)
	A66: Geography (80)
	A67: Hydrology (77)
	A68: Ocean Science (82)
Biology	A69: Biophysics (21)
	A70: Biochemistry (48)
	A71: Cell Biology (70)
	A72: Immunology (42)
	A73: Physiology (108)
	A74: Developmental Biology (171)
	A75: Genetics (43)
	A76: Molecular Biology (67)
	A77: Evolutionary Biology (44)
	A78: Ecology (565)
	A79: Neurobiology (46)
	A80: Botany (1697)
	A81: Entomology (734)
	A82: Zoology (1007)
	A83: Microbiology (513)
	A84: Virology (22)
Psychology	A85: Anthropology (21)
	A86: Social Psychology (167)
	A87: Developmental Psychology (916)
	A88: Psychometrics (366)
	A89: Physiological Psychology (454)
	A90: Managerial Psychology (169)
	A91: Educational Psychology (319)

2. AGRICULTURAL SCIENCE

Agricultural Science	
Field	**Subfield**
Agronomy	B1: Basic Agricultural Sciences (1136)
	B2: Crop Science (84)
	B3: History of Agriculture (90)
	B4: Horticulture (79)
	B5: Storage and Processing of Agricultural Products (75)
	B6: Soil Science (76)
	B7: Plant Protection Science (79)
Forestry	B8: Landscape Architecture (822)
	B9: Forest Genetics and Breeding (80)
	B10: Silviculture (80)
	B11: Forest Management (80)
	B12: Forest Protection (80)
	B13: Wildlife Conservation and Management (80)
	B14: Forest Statistics (80)
	B15: Forestry Economics (80)
Animal Husbandry and Veterinary Science	B16: Veterinary Medicine (1753)
	B17: Basic Disciplines of Animal Husbandry and Veterinary Science (80)
	B18: Animal Husbandry Science (80)
Aquaculture	B19: Aquafeed Science (75)
	B20: Aquatic Conservation (71)
	B21: Fisheries Science (80)
	B22: Storage and Processing of Aquatic Products (73)
	B23: Aquaculture Engineering (80)
	B24: Aquatic Resources Science (73)

3. MEDICAL SCIENCE

Medical Science	
Field	**Subfield**
Basic Medical Sciences	C1: History of Medicine (35)
	C2: Human Anatomy (1358)
	C3: Human Physiology (108)
	C4: Radiology (1597)
	C5: Medical Parasitology (159)
	C6: Medical Microbiology (1147)
	C7: Pathology (388)
	C8: Medical Laboratory Animal Science (247)
Clinical Medicine	C9: Clinical Diagnostics (90)
	C10: Preventive Medicine (58)
	C11: Anesthesiology (183)
	C12: Internal Medicine (549)
	C13: Surgery (1263)
	C14: Ophthalmology (514)
	C15: Stomatology (2186)
	C16: Nuclear Medicine (188)
	C17: General Practice (120)
	C18: Nursing (520)
Preventive Medicine and Public Health	C19: Environmental Medicine (281)
	C20: Health Statistics (578)
	C21: Nutrition (80)
	C22: Toxicology (75)
	C23: Disinfection Science (80)
	C24: Epidemiology (80)
	C25: Vector Biology Control (80)
	C26: Occupational Disease (80)
	C27: Endemic Disease (80)
	C28: Social Medicine (80)
	C29: Health Inspection (78)
	C30: Food Hygiene (72)
	C31: Environmental Hygiene (79)
	C32: Eugenics (80)
	C33: Health Promotion and Health Education (80)
	C34: Health Management (80)
Military and Special Medicine	C35: Military Medicine (70)
	C36: Special Medicine (72)
Pharmacy	C37: Medicinal Chemistry (2041)
	C38: Pharmaceutics (24)
	C39: Pharmaceutical Administration (888)
Traditional Chinese Medicine and Materia Medica	C40: Traditional Chinese Medicine (3226)
	C41: Chinese Materia Medica (2362)

4. ENGINEERING AND TECHNOLOGICAL SCIENCES

Engineering and Technological Sciences	
Field	**Subfield**
Basic Disciplines of Engineering and Technological Sciences	D1: Engineering Mechanics (50)
	D2: Engineering Geology (81)
	D3: Engineering Mathematics (76)
	D4: Engineering Cybernetics (80)
	D5: Engineering Hydrology (80)
	D6: Engineering Bionics (80)
	D7: Engineering Psychology (80)
	D8: Standards Science and Technology (80)
	D9: Metrology (80)
	D10: Exploration Technology (80)
	D11: General Engineering Technology (80)
	D12: Industrial Engineering (80)
Engineering and Technology Related to Information and Systems Science	D13: Control Science and Technology (98)
	D14: Information Security Technology (761)
	D15: Systematic Application of Information Technology (82)
	D16: Simulation Science and Technology (80)
Engineering and Technology Related to Natural Sciences	D17: Engineering and Technology Related to Physics (70)
	D18: Optical Engineering (125)
	D19: Marine Engineering and Technology (80)
	D20: Bioengineering (79)
	D21: Agricultural Engineering (83)
Surveying and Mapping Science and Technology	D22: Geodetic Surveying Technology (87)
	D23: Photogrammetry and Remote Sensing Technology (72)
	D24: Cartographic Technology (89)
	D25: Engineering Surveying Technology (540)
	D26: Marine Surveying (80)
Materials Science	D27: Basic Disciplines of Materials Science (327)
	D28: Surveying Instruments (80)
	D29: Material Surfaces and Interfaces (70)
	D30: Material Failure and Protection (80)
	D31: Material Testing and Analysis Technology (72)
	D32: Material Experiments (80)
	D33: Material Synthesis and Processing Technology (80)
	D34: Metallic Materials (79)
	D35: Inorganic Non-Metallic Materials (72)
	D36: Organic Polymer Materials (77)
	D37: Composite Materials (74)
	D38: Biomaterials (75)
	D39: Nanomaterials (80)

Engineering and Technological Sciences	
Field	**Subfield**
Mining Engineering Technology	D40: Mining Geology (88)
	D41: Mine Surveying (70)
	D42: Mine Design (75)
	D43: Surface Mining Engineering (78)
	D44: Underground Mining Engineering (80)
	D45: Mining Engineering (86)
	D46: Mineral Processing Engineering (78)
	D47: Drilling Engineering (80)
	D48: Oil and Gas Field Development Engineering (84)
	D49: Petroleum and Natural Gas Storage and Transportation Engineering (83)
	D50: Mining Machinery Engineering (80)
	D51: Mining Electrical Engineering (80)
	D52: Mining Environmental Engineering (87)
	D53: Mine Safety (93)
	D54: Comprehensive Utilization of Mining Resources Engineering (84)
Metallurgical Engineering Technology	D55: Metallurgical Physical Chemistry (72)
	D56: Metallurgical Thermal Engineering (80)
	D57: Metallurgical Technology (70)
	D58: Ferrous Metallurgy (70)
	D59: Non-Ferrous Metallurgy (70)
	D60: Rolling (80)
	D61: Metallurgical Machinery and Automation (70)
Mechanical Engineering	D62: Mechanical Design (1941)
	D63: Mechanical Manufacturing Processes and Equipment (231)
	D64: Cutting Tool Technology (80)
	D65: Machine Tool Technology (80)
	D66: Fluid Transmission and Control (83)
	D67: Mechanical Manufacturing Automation (80)
Power and Electrical Engineering	D68: Electrical Engineering (681)
	D69: Engineering Thermophysics (80)
	D70: Thermal Engineering (80)
	D71: Power Machinery Engineering (80)
	D72: Refrigeration and Cryogenic Engineering (80)

Engineering and Technological Sciences	
Field	**Subfield**
Energy Science and Technology	D73: Energy Chemistry (72)
	D74: Energy Computing and Measurement (80)
	D75: Energy Storage Technology (80)
	D76: Energy-Saving Technology (80)
Nuclear Science and Technology	D77: Nuclear Detection Technology and Nuclear Electronics (70)
	D78: Radiometric Metrology (70)
	D79: Nuclear Instruments and Equipment (78)
	D80: Nuclear Materials and Process Technology (70)
	D81: Particle Accelerators (70)
	D82: Fission Reactor Engineering Technology (70)
	D83: Nuclear Fusion Engineering Technology (80)
	D84: Nuclear Power Engineering Technology (79)
	D85: Isotope Technology (95)
	D86: Nuclear Explosion Engineering (92)
	D87: Nuclear Safety (80)
	D88: Spent Fuel Reprocessing Technology (80)
	D89: Radiation Protection Technology (80)
	D90: Nuclear Facility Decommissioning Technology (80)
	D91: Radioactive Waste Treatment and Disposal Technology (80)
Electronics and Communication Technology	D92: Electronic Technology (736)
	D93: Information Processing Technology (27)
	D94: Communication Technology (50)
	D95: Optoelectronics and Laser Technology (81)
	D96: Semiconductor Technology (80)
	D97: Broadcasting and Television Engineering Technology (80)
	D98: Radar Engineering (80)
Computer Science and Technology	D99: Basic Disciplines of Computer Science and Technology (922)
	D100: Computer System Architecture (999)
	D101: Computer Software (228)
	D102: Computer Engineering (41)
	D103: Computer Applications (285)

Engineering and Technological Sciences	
Field	**Subfield**
Chemical Engineering	D104: Basic Disciplines of Chemical Engineering (64)
	D105: Chemical Measurement Technology and Instrumentation (80)
	D106: Chemical Transport Processes (80)
	D107: Chemical Separation Engineering (80)
	D108: Chemical Reaction Engineering (80)
	D109: Chemical Systems Engineering (80)
	D110: Chemical Machinery and Equipment (75)
	D111: Inorganic Chemical Engineering (74)
	D112: Organic Chemical Engineering (80)
	D113: Electrochemical Engineering (77)
	D114: Coal Chemical Engineering (79)
	D115: Petrochemical Engineering (79)
	D116: Natural Gas Chemical Engineering (80)
	D117: Fine Chemical Engineering (76)
	D118: Papermaking Technology (86)
	D119: Fur and Leather Engineering (83)
	D120: Pharmaceutical Engineering (127)
	D121: Biochemical Engineering (116)
Engineering and Technology Related to Product Applications	D122: Product-Specific Application Technology (21)
	D123: Instrumentation Technology (80)
	D124: Weapons Science and Technology (90)
Textile Science and Technolog	D125: Textile Materials (80)
	D126: Fiber Manufacturing Technology (80)
	D127: Textile Technology (80)
	D128: Dyeing and Finishing Technology (80)
	D129: Clothing Technology (80)
	D130: Textile Machinery and Equipment (80)
Food Science and Technology	D131: Basic Disciplines of Food Science and Technology (80)
	D132: Food Packaging and Storage (77)
	D133: Food Machinery (80)
	D134: Processing and Utilization of By-Products in Food Processing (80)
	D135: Food Industry Business Management (86)
	D136: Food Engineering and Grain and Oil Engineering (80)

Engineering and Technological Sciences	
Field	**Subfield**
Civil and Architectural Engineering	D137: History of Architecture (85)
	D138: Building Materials (175)
	D139: Civil and Architectural Structures (108)
	D140: Civil and Architectural Engineering Design (235)
	D141: Basic Disciplines of Civil and Architectural Engineering (80)
	D142: Civil and Architectural Engineering Surveying (80)
	D143: Engineering Structures (80)
	D144: Civil and Architectural Engineering Construction (80)
	D145: Civil Engineering Machinery and Equipment (80)
	D146: Municipal Engineering (80)
	D147: Architectural Economics (80)
Hydraulic Engineering	D148: Basic Disciplines of Hydraulic Engineering (173)
	D149: Hydraulic Engineering Surveying (70)
	D150: Hydraulic Materials (79)
	D151: Hydraulic Structures (80)
	D152: Hydraulic Machinery (74)
	D153: Hydraulic Engineering Construction (92)
	D154: River Sediment Engineering (85)
	D155: Environmental Hydraulics (96)
	D156: Water Resources Management (72)
	D157: Flood Control Engineering (78)
	D158: Hydraulic Economics (69)
Transportation Engineering	D159: Road Engineering (79)
	D160: Highway Transportation (76)
	D161: Railway Transportation (80)
	D162: Waterway Transportation (80)
	D163: Ship and Vessel Engineering (80)
	D164: Air Transportation (80)
	D165: Transportation Systems Engineering (80)
	D166: Transportation Safety Engineering (80)
	D167: Basic Disciplines of Aviation and Aerospace Science and Technology (80)
	D168: Aircraft Structure and Design (80)
	D169: Spacecraft Structure and Design (80)
	D170: Aviation and Aerospace Propulsion Systems (80)

Engineering and Technological Sciences	
Field	**Subfield**
Aviation and Aerospace Science and Technology	D171: Aircraft Instruments and Equipment (80)
	D172: Aircraft Control and Navigation Technology (78)
	D173: Aviation and Aerospace Materials (80)
	D174: Aircraft Manufacturing Technology (84)
	D175: Aircraft Testing Technology (80)
	D176: Aircraft Launch, Recovery, and Flight Technology (84)
	D177: Aviation and Aerospace Ground Facilities and Technical Support (79)
	D178: Aviation and Aerospace Systems Engineering (89)
Environmental Science and Technology and Resource Science and Technology	D179: Basic Disciplines of Environmental Science and Technology (203)
	D180: Environmental Science (138)
	D181: Environmental Engineering (493)
	D182: Resource Science and Technology (24)
Safety Science and Technology	D183: Public Safety (259)
	D184: Basic Disciplines of Safety Science and Technology (70)
	D185: Safety Social Science (75)
	D186: Safety Material Science (75)
	D187: Safety Ergonomics (83)
	D188: Safety Systems Science (82)
	D189: Safety Engineering Technology (78)
	D190: Safety and Health Engineering Technology (82)
	D191: Safety Social Engineering (83)
	D192: Sector-Specific Safety Engineering Theory (96)
Management Science	D193: History of Management Thought (84)
	D194: Management Theory (80)
	D195: Management Metrology (81)
	D196: Sector Economic Management (80)
	D197: Regional Economic Management (80)
	D198: Science and Technology Management (80)
	D199: Public Administration (80)
	D200: Human Resource Development and Management (80)
	D201: Futures Studies (80)
	D202: Enterprise Management (600)
	D203: Management Engineering (71)

5. HUMANITIES AND SOCIAL SCIENCES

Humanities and Social Sciences	
Field	**Subfield**
Marxism	E1: Studies on Marx, Engels, Lenin, and Stalin (103)
	E2: Scientific Socialism (88)
	E3: Foreign Marxism Studies (81)
	E4: Mao Zedong Thought Studies (888)
	E5: History of Marxist Thought (416)
	E6: History of Socialist Movements (104)
Philosophy	E7: Marxist Philosophy (769)
	E8: History of Chinese Philosophy (21)
	E9: History of Western Philosophy (548)
	E10: Modern Foreign Philosophy (1)
	E11: Logic (368)
	E12: Ethics (69)
	E13: Aesthetics (976)
Religious Studies	E14: Religious Theory (60)
	E15: Primitive Religions (80)
	E16: Ancient Religions (80)
	E17: Buddhism (70)
	E18: Christianity (74)
	E19: Islam (80)
	E20: Taoism (80)
	E21: Judaism (80)
	E22: Hinduism (80)
	E23: Zoroastrianism (80)
	E24: Manichaeism (80)
Linguistics	E25: General Linguistics (199)
	E26: Comparative Linguistics (44)
	E27: Linguistic Geography (26)
	E28: Sociolinguistics (86)
	E29: Psycholinguistics (52)
	E30: Applied Linguistics (861)
	E31: Chinese Language Studies (439)
	E32: Languages and Scripts of Chinese Ethnic Minorities (24)
	E33: Foreign Languages (202)
Literature	E34: Literary Theory (231)
	E35: Literary Aesthetics (99)
	E36: Literary Criticism (89)
	E37: Comparative Literature (81)
	E38: Modern Chinese Literature (80)
	E39: Ancient Chinese Literature (355)
	E40: Chinese Genre Literature (82)
	E41: Chinese Folklore Literature (80)
	E42: Literature of Chinese Ethnic Minorities (80)
	E43: World Literature History (80)
	E44: Eastern Literature (80)

Humanities and Social Sciences	
Field	**Subfield**
Art Studies	E45: Russian Literature (80)
	E46: Chinese Children's Literature (390)
	E47: British Literature (81)
	E48: French Literature (81)
	E49: German Literature (21)
	E50: Art Psychology (82)
	E51: Music (36)
	E52: Drama (45)
	E53: Traditional Chinese Opera (31)
	E54: Dance (30)
	E55: Film (29)
	E56: Radio and Television Arts (21)
	E57: Fine Arts (869)
	E58: Applied Arts (46)
	E59: Calligraphy (26)
	E60: Photography (27)
History	E61: Ancient Chinese History (66)
	E62: World General History (82)
	E63: Asian History (76)
	E64: African History (21)
	E65: European History (87)
	E66: Historiography Theory (80)
	E67: Historical Documentation (72)
	E68: General Chinese History (80)
Archaeology	E69: Archaeological Theory (81)
	E70: History of Archaeology (80)
	E71: Archaeological Technology (80)
	E72: Chinese Archaeology (26)
	E73: Foreign Archaeology (30)
	E74: Specialized Archaeology (22)
Economics	E75: Political Economics (21)
	E76: Economic Geography (29)
	E77: Developmental Economics (87)
	E78: Economic History (691)
	E79: World Economics (462)
	E80: Management Economics (21)
	E81: Accounting (718)
	E82: Technical Economics (328)
	E83: Labor Economics (22)
	E84: Urban Economics (229)
	E85: Resource Economics (21)
	E86: Logistics Economics (644)
	E87: Commercial Economics (418)
	E88: Information Economics (544)
	E89: Public Finance (427)
	E90: Finance (404)

Humanities and Social Sciences	
Field	**Subfield**
Political Science	E91: Political Science Theory (303)
	E92: Political Systems (87)
	E93: Public Administration (398)
	E94: International Politics (84)
Law	E95: Theoretical Jurisprudence (376)
	E96: Legal History (155)
	E97: Sectoral Law (6471)
	E98: International Law (476)
Military Science	E99: Military Theory (80)
	E100: Military History (80)
	E101: Military Psychology (80)
	E102: Strategic Studies (80)
	E103: Operational Studies (80)
	E104: Tactical Studies (80)
	E105: Military Command Studies (80)
	E106: Military Organization Studies (80)
	E107: Military Political Work Studies (80)
	E108: Military Logistics (80)
	E109: Military Geography (80)
	E110: Military Technology (80)
Sociology	E111: History of Sociology (48)
	E112: Sociological Theory (1089)
	E113: Sociological Methods (324)
	E114: Experimental Sociology (21)
	E115: Applied Sociology (1016)
	E116: Social Geography (30)
	E117: Cultural Sociology (45)
	E118: Economic Sociology (56)
	E119: Social Anthropology (63)
	E120: Organizational Sociology (168)
	E121: Developmental Sociology (34)
	E122: Welfare Sociology (115)
	E123: Demography (8)
	E124: Labor Science (29)
Ethnology and Cultural Studies	E125: Cultural Anthropology and Folklore (79)
	E126: Cultural Studies (86)
	E127: Tibetology (95)
	E128: Xinjiang Ethnic Studies (85)
	E129: World Ethnic Studies (47)
Journalism and Communication Studies	E130: Journalism Theory (170)
	E131: History of Journalism (872)
	E132: Journalism Practice (35)
	E133: Journalism Business Management (92)
	E134: Radio and Television (81)
	E135: Communication Studies (458)
	E136: Journalism Operations (80)

Humanities and Social Sciences	
Field	**Subfield**
Education	E137: History of Education (592)
	E138: Principles of Education (82)
	E139: Teaching Methodology (56)
	E140: Moral Education Principles (590)
	E141: Educational Sociology (339)
	E142: Educational Management (26)
	E143: Educational Technology (2125)
	E144: General Education (277)
	E145: Vocational and Technical Education (34)
Sports Science	E146: Exercise Physiology (907)
	E147: History of Sports (86)
	E148: Sports Theory (80)
	E149: Sports Biomechanics (81)
	E150: Sports Psychology (80)
	E151: Sports Health Science (80)
	E152: Physical Education (80)
Statistics	E153: Economic Statistics (70)
	E154: Science and Technology Statistics (85)
	E155: Environmental and Ecological Statistics (80)
	E156: Biological and Medical Statistics (82)
	E157: Biological and Medical Statistics (82)
Library, Information, and Documentation Science	E158: Information Science (89)
	E159: Archival Science (52)
	E160: Museum Studies (112)

E Evaluation Method and Difficulty Level Calibration

Below we provide the detailed methodology for model evaluation and the calibration process used to assign difficulty levels to the EESE instances, addressing specific reviewer queries.

E.1 Model Evaluation Method

The evaluation process in this study follows the "LLM-as-a-judge" paradigm. Specifically, we first present questions to the model under test and record its responses. These responses, along with the ground-truth answers, are then provided to the judge model GPT-4o, which is explicitly informed of the question type (objective or subjective). For objective questions, a binary scoring criterion is applied, where a correct answer receives 10 points and an incorrect answer receives 0. For subjective questions, the judge model assigns a continuous score between 0 and 10 based on response quality. The scores for all questions are subsequently averaged and normalized to a percentage scale to represent the model's overall performance.

E.2 Difficulty Level Calibration

To assess the difficulty level of questions in EESE-Pool, we selected 6 representative models (including DeepSeek-R1, O3, GPT-4o, Grok-3, Gemini-2.5-pro, Qwen2.5-72B-Instruct) and prompted each to answer every question independently. Using GPT-4o as the judge model, we computed the average score achieved by these models on each question. Based on this mean score, questions are classified into three difficulty tiers: those with a score below 4 are labeled as "Hard", scores from 4 to 7 (inclusive) as Middle", and scores exceeding 7 as "Easy".

F Human Expert Recruitment and Involvement

This appendix details the protocols for recruiting human experts and their involvement in the construction of the EESE benchmark, covering recruitment, task specifications, compensation, and ethical considerations.

F.1 Recruitment and Qualification

Recruitment Method: Experts were primarily recruited through our academic collaboration networks, targeting top-tier universities and research institutions to ensure high levels of expertise and reliability.

Qualification Requirements: All recruited experts were required to hold a Master's or Ph.D. degree in a relevant scientific discipline, or to possess several years of high-level teaching or research experience.

F.2 Task Specifications and Competency Requirements

Expert involvement was structured across different stages of data construction and refinement, with tasks categorized by required cognitive load and expertise.

F.2.1 Data Engine

Transcription Experts collected instances from textbooks, question banks, and online resources, transcribing them into a standardized format. This task required foundational domain knowledge and strict adherence to data formatting and fact-checking protocols.

Expansion Experts contributed high-value instances for uncovered subfields by synthesizing field knowledge, practical experience, and pedagogical insights. This demanded high professional competence, with a focus on addressing knowledge gaps and ensuring instance novelty.

Coarse-grained Quality Control Experts reviewed and manually modified instances flagged by LLMs for errors in formatting, factual accuracy, or logical coherence. This required critical thinking and a mastery of LLM error review guidelines and difficulty verification standards.

F.2.2 Data Refinement

Enhancement By Distraction (Low HI) Experts verified the correctness and relevance of auto-generated distractors, serving as the final fine-grained quality control step. This required **familiarity with subject matter** to ensure distractors were highly discriminative without introducing factual errors.

Enrichment By Cross-Disciplinary (Medium HI) Experts conducted a fine-grained review and refinement of interdisciplinary content to ensure factual precision and educational alignment. This demanded the ability to integrate knowledge across disciplines and design complex, yet coherent, interdisciplinary links.

Expert-Driven Refinement (High HI) Experts manually rewrote or restructured problems to enhance clarity, embed subtle complexity, or decompose multi-step reasoning, followed by fine-grained quality validation. This task had the highest level of expertise requirement, necessitating the ability to reconstruct complex logical structures and perform meticulous quality validation.

F.3 Compensation Structure

To ensure the scientific rigor of the EESE benchmark, significant resources were allocated for human expertise. A total of 609 experts contributed to the construction of the 100K+ instance EESE-Pool.

Total Investment: The total cost for the entire construction process was approximately $428,057.77. The cumulative effort amounted to approximately 30,510 expert-hours. [1]

Compensation Strategy: A strict tiered compensation strategy was implemented to align remuneration with the professionalism and complexity of each task. Basic tasks, such as *Transcription* and *Coarse-grained QC*, were compensated at a standard rate. Core tasks demanding high expertise and cognitive load, such as *Expansion* and *Expert-Driven Refinement (High HI)*, were compensated at a premium rate, with a maximum hourly rate of $45. The average hourly rate across the project was approximately $14.03.

F.4 Informed Consent

Prior to their involvement, all experts were required to sign an Informed Consent form and a service agreement. These documents clearly outlined the nature of their tasks, the scope of data usage, and the compensation structure. This process ensured that all experts participated in the EESE construction on a fully informed and voluntary basis.

[1] All monetary and hour amounts here are approximate and not exact financial figures.