

## LEED Study Sessions – Practice Exam Questions

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1. Total Site Area must be used consistently in calculations that demonstrate compliance with the requirements of which two credits? (Choose two)
  - a) SS Credit 2, Development Density & Community Connectivity
  - b) SS Credit 7.1, Heat Island Effect Non-Roof
  - c) SS Credit 4.1, Alternative Transportation: Public Transportation Access
  - d) SS Credit 5.2, Site Development: Maximize Open Space
  
2. If a project scores 39 points what rating would it receive?
  - a) Certified
  - b) Silver
  - c) Gold
  - d) Platinum
  
3. All of the following are undesirable sustainable sites on which to build, except:
  - a) A site located 200 feet from a wetland
  - b) Land that provides habitat to endangered species
  - c) Lands at an elevation of 5 feet or below the 100-year flood plain
  - d) Prime agricultural land
  
4. A new commercial building in downtown Seattle is using a roof with a SRI 30 as tested in accordance with ASTM E 1980 for 80% of the roof surface and a non-energy star rated roof for the remaining 20%. Will this project earn SS Credit 7.2, Heat Island Effect, Roof?
  - a) Yes
  - b) No
  - c) Not enough information
  
5. As part of an urban redevelopment effort, the city is renovating a 30,000 sq. ft. timber frame warehouse into a multi-use project with an additional 50,000 sq. ft. of new construction. This 80,000 sq. ft project reuses the warehouse, replaces single pane glazing with energy efficient windows manufactured in a neighboring city, and installs reclaimed wood floors donated from a local company. Based upon the above information, which three credits may be applicable to the project's LEED certification application? (Choose three)
  - a) MR Credit 7, Certified Wood
  - b) MR Credit 3, Materials Reuse
  - c) MR Credit 5, Regional Materials
  - d) MR Credit 2, Construction Waste Management
  
6. What are two responsibilities of the contractor during the Project Construction Phase that support the LEED Documentation Process? (Choose two)
  - a) Provide cut sheets for tile, gypsum board, and toilet partition submittals
  - b) Provide energy modeling calculations
  - c) Provide site photometric plans
  - d) Provide calculations for waste diverted from landfill

7. EA Prerequisite 2, Minimum Energy Performance requires the building design to comply with which of the following standards:
- I. ASHRAE 90.1
  - II. ASHRAE 55
  - III. ASHRAE 62
  - IV. Local Energy Codes, if they are stricter than ASHRAE requirements
  - V. ASHRAE 129
- a) II or V
  - b) I or IV
  - c) I or II
  - d) V or IV
  - e) II or IV
8. SS Credit 3 - Brownfield Redevelopment was designed to rehabilitate damaged sites around the country. What reference standard must be met in order to classify an area as a Brownfield?
- I. ASTM E 1903-97
  - II. ASTM 408
  - III. Classification by a local, state, or federal government agency
  - IV. Classification by the project owner or team
  - V. Classification by the USGBC
- a) I or II
  - b) I or III
  - c) I or IV
  - d) II or III
  - e) II or V
9. A local non-profit agency is building a new 3 story multi-family affordable housing project. Which LEED rating system best applies to this project?
- a) LEED-CI
  - b) LEED-EB
  - c) LEED-ND
  - d) LEED-H
  - e) LEED-NC
10. What credits involve specifying "Green Materials?" (Choose Three)
- a) MR Credit 4, Recycled Content
  - b) MR Credit 6, Rapidly Renewable Materials
  - c) MR Credit 1, Building Reuse
  - d) MR Prerequisite 1, Storage and Collection of Recyclables
  - e) MR Credit 3, Materials Reuse
11. Which kinds of energy loads in a building are considered process energy loads under Option 1 in EA Credit 1, Optimize Energy Performance? (Choose Three)
- a) HVAC
  - b) Service Hot Water
  - c) Plug Loads
  - d) Refrigeration Equipment
  - e) Parking Lighting

- f) Elevators
12. The design team has elected to pursue EA Credit 1, Optimize Energy Performance. Which should the LEED Accredited Professional verify?
- a) Energy Type
  - b) Cost of Energy
  - c) Amount of renewable energy generated on-site
  - d) All of the above
13. Which of the following are included in the calculation to determine compliance with MR Credits 3 through 7?
- a) Labor costs
  - b) Equipment costs
  - c) Transportation costs
  - d) Mechanical and Electrical components
  - e) All of the above
  - f) None of the above
14. A non-profit located in San Francisco, CA is building a new classroom building. It is located adjacent to a power plant, but is generating all of its energy on-site through the use of photovoltaic panels and a small wind turbine. Which credits may the project be eligible to achieve? (Choose two)
- I. EA Credit 1, Optimize Energy Performance
  - II. EA Credit 2, On-Site Renewable Energy
  - III. ID Credit 1, Innovation in Design
  - IV. EA Credit 6, Green Power
- a) I only
  - b) II only
  - c) I and II
  - d) IV only
  - e) I, II, and III
15. A new housing project in Austin Texas is installing solar thermal panels to heat hot water using the sun. Which credits may the project be eligible to achieve?
- I. EA Credit 1, Optimize Energy Performance
  - II. EA Credit 2, On-Site Renewable Energy
  - III. ID Credit 1, Innovation in Design
  - IV. EA Credit 6, Green Power
- a) I only
  - b) II only
  - c) I and II
  - d) IV only
  - e) I, II, and III

16. The Solar Living Center is a retail facility, learning center, and demonstration building in Hopland, CA. During the design process, the material selection process focused on materials that were environmentally friendly and low in embodied energy. The north and west walls of the building were constructed with straw bales. The exterior and interior wall surfaces are covered with soil cement plaster made with local soils to protect the straw bale from moisture and to provide structural integrity. In addition, pressed strawboard panels were installed between structural elements to serve as sound absorber and insulator. Based on the above information, which two credits is the project most likely eligible for? (Choose two)
- a) MR Credit 4, Recycled Content
  - b) MR Credit 6, Rapidly Renewable Materials
  - c) MR Credit 5, Regional Materials
  - d) MR Credit 3, Materials Reuse
17. The KSBA Architects Office Building in Pittsburgh Pennsylvania reused the entire structure and shell of the 1888 building as well as 90% of the interior millwork. New components were installed to update the interior spaces including raised access floors with new carpet tile on top, new wood doors, and new acoustical ceiling systems. Based on the above information, how many points under MR Credit 1, Building Reuse, is this project likely eligible for.
- a) 0
  - b) 1
  - c) 2
  - d) 3
18. What item is not required to be included in the initial application to USGBC to document MR Credit 7, Certified Wood?
- a) Cut Sheets
  - b) Letter Template
  - c) Chain of Custody Certificate Number
  - d) Calculation
19. Which of the following are considered regular occupied spaces:
- I. Conference Rooms
  - II. Offices
  - III. Classrooms
  - IV. Break rooms
  - V. Lobbies
- a) I, II, and III
  - b) II and III
  - c) II, III, and IV
  - d) I, III, and V
  - e) I, II, III, IV
20. A law firm occupying a 50-year-old building is upgrading the mechanical systems to improve energy performance and implementing green procurement and operations policies. Which LEED rating system best applies to this project?
- a) LEED-CI

- b) LEED-EB
  - c) LEED-CS
  - d) LEED-NC
  - e) LEED-ND
21. Which is not a potential strategy to help achieve Water Credit 3?
- a) High efficiency irrigation
  - b) Rainwater collection for irrigation
  - c) Waterless urinal
  - d) 1.4 gallon water closet
  - e) Low flow showerheads
22. Project Registration does not provide:
- a) Access to LEED Online
  - b) Access to Credit Interpretations
  - c) LEED Letter Templates in Adobe
  - d) Access to the Reference Guide
23. The King Street Center was designed to collect rainwater from 44,000 square feet of roof area and store it in three 5,400-gallon tanks on the basement. The water is used to flush water closets throughout the building. Rainwater provides 1.4 million gallons of water or about two-thirds of the total water closet demand. These design strategies might help the project achieve which three credits?
- a) WE Credit 1, Water Efficient Landscaping
  - b) SS 6.1, Stormwater Design – Quantity Control
  - c) WE Credit 2, Innovative Wastewater Technologies
  - d) WE Credit 3, Water Use Reduction
  - e) SS Credit 6.2, Stormwater Management - Treatment
24. Which of the following Indoor Environmental Quality characteristics is not addressed by LEED?
- a) Indoor air quality
  - b) Thermal comfort
  - c) Acoustical comfort
  - d) Access to daylight and views
25. EQ Credit 1, Outdoor Air Delivery Monitoring requires a permanent CO<sub>2</sub> monitoring system:
- a) That generates an alarm when conditions vary by 10% or more from a set point
  - b) That monitors CO<sub>2</sub> levels between 3' and 6' from the floor
  - c) Both a and b
  - d) Neither a nor b
26. All of the following are appropriate forms of documentation for EQ Credit 3.1, Construction IAQ Management Plan except:
- a) Copy of the Management Plan
  - b) Photographs
  - c) List of filter media used
  - d) Letter from Subcontractor declaring requirements are met

27. What is the required documentation for a typical site complying with Site Credit 1, Site Selection?
- I. Site Plan
  - II. Management Plan
  - III. Letter Template
  - IV. Letter of Certification from Local Government Agency with Jurisdiction over the Project
- a) III and IV  
b) III only  
c) III and I  
d) III and II
28. The design team has elected to pursue design strategies to meet the requirements of EQ Credit 6.2, Controllability of Systems – Thermal Comfort. Which items should the LEED Accredited Professional verify?
- I. Room Use
  - II. Number of Operable Windows
  - III. Number of Individual Comfort Controls
  - IV. Number of Lighting Controls
  - V. Number of Occupants
- a) I, II, III, and V  
b) I, III, IV, and V  
c) III, IV, and V  
d) I, III, and IV
29. The design team has elected to pursue design strategies to meet the requirements of SS Credit 7.1, Heat Island Effect, Non-Roof. Which two should the LEED Accredited Professional verify? (Choose two.)
- a) The SRI value of hardscape features  
b) Emissivity of pervious surfaces  
c) Run-off coefficients for impervious paving materials selected  
d) Area of shading for the site trees
30. In an office facility, the design includes a rainwater harvesting system that collects 16,000 gallons of water annually. The rainwater is used for flushing water closets. What information is necessary to calculate the reduction in potable water demand on building sewage conveyance for achieving WE Credit 2, Innovative Wastewater Technologies? (Choose Three)
- a) Annual work days  
b) Number of FTE building occupants  
c) Flow rates of faucets  
d) Total building volume of Process water generated.  
e) Total Daily Volume of wastewater generated
31. When writing a Credit Interpretation Request, what information is required to be included?
- I. Name of project
  - II. Relevant drawings related to the question

III. Your contact information

IV. Project Overview

- a) I and IV
- b) III, and V
- c) I, II, III
- d) All of the Above
- e) None of the Above

32. Which of the following statements is true about CIRs (choose one):

- a) Points are awarded through the CIR process
- b) Each costs \$220
- c) Only LEED Accredited Professionals can submit CIRs
- d) Credit language can be changed through the CIR process

33. Per the requirements of EA Credit 5 – Measurement and Verification, providing for ongoing accountability and optimization requires which two of the following? (Choose two)

- a) Hiring on-site monitoring personnel
- b) Use Option B or D of the IPVMP Volume III
- c) Training on-site monitoring personnel
- d) Developing a measurement and verification plan
- e) Developing an O&M manual for on-site personnel

34. Rapidly Renewable materials are classified as materials that come from plants that are typically harvested within a how many year cycle?

- a) 5
- b) 10
- c) 15
- d) 20

35. For MR Credit 1, Building Reuse the percentage of reused building structure is measured in:

- a) Square feet
- b) Cubic feet
- c) Tons
- d) Lineal Feet

36. The Audubon Center at Debs Park in Los Angeles, CA is a LEED Platinum project. The building achieved over 35% water use reduction and includes an on-site wastewater treatment system. Photovoltaic panels supply the building with 100% of its energy use. Over 50% the total materials are manufactured within a 500-mile radius and 27% of the total materials are locally harvested as well. Daylight is present in 80% of the regularly occupied spaces and views are present in 89% of the spaces.

Based on the above information which credits is the project eligible for:

- I. WE Credit 3 Water Use Reduction
- II. WE Credit 2 Innovative Waste water Technologies
- III. MR 5.1 = Regional materials
- IV. MR 5.2 = Regional Materials
- V. EQ 8.1 Daylight
- VI. EQ 8.2 Views

- a) I, II, III, IV, and V
- b) I, III, V, and VI
- c) I, II, III, and V
- d) I, II, III, and IV
- e) All of the above

37. The President of a Fortune 500 Company decides to build a new corporate headquarters building that will provide an optimal working environment for employees. Among numerous green building strategies implemented on the project, the design team includes an underfloor air distribution system throughout, operable windows, task/ambient lighting, perimeter offices adjacent to the building core with open office areas near the perimeter wall, and photoelectric lighting controls.

These design strategies may help the project achieve which three credits? (Choose three)

- a) EQ Credit 2 Increase Ventilation
- b) EQ Credit 6 Controllability of Systems
- c) EQ Credit 1 Carbon Dioxide Monitoring
- d) EA Credit 5 Measurement and Verification
- e) EA Credit 1 Optimize Energy Performance
- f) EQ 5 Indoor Chemical Pollutant Source Control

38. The SMACNA IAQ Guidelines for Occupied Buildings Under Construction recommends control measures in which three categories? (Choose three)

- a) HVAC Protection
- b) Building Flush-out
- c) Source Control
- d) Walk-off Mats
- e) Scheduling
- f) Separation of Chemical Use Areas
- g) Pathway Control

39. The design team has elected to pursue design strategies to meet the requirements of EQ Credit 8.1, Daylight and Views. Which two items should the LEED Accredited Professional verify? (Choose two)

- a) Room Area and Glazing Area
- b) U value of Window
- c) Height of Window
- d) Solar Shading co-efficient of Window

40. All of the following are major environmental/credit categories in the LEED Green Building Rating System except:

- a) Sustainable Sites
- b) Indoor Air Quality
- c) Energy & Atmosphere
- d) Materials & Resources

41. Which of the following would be the most effective way to reduce heat gain in a building:

- a) Use a window with low shading co-efficient
- b) Thermal mass in the floor
- c) Plant deciduous trees on the North side of the building
- d) Use a roofing material with a low albedo

42. To achieve LEED certification, a project must:
- a) Achieve at least 26 points with at least 1 point in each of the five environmental categories plus all prerequisites
  - b) Achieve at least 26 points in any combination of categories plus satisfy all prerequisites
43. The total number of points available under LEED-NC is:
- a) 64
  - b) 69
  - c) 52
  - d) 56
44. How many points are available for alternative transportation considerations?
- a) 2
  - b) 3
  - c) 4
  - d) 5
45. All of the following are certification levels achievable under LEED-NC v 2.2 except:
- b) Certified
  - c) Bronze
  - d) Silver
  - e) Platinum
46. In order to receive points under MR Credit 5.1 Regional Materials, 10% of materials must:
- a) Be extracted, harvested, or recovered, and manufactured within a 1000 mile radius
  - b) Be manufactured within a 1000 mile radius
  - c) Be extracted, harvested, or recovered, and manufactured within a 500 mile radius
  - d) Be manufactured within a 500-mile radius.
47. Choose the response that best answers the following question: LEED was created for what purpose?
- a) To establish recognized leadership on the green buildings sector
  - b) To establish a law at the federal level standardizing green building practices
  - c) To create a "Green Building" movement that could one day impose costly new standards on the building industry
  - d) To raise awareness of the Green Building benefits in the Pacific Northwest
48. I believe we meet the requirement for a certain credit, but in a slightly different way than the Rating System describes. To receive clarification, I should do all the following except:
- a) Review the Rating System to make sure our proposed strategy meets the stated Intent of the credit.
  - b) Review the Reference Guide for additional information that may pertain
  - c) Review on-line Credit Interpretations to check for similar guidance on another project.
  - d) Submit a Credit Interpretation Request
  - e) Call USGBC
49. A new school in western Washington built on the site of an old parking lot has employed various storm water management techniques which in aggregate reduce the storm water run-off by 23% and remove 72% of the total suspended solids. Which of the following credits is earned:

- a) Site 6.1 Stormwater Design – Quantity Control
  - b) Site 6.2 Stormwater Design – Quality Control
  - c) Site 6.1 and Site 6.2
  - d) Neither Site 6.1 nor Site 6.2
50. What THREE steps should be taken before submitting a CIR (Guidelines for CIR customers)? (Choose three)
- a) Review the intent of the credit or prerequisite and self-evaluate whether the project meets this intent
  - b) Call the USGBC and ask their advice.
  - c) Consult the LEED Reference Guide.
  - d) Review the CIRs online and see if the same inquiry has been answered.
  - e) Call O'Brien and Co to have them complete the accreditation documentation for the project.
51. All of the following describe a material's embodied energy except:
- a) Cradle to grave
  - b) Operating energy
  - c) Energy required to harvest, mine, manufacture, transport, and install
  - d) Life-cycle analysis
52. The Energy Policy Act of 1992 relates to:
- a) Building commissioning
  - b) Optimize energy efficiency
  - c) Indoor water use efficiency
  - d) Minimum energy performance
53. What is the fee for a project's first Credit Interpretation Ruling?
- a) \$200
  - b) \$220
  - c) \$250
  - d) The first two are free
54. When a project submits for certification under LEED Version 2.2, how is the application submitted?
- a) Entirely on-line
  - b) Letter Templates are submitted on-line and other submittals are sent in via mail
  - c) One hard copy binder, and one CD is sent to the USGBC
  - d) Two binders are sent to the USGBC
55. The Environmental Resource Guide is a:
- a) Document of federal guidelines for environmental practices
  - b) Publication of the EPA's list of approved products
  - c) Comprehensive guide documenting materials' life cycle analysis
  - d) Environmental guidelines for wastewater treatment and outflow
56. What is the Reference Standard(s) for EQ Credit 3.1 and 3.2 Construction IAQ Management Plan?
- a) IAQ Guidelines for Occupied Buildings Under Construction, 1995 Chapter 3 (SMACNA Standard)

- b) ANSI/ASHRAE 52.2 - 1999 Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size
  - c) EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
  - d) All of the above
57. A LEED Reference Guide provides all of the following except:
- a) Documentation requirements
  - b) Calculation methods
  - c) Recommended strategies
  - d) Complete sample Letter Templates
58. The maximum certification fee on any project over 500,000 SF for a USGBC member is:
- a) \$7,500
  - b) \$12,500
  - c) \$17,500
  - d) \$22,500
59. How do you register a LEED project?
- a) Call the USGBC Hot Line.
  - b) Fax USGBC the registration form that can be downloaded from the USGBC web site.
  - c) Call O'Brien & Company.
  - d) Complete the on-line registration section on the USGBC web site.
60. Green building practices encourage commissioning agents to be:
- a) Hired at the start of construction
  - b) Members of the design team
  - c) Hired directly by the mechanical subcontractor
  - d) An independent agent hired directly by the owner
61. An economizer cycle on an HVAC system refers to:
- a) Energy efficiency settings and controls
  - b) Running the system at lower temperatures at night
  - c) Supplying all areas with the same temperature air
  - d) Using outdoor air for heating and cooling
62. LEED Applications via LEED On-line can submit for a preliminary design review:
- a) At the end of Design Development
  - b) At 100% Construction Documents
  - c) When all the Design credits have been documented online
  - d) By paying an additional fee
63. Once the certification application is submitted, the USGBC will
- a) Send out a certificate and plaque with the level of certification as submitted
  - b) Review and mark each credit as "Credit Achieved," or "Credit Denied"
  - c) Review and mark each credit as "Pending," "Denied," or "Audited"
  - d) Audit every credit
64. The following are all prerequisites for LEED certification except:
- a) Fundamental Refrigerant Management
  - b) Fundamental Commissioning of the Building Energy Systems
  - c) Optimize Energy Performance

- d) Construction Activity Pollution Prevention
65. Which of the following is not a LEED Rating System?
- a) LEED-ND
  - b) LEED-CS
  - c) LEED-TI
  - d) LEED-EB
66. Submittals required for LEED documentation may include all of the following except:
- a) The LEED Letter Template submitted by the responsible party
  - b) A complete set of construction documents
  - c) Calculations
  - d) Additional narratives
67. Which of the following is the reference standard for EQ Prerequisite 1 Minimum IAQ Performance?
- a) ASHRAE/IESNA 90.1 – 2004
  - b) AHSRAE 55-2005
  - c) ASHRAE 52.2 1999
  - d) ASHRAE 62.1 - 2004
68. To achieve a point under credit EA 6 - Green Power, a project must engage in a two-year contract to purchase power generated from renewable sources that meet the Center for Resource Solutions (CRS) Green-e certification requirements. The amount of purchased power must be:
- I. 50% of the estimated electricity use as calculated based on the Department of Energy Commercial Buildings Energy Consumption Survey database
  - II. 35% of the estimated electricity use as calculated based on the Department of Energy Commercial Buildings Energy Consumption Survey database
  - III. 35% of the design case annual electrical consumption as calculated for EA 1
  - IV. 50% of the design case annual electrical consumption as calculated for EA 1
- a) I or IV
  - b) II or III
  - c) III only
  - d) IV only
69. Whole building simulation demonstrates that the design energy cost of the building exceeds ASHRAE/IESNA Standard 90.1-2004 requirements by 20%. This qualifies the project for how many points?
- a) 2 points
  - b) 3 points
  - c) 4 points
  - d) Can't tell
70. Which credit or credits will the use of Energy Star copiers and fax machines help achieve?
- a) Minimum Energy Performance
  - b) Optimize Energy Performance
  - c) Both a and b
  - d) Neither a nor b

71. Points are credited toward a project's LEED certification for:
- a) Complying with ASHRAE/IESNA Standard 90.1-2004 energy requirements
  - b) Performing building commissioning
  - c) Conducting a LEED/sustainability charrette early in the design phase of the project.
  - d) Providing individual lighting control zones.
72. For LEED-NC v2.2, the LEED letter templates:
- a) Are provided in Excel spreadsheet format to facilitate documentation of credits
  - b) Are available in Adobe PDF on LEED On-line
  - c) Must be submitted via e-mail
  - d) All of the above
73. EA Credit 5 - Measurement and Verification requires that projects develop and implement a Measurement and Verification Plan consistent with which of the following two options as specified in the Internal Performance Measurement & Verification Protocol Volume III (Choose two):
- a) Option A – Partially Measured Energy Conservation Measure Isolation
  - b) Option B – Energy Conservation Measure Isolation
  - c) Option C – Whole Building Comparison
  - d) Option D – Whole Building Calibrated Simulation
74. In the manufacturing of vinyl tiles, some scrap vinyl is left over after the cutting of the tiles. The manufacturer reuses this material as a raw material in the manufacturing of other vinyl tiles. Which of the following terms best describes the above material for LEED purposes?
- a) Post consumer recycled content
  - b) Pre-consumer recycled content
  - c) Salvaged material
  - d) None of the above
75. The following are all prerequisites for LEED certification except:
- a) Minimum Ventilation Effectiveness
  - b) Environmental Tobacco Smoke Control
  - c) Fundamental Refrigerant Management
  - d) Storage and Collection of Recyclables
76. ASHRAE Standard 55 – 2004 relates to:
- a) Ventilation for acceptable indoor air quality
  - b) Temperature and humidity ranges for human comfort
  - c) Carpet emissions
  - d) Erosion control
77. When is the best time to incorporate ecological concepts into a project?
- a) Predesign
  - b) Schematic Design
  - c) Construction Documents
  - d) Design Development
78. For MR Credit 2, Construction Waste Management calculations are done by:
- a) Weight
  - b) Volume
  - c) Weight or Volume

- d) Weight and Volume
79. EQ Credit 7.2, Thermal Comfort – Verification requires owners to:
- I. Conduct a thermal comfort survey within 6 to 18 months
  - II. Conduct a thermal comfort survey within 12-18 months
  - III. Conduct a thermal comfort survey in accordance with ASHRAE Standard 55-2004
  - IV. Conduct a thermal comfort survey in accordance with ASHRAE Standard 62.1 2004
- a) I & IV
  - b) II & III
  - c) I & III
  - d) II & IV
80. To be awarded points under the Innovation in Design category, the proposed credit must demonstrate
- a) Exceptional performance above requirements set by the LEED System
  - b) Innovative performance in green building categories not specifically addressed in LEED
  - c) Both a) and b)
  - d) Either a) or b)
81. To be awarded a point under the LEED Accredited Professional credit,
- a) At least one principal participant of the project team must have successfully completed the LEED Accredited Professional exam.
  - b) At least one principal participant of the design team must have successfully completed the LEED Accredited Professional exam.
  - c) All members of the project team must have successfully completed the LEED Accredited Professional exam.
82. Green Seal Standard GS -11 relates to:
- a) Formaldehyde-free composite wood
  - b) Low-emitting adhesives
  - c) Recycled content drywall
  - d) Low-VOC, low-toxic paint and coatings
83. To qualify for EQ Credit 4.1, Low-emitting Materials – Adhesives and Sealants
- a) All adhesives used on the project must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168.
  - b) All sealants and sealant primers used on the project must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168
  - c) Both a) and b).
  - d) None of the above
84. The EPA's Comprehensive Procurement Guidelines are:
- a) Recycled content product standards and list of recycled content materials and product manufacturers
  - b) Contractual rules for supplying materials and services to the EPA
  - c) Energy efficiency product standards
  - d) Regulations on chemical content and materials selection and handling
85. How much time is allowed for the growth of shade provided plantings, to meet the minimum standard to reduce non-roof heat islands in the Heat Island Effect: Non-Roof Credit 7.1?

- a) 2 years
  - b) 3 years
  - c) 5 years
  - d) 7 years
86. Credit SS (Sustainable Sites) 4.1 Public Transportation Access - the following transportation alternatives must be within the following distances from the project?
- a) 1/4 mile pedestrian route to a commuter rail, light rail or subway and 1/2 mile of two or more bus ones.
  - b) 1/2 mile pedestrian route to a commuter rail, light rail or subway and 1/4 mile of two or more bus lines.
  - c) 1/2 mile of two or more bus lines and 3/4 mile pedestrian route to a commuter rail, light rail or subway.
  - d) 3/4 mile of two or more bus lines and 1/2 mile pedestrian route to a commuter rail, light rail or subway.
87. Which of the following is NOT part of the submittal documentation for Credit SS 4.4 Parking Capacity?
- a) Provide the FTE occupancy for the project
  - b) Provide the total parking capacity of the site
  - c) Provide the report from the traffic count study
  - d) Confirm the appropriate project compliance path
88. What is required for Water Use Reduction Credit 3.1?
- a) Employ strategies that in aggregate use 20% less water than baseline calculated for building.
  - b) Employ strategies that in aggregate use 10% less water than baseline calculated for building.
  - c) Employ strategies that in aggregate use 25% less water than baseline calculated for building.
  - d) Employ strategies that in aggregate use 30% less water than baseline calculated for building.
89. What percentage of energy cost savings must the energy design achieve to get all ten points for the Optimize Energy Performance, Option 1, for both new and existing buildings?
- a) 14% for new buildings, 7% for existing buildings
  - b) 24.5% for new buildings, 17.5% for existing buildings
  - c) 35% for new buildings, 28% for existing buildings
  - d) 42% for new buildings, 35% for existing buildings
90. What does PPM stand for?
- a) Part per million
  - b) Particles per million
  - c) Power per minute
  - d) None of the above
91. How many credits are available under Innovation in Design credit 1?
- a) 6
  - b) 5
  - c) 4
  - d) 3

92. What are the three prerequisites for Energy & Atmosphere? (Choose three)
- a) Fundamental Commissioning of the Building Energy System.
  - b) Optimize Energy Performance.
  - c) Minimum Energy Performance.
  - d) Fundamental Refrigerant Management.
93. What is the reference standard for Water Efficiency Credit 3?
- a) ASHRAE/IESHA 92.1 - 2004.
  - b) ASHRAE/IESHA 90.1 - 2004.
  - c) EPA Act of 1992
  - d) EPA Act of 1998
94. What is a good practice for stabilizing soil?
- a) Temporary seeding.
  - b) Permanent seeding.
  - c) Mulching
  - d) All of the above
95. What is the minimum recycling area for a commercial building of 75,000 sq. ft.?
- a) 300
  - b) 175
  - c) 275
  - d) 225
96. Total LEED points of 33 would give your building a rating of:
- a) Certified
  - b) Silver
  - c) Gold
  - d) Platinum
97. For Credit MR 2.1 and MR 2.2 – Construction Waste Management, what is the percent of diverted waste required to earn the Exemplary Performance credit?
- a) 80% or greater
  - b) 90% or greater
  - c) 95% or greater
  - d) None is available for this credit
98. The reference standard for SS 8 – Light Pollution Reduction refers to which standard(s)?
- a) ASHRAE 52.2
  - b) ASHRAE standard 52.2 and 61.1
  - c) ASHRAE standard 90.1
  - d) ASHRAE standard 90.1 and EPA 840B92002
99. What value of locally sourced and manufactured materials must a \$5 million project have in order to qualify for Regional Materials 5.2?
- a) 500,000
  - b) 450,000
  - c) 950,000
  - d) 1,500,000

100. What standard do inertial architectural coatings have to meet to qualify for the Indoor Environmental Quality: Low Emitting Materials 4.2?
- a) ASHRAE 90.1, 1993
  - b) Green Seal Standard GS-11 Paints First Edition
  - c) ASTM C 1372 Emittance
  - d) EPA NTI Chapter 4 Part II
101. What percentage (based on surface area) of an existing building structure must be maintained to satisfy MR credit 1.1?
- a) 50%
  - b) 75%
  - c) 90%
  - d) 25%
102. How many prerequisites are there for Indoor Environmental Quality
- a) 2
  - b) 3
  - c) 1
  - d) 4
103. Which is not a factor in the calculation for EQ credit 8.1?
- a) window square footage
  - b) floor area square footage
  - c) window height factor
  - d) window r- insulation factor
104. Which is not a rapidly renewable material?
- a) agrifiber
  - b) bauxite
  - c) linoleum
  - d) wool
105. Which is not a strategy to deal with SS credit 7.1 with 50% of hardscapes
- a) paving with materials with a SRI of 29
  - b) green roof
  - c) shade
  - d) open grid paving system
106. Would interior clerestory windows (example; interior office with high clerestory windows along a corridor with windows to the exterior) qualify for the EQ Credit 8.2 Daylight & Views?
- a) Yes, if South or West-facing for maximum light exposure.
  - b) Yes, if there's a direct line of sight to a perimeter window.
  - c) No, only windows with glazing between 2'-6" and 7'6" qualify.
  - d) Don't know, there's not enough information to tell.
107. ID credits – Which of the following would qualify for ID credit?
- a) A strategy results that greatly exceeds those required in an existing LEED credit.
  - b) LEED-AP on the team
  - c) A Strategy not addressed by LEED prerequisite or credit, but warrant consideration for their sustainability benefit.
  - d) All of the above

108. ID credits – Including a LEED-AP on the team, how many ID credits are possible?
- a) Only one
  - b) Only two
  - c) Up to four
  - d) Up to five
109. ID credits - Each single strategy may be eligible for how many ID points?
- a) Up to five.
  - b) Up to four.
  - c) Only two.
  - d) Only one.
110. ID credits – The process or specification must be?
- a) Pertain to the interior design portion of the project
  - b) Apply only to a limited portion of the project
  - c) Comprehensive, as in applies to the entire project being certified under LEED
  - d) All of the above
111. ID credits – Generally what exemplary performance is required for this credit? (Choose two)
- a) At least doubling the credit requirements
  - b) Exceed the requirement by at least 75%
  - c) Achieve the next incremental percentage threshold
  - d) Double the required incremental percentage threshold
112. LEED-NC addresses building energy efficiency in all of the following except:
- a) EAp 1
  - b) EAp 2
  - c) EAcr 1
  - d) EAcr 2
113. LEED NC Registration - Certification fees are fixed rates except when the building square footage is?
- a) Less than 50,000
  - b) More than 500,000
  - c) 50,000 - 500,000
  - d) All of the above.
114. LEED-NC Project Certification – A) Certification and a plaque are awarded for achievement of which rating level or levels? and B) What is the order from lowest amount of points required to the highest?
- a) Certified
  - b) Platinum
  - c) Gold
  - d) Silver
115. Greening Opportunity Icon - signifies opportunity and assistance for projects that are proceeding with the intention for what certification following LEED-NC?
- a) LEED-CI
  - b) LEED-EB

- c) LEED-ND
- d) LEED-CS

116. CIR- What does this mean and does it guarantee credit award?

- a) Core Interior Rating
- b) Credit Information Ruling
- c) Credit Interpretation Request
- d) Certified Independent Rating

117. A project is seeking a point for MRc6, Rapidly Renewable Materials and has a total materials cost of \$200,000. The following materials have been included in their calculations: Bamboo flooring (\$2,000), cork walls (\$500) and wool carpet (\$2,000). What is an additional material that will get them this credit?

- a) Wheatboard paneling (\$700)
- b) Cotton insulation (\$150)
- c) Reclaimed cedar trim (\$1000)
- d) All of the above

118. Recycling is defined as? (Choose two)

- a) The diversion or recovery of waste from human activities from the solid waste stream.
- b) Diverting hazardous materials from landfills by providing an accessible storage area.
- c) An area dedicated to the collection and storage of non-hazardous materials that include at least paper, corrugated cardboard, glass, plastics and metals.
- d) All of the above.

119. MRcr1.3 - This credit is focused on?

- a) Reuse of interior and exterior non-structural elements.
- b) Reuse of interior, structural elements.
- c) Reuse of interior, non-structural elements.
- d) The required calculation of the total area of existing interior non-structural elements prior to demolition.

120. MRcr2 - The fee charged by a landfill is (Choose two)?

- a) For the collection and sorting of waste.
- b) Called Tare Fees and is calculated by deducting the weight of the hauling vehicle after dumping from the full load weight.
- c) Called Tipping Fees.
- d) For disposal of waste volumes and is typically quoted for one ton of waste.

121. MRcr4.1 - For this credit, the use of recycled content materials is? (Choose three)

- a) Post- and/or pre-consumer material.
- b) Reclaimed and reused material from within the same process that generated it.
- c) Reclaimed material that is no longer usable for its intended purpose.
- d) Defined in accordance with the document, ISO 14021.

122. MRcr5 - For use in this credit, Regionally Manufactured Materials are defined as?

- a) Requiring that the raw material is from within a 500-mile radius.
- b) On-site assembled, erected or installed finish components, as in structural steel.
- c) Assembled as a finished product within a 500-mile radius of the project site.
- d) All of the above.

123. MRcr7 - The definition of COC is?
- a) Calculation of Costs.
  - b) Carbon and Oxygen Calculations.
  - c) Chain-of-Custody.
  - d) Clarity-of-Content.
124. EQpr1 - Per this credit, which of the following are the basic method(s) for ventilating buildings? (Choose three)
- a) Active Ventilation (i.e. mechanical).
  - b) Passive Ventilation (i.e. natural).
  - c) Tertiary Ventilation (i.e. indoor, outdoor and forced air sources).
  - d) Mixed-mode Ventilation (i.e. natural or mechanical, or both together).
125. EQcr1 - Here ventilation includes? (Choose three)
- a) Supplying air to a space.
  - b) Removing air from a space.
  - c) Controlling only air contaminant levels or temperature within a space.
  - d) Requirements as defined per ASHRAE 62.1-2004 Users Manual, Appendix A.
126. Name basic criteria for achieving an innovation credit for a category not specifically addressed by LEED? (Choose three)
- a) None - It's not possible to receive credit outside the 5 defined USGBC credit categories.
  - b) Must establish a baseline of standard performance for comparison to final design.
  - c) Must use a formula for the project that is applicable to other projects.
  - d) Use process or specification that are comprehensive in that it applies to whole not only part of the project.
127. WEcr1 - Potable Water is defined as? (Choose three)
- a) Water captured from the site in rain barrels.
  - b) Water suitable for drinking.
  - c) Water supplied from wells.
  - d) Water supplied from municipal water systems.
128. WEcr2 - Graywater is defined as water from? (Choose three)
- a) Showers.
  - b) Toilets.
  - c) Kitchen sinks.
  - d) Bathtubs.
129. EApr1 - What is the Basis of Design (BOD)? (Choose three)
- a) A document that includes the indoor environmental quality criteria.
  - b) Design information necessary to accomplish the architect's project requirements.
  - c) It references applicable codes, standards, regulations and guidelines.
  - d) A document that is updated with each subsequent design submission with increasing specificity as applicable.
130. EApr3 - Refrigerants? (Choose three)
- a) Reject heat from a reservoir at low temperatures.
  - b) Reject heat at higher temperatures.
  - c) Absorb heat from a reservoir at low temperatures.
  - d) Are working fluids of refrigeration cycles.

131. EAcr1 - An Energy Star rating is? (Choose three)
- a) Represented by a score of 75 for an average building performance.
  - b) Earned from the comparison of a building's energy performance to similar buildings in similar climates.
  - c) Represented by a score of 50 for an average building performance.
  - d) Generated using a Portfolio Manager.
132. SSc3 - Site Assessment includes which of the following? (Choose three)
- a) Generation of information used to support remedial action decisions.
  - b) Both above ground and sub-surface characteristics to determine release.
  - c) Only above ground characteristics are used to determine release.
  - d) The geology and hydrology of the site are included in the evaluation.
133. An owner wants to see a project's anticipated rating as soon as possible, and to minimize the number of prerequisites or credits that must wait until construction. The project administrator should advise that which of the following prerequisites wait until the project is complete before submitting for review? (choose two)
- a) SSp1
  - b) WEp1
  - c) EAp1
  - d) MRp1
  - e) EQp1
  - f) IDp1
134. SScr4.1 - Public Transportation includes: (Choose three)
- a) No privately owned means of transportation.
  - b) Bus.
  - c) Trolley.
  - d) Rail.
135. SScr4.3 - Alternative Fuel Vehicles use low-polluting fuels such as: (Choose three)
- a) Electricity.
  - b) Natural Gas.
  - c) Low Octane Gas.
  - d) Hydrogen.
136. SScr7.1 - SRI is what? (Choose two)
- a) Solar Reduced Infiltration.
  - b) Defined so standard black is 0.
  - c) Solar Reflectance Index.
  - d) Defined so standard white is 100.
137. SScr8 - Light Pollution is? (Choose three)
- a) Directed off the site.
  - b) Directed toward the ground.
  - c) Wasted light from the building sites that produces glare.
  - d) Directed toward the sky.
138. What are the benefits of LEED certification?

- a) The building cost less to operate and maintain.
  - b) Provision of third-party validation of a building's performance.
  - c) It is a tool for buildings of all types and sizes.
  - d) It evaluates environmental performances from a whole building perspective.
139. EAcr1 - What changed for projects registered after June 26, 2007 for this credit to Optimize Energy Performance? (Choose two)
- a) There are three instead of four compliance path options available.
  - b) The project must be in compliance with EA Prerequisite 4.
  - c) Required to achieve at least two of the ten points available.
  - d) Must comply with ASHRAE/IESNA Standard 90.1-2007.
140. SScr2 - In defining Square Footage? (Choose two)
- a) Surface parking (only 1 story of parking) may be counted as part of the building square footage.
  - b) Only 2 stories of a parking structure may be counted as part of a building square footage.
  - c) Neither structured nor stacked parking is allowable in square footage calculations.
  - d) Both structured and stacked parking are allowable in square footage calculations.
141. The LEED rating system includes the following environmental categories: (Choose three)
- a) Materials & Resources and Indoor Environmental Quality.
  - b) Sustainable Sites and Water Efficiency
  - c) Habitat Preservation and Sustainable Sites
  - d) Water Efficiency and Materials & Resources
142. LEED NCv2.2 has the option of splitting a certification application into how many phases?
- a) five
  - b) two
  - c) four
  - d) three
143. SSpr1 - What two types of measures does the standard describe to control sedimentation and erosion? (Choose two)
- a) Seeding
  - b) Stabilization
  - c) Sediment Trap
  - d) Structural Control
144. SScr1 - Which of the following are included in defining the Development Footprint?
- a) Hardscape
  - b) Non-building facilities
  - c) Building structures
  - d) Parking lots
145. SScr2 - What are considerations for this credit? (Choose three)
- a) Environmental Issues
  - b) Equitability Issues
  - c) Economic Issues
  - d) Community Issues

146. SScr3 - What concerns are key issues when evaluating brownfield redevelopment?  
(Choose two)
- a) Environmental Issues
  - b) Equitability Issues
  - c) Economic Issues
  - d) Community Issues
147. SScr4.1 - What are environmental issues for this Alternative Transportation credit?
- a) Vehicle Emissions
  - b) Oil Extraction
  - c) Impervious Surfaces
  - d) Petroleum Refining
148. What basic method(s) allow for ventilating buildings:
- a) Active ventilation
  - b) Passive ventilation
  - c) mixed-mode ventilation
  - d) All of the above
149. How many possible points are available in ID credit 1 (innovation in design process):
- a) 1
  - b) 2
  - c) 3
  - d) 4
150. Credit can be earned for Alternative Transportation, Parking Capacity by doing all of the following except:
- a) Provide carpool drop-off areas
  - b) Provide designated vanpool parking
  - c) Provide bicycle storage
  - d) Provide shuttle services to mass transit
151. Credit for Optimizing Energy Performance can be supported by all but the following:
- a) Comply with the US Department of Energy Standard Process for Commercial Energy
  - b) Comply with the prescriptive measures of ASHRAE Advanced Energy Design Guild for Small Office Buildings
  - c) Comply with Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark Version 1.1
  - d) Doing a whole building simulation according to ASHRAE/IESNA Standards
152. Innovations in Design must do all but two of the following:
- a) Exceed the requirements in another category
  - b) Not be covered in any other category
  - c) Provide environmental benefits
  - d) Provide health benefits
153. If your team managed to get all prerequisites and for the first two LEED categories in the reference guide what minimum number of credits are needed to earn Gold certification from all the remaining categories?
- a) 22
  - b) 20

- c) 7
- d) 25

154. In order to earn 1 credit point for SS 4.2, what could the design team and commercial building do?

- a) Provide secure bicycle parking spaces for 5% of the FTE building occupants, and showers and changing rooms for 5% of the FTE occupants.
- b) Provide secure bicycle parking spaces for 5% of the FTE building occupants, and showers and changing rooms for .5% of FTE occupants.
- c) Provide secure bicycle parking spaces for 15% of the FTE building occupants.
- d) Provide elephant taxis service at supplemented rates for 5% of building FTE

155. In what way does LEED 2.2 use the Portland, OR. Zoning Code: Title 33. Chapter 33.266

- a) To state the amount of exterior lighting lumens are required for each sq/ft. of exterior parking lot.
- b) To state minimum sidewalk width to and area of a public bus stop on 3 story and greater commercial buildings.
- c) To state minimum number of parking spaces required per building area.
- d) To state number of parking spaces required for residential buildings and provide 5% of preferred parking spaces for car/van pools.

156. Regarding credit SS Prerequisite 1, what is the intent of Construction Activity Pollution Prevention?

- a) Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.
- b) Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.
- c) Reduce pollution and land development impacts from automobile use.
- d) Reduce pollution and land development from single occupancy vehicle use.

157. Regarding WE credit 2, what is the intent of Innovative Wastewater Technologies?

- a) Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.
- b) Maximize water efficiency within building to reduce the Buren on municipal water supply and wastewater systems.
- c) Verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design and construction documents.
- d) Limit or eliminate the use of potable water, or the natural surface or subsurface water resource available on or near the project site, for landscape irrigation.

158. Regarding EA credit 4, what is the intent of Fundamental Refrigerant Management?

- a) Encourage and recognize levels of on site renewable energy self supply in order to reduce environmental and economic impact with fossil fuel energy use.
- b) Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.
- c) Reduce ozone depletion.
- d) Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

159. Regarding EQ credit Prerequisite 1, what is the intent of Minimum IAQ Performance?

- a) Minimize exposure of building occupants to potentially hazardous particulate and chemical pollutants.
- b) Provide for the building occupants a connection between indoor space and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.
- c) Provide a comfortable thermal environment that supports the productivity and well-being of building occupants.
- d) Establish minimum indoor air quality performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.

160. A proposed cold storage warehouse will use refrigeration equipment that contains less than 0.5 lbs of refrigerant. What information is needed to determine compliance with EA Credit 4?

- a) Equipment Type
- b) Refrigerant Type
- c) Refrigerant Charge in lbs of refrigerant per ton of gross ARI rated cooling capacity
- d) None of the above

161. How does the USGBC recognize buildings that achieve one of the rating levels? (Choose two).

- a) With a special mention in the USGBC newsletter
- b) With a formal letter
- c) With a mountable plaque
- d) With a free credit interpretation request on the owner's next project

162. During construction, a change order is issued to landscape areas that were previously going to be asphalt pavement. Which LEED credits may be impacted favorably by this decision? (Choose three).

- a) SS Credit 5.2: Maximize Open Space
- b) WE Credit 1.1 Water Efficient Landscaping: Reduce by 50%
- c) SS Credit 6.2: Stormwater Design: Quality Control
- d) SS Credit 6.1: Stormwater Design: Quantity Control

163. EA Credit 6 requires that you determine the building baseline electricity use by which of the following means?

- a) Using the DOE CBECS database to determine the estimated electricity use
- b) Using the annual electricity consumption from the results of EA Credit 1
- c) A or B
- d) A and B

ANSWER KEY

- |             |             |                              |
|-------------|-------------|------------------------------|
| 1) a, d     | 50) a, c, d | 99) b                        |
| 2) c        | 51) b       | 100) b                       |
| 3) a        | 52) c       | 101) b                       |
| 4) c        | 53) b       | 102) a                       |
| 5) b,c,d    | 54) a       | 103) d                       |
| 6) a, d     | 55) c       | 104) b                       |
| 7) b        | 56) d       | 105) b                       |
| 8) b        | 57) d       | 106) d                       |
| 9) d        | 58) c       | 107) d                       |
| 10) a, b, e | 59) d       | 108) d                       |
| 11) c, d, f | 60) d       | 109) d                       |
| 12) d       | 61) d       | 110) c                       |
| 13) f       | 62) b       | 111) a & c                   |
| 14) c, e    | 63) b       | 112) a                       |
| 15) c       | 64) c       | 113) c                       |
| 16) b, c    | 65) c       | 114) A – All,<br>B – a,d,c,b |
| 17) c       | 66) b       | 115) b                       |
| 18) a       | 67) d       | 116) c, no                   |
| 19) a       | 68) b       | 117) a                       |
| 20) b       | 69) d       | 118) a & c                   |
| 21) a       | 70) b       | 119) c                       |
| 22) d       | 71) d       | 120) c & d                   |
| 23) b,c,d   | 72) b       | 121) a, c & d                |
| 24) c       | 73) b, d    | 122) c                       |
| 25) c       | 74) d       | 123) c                       |
| 26) d       | 75) a       | 124) a, b & d                |
| 27) b       | 76) b       | 125) a, b & d                |
| 28) a       | 77) a       | 126) b, c, & d               |
| 29) a, d    | 78) c       | 127) b, c, & d               |
| 30) a,b,e   | 79) c       | 128) a, c, & d               |
| 31) e       | 80) d       | 129) a, c, & d               |
| 32) b       | 81) a       | 130) b, c, & d               |
| 33) b, d    | 82) d       | 131) b, c, & d               |
| 34) b       | 83) d       | 132) a, b & d                |
| 35) a       | 84) a       | 133) a & c                   |
| 36) a       | 85) c       | 134) a, b & d                |
| 37) a, b, e | 86) b       | 135) a, b, & d               |
| 38) a, c, e | 87) c       | 136) b, c & d                |
| 39) a, c    | 88) a       | 137) a, c, & d               |
| 40) b       | 89) d       | 138) All                     |
| 41) a       | 90) a       | 139) a & c                   |
| 42) b       | 91) c       | 140) b & d                   |
| 43) b       | 92) a,c,d   | 141) a, b, & d               |
| 44) c       | 93) c       | 142) b                       |
| 45) c       | 94) d       | 143) b & d                   |
| 46) c       | 95) d       | 144) All                     |
| 47) a       | 96) b       | 145) a, c, & d               |
| 48) e       | 97) c       | 146) a & c                   |
| 49) d       | 98) c       |                              |

- 147) All
- 148) d
- 149) d
- 150) c
- 151) a
- 152) a & b
- 153) b
- 154) b
- 155) c
- 156) a
- 157) a
- 158) c
- 159) d
- 160) d
- 161) b & c
- 162) a, c, & d
- 163) c