



REFRIGERATION EQUIPMENT TECHNICIANS EXAMINATION TESTS

ENVIRONMENT

1. Where is the Earth's vital ozone layer located?
 - a. in the troposphere (up to 10—15 km from the Earth)
 - b. in the stratosphere (15-60 km from the Earth)**
 - c. in the mesosphere (above 60 km from the Earth)
 - d. in all these layers
2. What kind of radiation does the ozone layer absorb and reflect, preventing it from reaching the Earth surface?
 - a. ultraviolet (UV-B and UV-C) radiation**
 - b. X-radiation
 - c. ultrared radiation
 - d. gamma radiation
3. In which layer of the Earth's atmosphere does ozone act as a greenhouse gas and is considered a pollutant?
 - a. in the troposphere (up to 10—15 km from the Earth)**
 - b. in the stratosphere (15-60 km from the Earth)
 - c. in the mesosphere (above 60 km from the Earth)
 - d. in the ionosphere (above 85 km from the Earth)
4. Above which continent does the strongest periodic depletion of the ozone layer occur?
 - a. above the Europe
 - b. above the North America
 - c. above the Australia
 - d. above the Antarctic**
5. What causes the depletion of the ozone layer?
 - a. carbon dioxide
 - b. ammonia and hydrocarbons (propane, isobutene, etc)
 - c. artificial chemicals that comprise halogens (e.g. chlorine)**
 - d. all of the above



6. Which properties of artificial refrigerants make them cause ozone depletion?
- the refrigerants are very active chemical substances
 - the refrigerants have a long lifetime**
 - the refrigerants are lighter than air and easily go up to the stratosphere
 - none of the above
7. Which of the following refrigerant groups has the highest ozone-depleting potential (ODP)?
- CFC**
 - HCFC
 - HFC
 - all these groups have similar ozone-depleting potential
8. Which of the following refrigerants has a zero ozone-depleting potential?
- R12
 - R22
 - R502
 - R717 (ammonia)**
9. Which of the following factors reflects the overall impact of a refrigerant on climate change?
- HGWP
 - TEWI**
 - ODP
 - GWP
10. Which other industries, apart from refrigeration, air-conditioning and heat pump systems, use ozone-depleting substances?
- agriculture
 - fire protection
 - solvent industry
 - all of the above**
11. Which industry is the largest consumer of ozone-depleting substances in Georgia?
- agriculture
 - fire protection
 - refrigeration, air-conditioning and heat pump systems**
 - solvent industry



12. Which group of the Montreal Protocol Article 5 countries does Georgia belong to?
- a. countries whose annual per capita consumption and production of the controlled substances is less than 0.3 kg
 - b. all developing countries
 - c. all developed countries
 - d. countries with zero production of regulated substances
13. What is the scheduled reduction of R22 consumption in Georgia before 2020?
- a. 10%
 - b. 35%
 - c. 50%
 - d. 75%
14. When is Georgia due to prohibit production of new R22?
- a. in 2025
 - b. in 2030
 - c. in 2040
 - d. in 2050
15. The Montreal protocol is:
- a. a list of behaviors permitted and prohibited in Canada
 - b. a list of rules for handling refrigerants
 - c. an international agreement regulating production and consumption of ozone-depleting substances
 - d. a document regulating distribution of the humanitarian food aid provided by the US
16. What kind of human diseases can excessive UV radiation cause?
- a. eye cataract
 - b. skin cancer
 - c. low immunity
 - d. all of the above
17. In the Earth environment, the lifetime of CFCs with the highest ozone-depleting potential is:
- a. 100-150 years
 - b. 50-100 years
 - c. 25-50 years
 - d. 10-25 years



18. Phase-out of which refrigerant group is envisaged by the Kigali amendment of the Montreal Protocol?

- a. **HFC**
- b. CFC
- c. HCFC
- d. natural refrigerants

19. According to the Kigali amendment of the Montreal Protocol, when is Georgia due to freeze HFC growth at the baseline level?

- a. in 2017-2020
- b. in 2020-2022
- c. in 2022-2024
- d. **in 2024-2028**

20. How is the HFC consumption baseline calculated in Georgia?

- a. as an average of consumption for the years 2018-2020
- b. **as an average of consumption for the years 2020-2022**
- c. as an average of consumption for the years 2021-2023
- d. as an average of consumption for the years 2022-2024

21. Under the Georgian legislation, for which term are respective certificates issued to technicians who maintain refrigeration, air conditioning and heat pump systems?

- a. for 1 year
- b. for 2 years
- c. for 3 years
- d. **for 5 years**

22. Under the Georgian legislation, what is the minimum amount of refrigerant in stationary (fixed) equipment that would require the owner to keep a Electronic Refrigerant Use Logbook?

- a. **3 kg**
- b. 5 kg
- c. 10 kg
- d. 50 kg

23. The Georgian national legislation:

- a. regulates protection of the ozone layer
- b. regulates the sector of the refrigeration equipment, air conditioning and heat pumps
- c. regulates the import and export of ozone-depleting substances
- d. **all of the above**



24. How often should a device containing between 3 kg and 30 kg of refrigerant be routinely checked for leaks?
- a. At least once every 3 months
 - b. At least once every 6 months
 - c. Quarterly
 - d. At least once every 12 months**
25. How much is the fine for violating the requirements of the "Rules of Procedures of Electronic Refrigerant Management System"?
- a. GEL 100
 - b. GEL 500**
 - c. GEL 200
 - d. GEL 400
26. How much is the fine for violating the general requirements of the technical regulation on environmental requirements for the service of heat pumps, air conditioning and refrigeration equipment?
- a. 500
 - b. 300
 - c. 1000**
 - d. 1500
27. What fine does an uncertified legal entity face when providing services?
- a. 1000**
 - b. 500
 - c. 1500
 - d. 2000
28. What fine does an uncertified legal entity face if it repeatedly provides services?
- a. 1500
 - b. 700
 - c. 2000**
 - d. 100
29. What fine does an uncertified individual or individual entrepreneur face when providing services?
- a. GEL 300
 - b. GEL 100
 - c. GEL 600



გარემოს დაცვისა და სოფლის
მეურნეობის სამინისტრო



სსიპ გარემოსდაცვითი
ინფორმაციისა და
განათლების ცენტრი

d. GEL 400



30. What fine does an uncertified individual or individual entrepreneur face if he/she repeatedly provides services?

- a. GEL 500
- b. GEL 150
- c. GEL 200
- d. **GEL 800**

31. How much is the fine for the purchase/sale of a substance covered by the Montreal Protocol in violation of the established rules for each kilogram of the specified substance?

- a. **GEL 150**
- b. GEL 500
- c. GEL 200
- d. GEL 400



GEORGIAN STATE STANDARD SST 70: SAFETY AND ENVIRONMENTAL REQUIREMENTS TO MAINTENANCE OF REFRIGERATION SYSTEMS AND HEAT PUMPS

32. What is a secondary cooling/heating system?

- a. **a system that uses liquid heat conductor for heat exchange between the cooled/heated environment and the refrigeration system**
- b. a system where cooling/heating occurs in two or more phases
- c. a cascade refrigeration system
- d. none of the above

33. Under the Georgian Standard SST 70: Safety and Environmental Requirements to Maintenance of Refrigeration Systems and Heat Pumps, what is an occupied space?

- a. a space where all key components of a refrigeration system are located
- b. a space where the automatic control unit is located
- c. **a space where people may stay for a long period of time**
- d. all of the above

34. What is a hermetically sealed compressor?

- a. a compressor and an electrical motor within one removable case
- b. **a compressor and an electrical motor within one non-removable case**
- c. a compressor with a part of the driving shaft protruding from the hermetic case for connection to the motor
- d. any non-leaking compressor

35. What is a semi-hermetic compressor?

- a. **a compressor and an electrical motor within one removable case**
- b. a compressor and an electrical motor within one non-removable case
- c. a compressor with a part of the driving shaft protruding from the hermetic case for connection to the motor
- d. any compressor with a potential refrigerant leak

36. What is an open compressor?

- a. a compressor and an electrical motor within one removable case
- b. a compressor and an electrical motor within one non-removable case
- c. **a compressor with a part of the driving shaft protruding from the hermetic case for connection to the motor**
- d. any compressor that gets unsealed, from which a refrigerant leak occurs



37. What is a condensing unit?
- a. a unit consisting of a condenser and its air- or water-cooling device
 - b. a combination of a condenser and a liquid receiver
 - c. a cascade system condenser that also acts as an evaporator
 - d. a unit consisting of one or several compressors, condensers, liquid receivers (if necessary) and equipped with controlling devices**
38. What kind of test should be conducted prior to accepting a refrigeration system for maintenance?
- a. pressure strength test
 - b. pressure tightness test
 - c. safety equipment test
 - d. all of the above**
39. Under the Georgian Standard SST 70: Safety and Environmental Requirements to Maintenance of Refrigeration Systems and Heat Pumps, what is the minimum probation period for a technician to be being qualified for independent maintenance of refrigeration systems?
- a. 1 month**
 - b. 3 months
 - c. 6 months
 - d. 12 months
40. Which safety group does R22 belong to?
- a. A3
 - b. A1**
 - c. A2
 - d. B2L
41. Which safety group do refrigerants R600a (isobutene) and R290 (propane) belong to?
- a. A3**
 - b. A1
 - c. A2L
 - d. B2
42. Which safety group does refrigerant R744 (carbon dioxide) belong to?
- a. A3
 - b. A1**
 - c. A2
 - d. B2L



43. Which safety group does refrigerant R717 (ammonia) belong to?

- a. A1
- b. A3
- c. A2L
- d. **B2**

44. Which safety group does refrigerant R1234yf belong to?

- a. A1
- b. A2
- c. A3
- d. **B2L**

45. Which safety group does refrigerant R410A belong to?

- a. **A1**
- b. A2L
- c. A3
- d. B2

46. What is the maximum recharging volume of R134a per unit volume of occupied space (practical norm)?

- a. 0.008 kg/m³
- b. 0.00035 kg/m³
- c. **0.25 kg/m³**
- d. 0.07 kg/m³

47. What is the maximum recharging volume of R717 per unit volume of occupied space (practical norm)?

- a. 0.008 kg/m³
- b. **0.00035 kg/m³**
- c. 0.25 kg/m³
- d. 0.07 kg/m³

48. What is the maximum recharging volume of R290 (propane) per unit volume of occupied space (practical norm)?

- a. **0.008 kg/m³**
- b. 0.00035 kg/m³
- c. 0.25 kg/m³
- d. 0.07 kg/m³



49. What is the maximum recharging volume of R744 (carbon dioxide) per unit volume of occupied space (practical norm)?

- a. 0.008 kg/m³
- b. 0.00035 kg/m³
- c. 0.25 kg/m³
- d. 0.07 kg/m³**

50. What determines the maximum amount of refrigerant in the refrigeration system when the refrigerant-containing parts of the system are located in occupied spaces?

- a. the practical norm
- b. the lower flammability level (LFL)
- c. space volume
- d. all of the above**

51. What is the maximum permissible concentration of highly toxic refrigerants (class B), above which the refrigerant is harmful for anyone working under its impact 8 hours a day and 40 hours a week?

- a. 300 ml/m³
- b. 400 ml/m³**
- c. 500 ml/m³
- d. 600 ml/m³

52. Which flammability class do highly flammable refrigerants belong to?

- a. 1
- b. 2
- c. 3**
- d. 4

53. How many air exchanges are necessary in a machine or equipment rooms if these are the 'occupied spaces'?

- a. 4 exchanges per hour**
- b. 3 exchanges per hour
- c. 2 exchanges per hour
- d. 1 exchange per hour

54. What is the minimal difference between the temperature of a hot surface and autoimmflamability temperature of the contacting refrigerant?

- a. 120°C
- b. 130°C
- c. 140°C
- d. 150°C**



55. What is the lowest concentration (in %) of flammable of A2 and A3 refrigerants in the air for the refrigerant detector to get activated?
- a. 10%
 - b. 20%**
 - c. 30%
 - d. 40%
56. During a visual check of the equipment location place, which of the following should be checked?
- a. condition of the mechanical ventilation in the machine and equipment rooms
 - b. condition of the refrigerant detector, alarm system and emergency system
 - c. accessibility of PPE
 - d. all of the above**
57. An external visual examination report should include the following information:
- a. comparison of the given piece of equipment with drawings of the refrigeration and electrical systems
 - b. availability of documentation for pressurized vessels
 - c. condition of connections, fastenings, fixtures and welds
 - d. all of the above**
58. Refrigerating systems with how much ammonia should have stop valves to isolate receivers from the system?
- a. over 50 kg**
 - b. over 100 kg
 - c. over 150 kg
 - d. over 200 kg
59. Equipment containing 3 kg and more refrigerants, except for hermetic systems containing 6 kg and less refrigerants, should be leak-tested at least:
- a. once in 3 months
 - b. once in 6 months
 - c. once in 9 months
 - d. once in 12 months**
60. Equipment containing 30 kg and more refrigerants should be leak-tested for at least:
- a. once in 3 months
 - b. once in 6 months**
 - c. once in 9 months
 - d. once in 12 months



61. Equipment containing 300 kg and more refrigerants should be leak-tested at least:
- a. once in 3 month**
 - b. once in 6 months
 - c. once in 9 months
 - d. once in 12 months
62. After reconstruction of refrigerating equipment, it is necessary to:
- a. remove extra tubes/piping
 - b. check the condition of stop valves
 - c. shut open piping blocks
 - d. do all of the above**
63. Receivers with which minimum capacity should have liquid level gauges installed?
- a. 100 kg for group A1 refrigerants
 - b. 25 kg for group A2, B1, B2 refrigerants
 - c. 2.5 kg for group A3, B3 refrigerants
 - d. all of the above**
64. What kind of information should be included into the ID plate fixed on a refrigerating equipment?
- a. name of the manufacturer and installer, equipment model and serial number
 - b. type and amount of refrigerant
 - c. name of the manufacturer and installer, equipment model, year of manufacture and serial number, type and amount of refrigerant, maximum permissible pressure from the high and low-pressure sides**
 - d. year of manufacture
65. What kind of information should be included into the refrigerating equipment installation document?
- a. only name of the manufacturer and installer
 - b. information confirming that the equipment has been installed in compliance with the design requirements and that the system has been equipped with protection and control devices; also information about fine-tuning after putting to operation**
 - c. name of the manufacturer and installer, and technical data if the system
 - d. operation manual



66. Under the Georgian Standard SST 70: Safety and Environmental Requirements to Maintenance of Refrigeration Systems and Heat Pumps, what are the requirements to doors leading to the machine and equipment rooms?

- a. the doors must ensure free exit of a sufficient number of people
- b. the doors must be tight-fitting and self-closing, and open from both sides
- c. the doors must have a fire-resistance rating of at least 1 hour
- d. all of the above**

67. Where should a stationary/fixed refrigerant detector be positioned?

- a. at the highest point in the room
- b. at the lowest point in the room
- c. at the highest point for refrigerants that are lighter than air, and at the lowest point for refrigerants that are heavier than air**
- d. next to the compressor

68. For which safety group of refrigerants should the handling staff necessarily use protective gloves and goggles?

- a. for all groups of refrigerants, regardless of their properties**
- b. B2
- c. A2
- d. A1 and B1

69. First aid equipment related to the refrigerants contained in the system and respective medicines should be stored:

- a. in the machinery room
- b. next to the entrance to the machinery room**
- c. in the refrigeration chamber
- d. in the office

70. The following requirements apply to refrigerating systems operating on Group B2 refrigerants:

- a. the system's receiver should contain the full amount of the refrigerant circulating in the system
- b. pipes and collectors should be welded without any flanges, and should be placed in a concrete floor
- c. the collector and distribution pipes should be placed in a dedicated distribution canal connected to the machinery room
- d. all of the above**



71. What kind of information should be permanently and safety displayed on the refrigerant pump?
- name of the manufacturer and year of manufacture
 - model's name and serial number
 - the design or maximum permissible pressure
 - all of the above**
72. Who identifies maximum permissible pressures for different parts of a refrigerating system?
- manufacturer upon client's request
 - designer, according to the system and in consideration of local conditions**
 - installer, according to the system and in consideration of local conditions
 - none of the above
73. What does the distance between tube/pipe fixtures depend on?
- on the c material
 - on the tube/s/pipe's section area
 - on tube/pipe length
 - on all of the above**
74. When is it permissible to pass a refrigerant through ventilation and air-conditioning channels?
- never**
 - permissible for Group A1 refrigerants
 - in all cases unless Group A3 or B3 refrigerants are used
 - in all cases unless natural refrigerants are used
75. What is a relative refrigerant loss?
- a ratio between the refrigerant amount lost during recharging, and the total amount of the refrigerant in the system
 - a ratio between the actual amount of the refrigerant in the system, and the amount indicated in the system's technical documentation
 - a ratio between the refrigerant amount lost from the system in a year, and the total amount of the refrigerant existing in the system**
 - a ratio between the refrigerant amount lost from a shutdown system, and the refrigerant amount lost from the working system
76. What kind of checks/tests are required for the safety valve, the rupture disk and the fuse plug?
- only visual check
 - visual check and leak test**



- c. maximum permissible pressure test
- d. no checks/tests required

77. A maintenance/repair guide for equipment containing Group A3 refrigerants should include the following information:

- a. rules for normal operation, switching on / switching off
- b. rules for systematic maintenance and repair, including safety requirements to opening up some components of the system
- c. rules for testing the safety system and its components
- d. **all of the above**

78. What is 'controlled waste'?

- a. **refrigerant extracted from the system before it is identified**
- b. re-cycled refrigerant
- c. recovered refrigerant
- d. destroyed refrigerant

79. A visual check of the amount of refrigerant in the refrigerating system is done using:

- a. a level sight glass
- b. a level gage
- c. pressure and temperature readings during operation
- d. **all of the above**

80. How often should fixed fluorinated refrigerant detectors be calibrated?

- a. once in a month
- b. once in 6 months
- c. **once in 12 months**
- d. no calibration required

81. When is it possible to re-use an extracted fluorinated refrigerant in the same system without re-cycling?

- a. after replacement of an electrically-damaged hermetic or semi-hermetic compressor
- b. **if there are no acids, moisture or mechanical pollutants in the system**
- c. after replacement of the dehydrating filter
- d. in all cases



THERMODYNAMICS

82. Which thermodynamic parameter is measured in degrees?

- a. pressure
- b. density
- c. temperature**
- d. volume

83. What is the term defining the amount of heat necessary to cool/heat a unit mass by one degree?

- a. heat conductivity
- b. heat emission
- c. heat absorption
- d. specific heat capacity**

84. What is the term defining the rate of doing work per unit time?

- a. viscosity
- b. frequency
- c. power**
- d. heat

85. What is the term defining the amount of heat extracted from evaporating a 1 kg of a liquid refrigerant?

- a. specific cooling capacity**
- b. heat emission
- c. heat absorption
- d. specific heat capacity

86. Critical temperature is a temperature:

- a. above which substance can explode
- b. above which substance cannot be liquefied**
- c. below which substance can only be in the liquid state
- d. below which the solid and liquid phases of the substance are balanced

87. Normal boiling point is:

- a. the temperature at which substance boils at the atmosphere pressure (1.01 bar)**
- b. a condition when vapor bubbles appear only of the surface of the liquid
- c. a condition when vapor bubbles appear in the body of the liquid



d. all of the above

88. Absolute temperature is measured in:

- a. degrees Celsius
- b. degrees Fahrenheit
- c. Kelvins**
- d. all of the above

89. When the thermometer reading for the substance temperature is 0°C , its absolute temperature is:

- a. 125.3K
- b. 360.0K
- c. 273.15K**
- d. 80.5K

90. What is the difference between the absolute pressure and the gauge pressure?

- a. 2 bar
- b. 1 bar**
- c. 0 bar
- d. 0.1 bar

91. Which of the following refrigerants is a CFC?

- a. R12**
- b. R22
- c. R1234yf
- d. R143a

92. Which of the following refrigerants is a HCFC?

- a. R12
- b. R22**
- c. R134a
- d. R1234yf

93. Which of the following refrigerants is a HFO?

- a. R12
- b. R1234yf**
- c. R134a



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d. R744



94. Which of the following refrigerants is a HFC?

- a. R12
- b. R22
- c. R134a**
- d. R744

95. Which of the following refrigerants is a HC?

- a. R134a
- b. R404A
- c. R407C
- d. R600a**

96. Which of the following mixtures is azeotropic?

- a. R402
- c.b. R502**
- d.R407C
- e. R410A

97. Which of the following mixtures is zeotropic?

- a. R404A**
- b. R500
- c. R502
- d. R507

98. Which of the following is a service mixture?

- a. any zeotropic mixture
- b. any azeotropic mixture
- c. a mixture containing R22**
- d. none of the above

99. Which of the following is used to identify the refrigerant type?

- a. a halide test lamp
- b. an identifier**
- c. a leak detector
- d. all of the above



100. A pressure drop in the capillary tube can be caused by:
- friction with the wall
 - acceleration of the flow
 - change in the flow direction
 - all of the above**
101. Which thermodynamic process occurs in the compressor?
- compression of the refrigerant**
 - superheating of the refrigerant
 - evaporation of the refrigerant
 - all of the above
102. Which thermodynamic process occurs in the condenser?
- compression of the refrigerant
 - liquefaction of the refrigerant**
 - evaporation of the refrigerant
 - none of the above
103. Which thermodynamic process occurs in the evaporator?
- compression of the refrigerant
 - liquefaction of the refrigerant
 - evaporation of the refrigerant**
 - none of the above
104. When the boiling temperature decreases, the refrigerating capacity of the compressor:
- increases
 - decreases**
 - remains unchanged
 - may increase or decrease depending on the refrigerant
105. The refrigerant speed in the tube depends on:
- refrigerant density
 - refrigerant discharge
 - internal tube diameter
 - all of the above**



106. When the temperature of the condensate increases, the refrigerating capacity of the compressor:

- a. increases
- b. decreases**
- c. remains unchanged
- d. may increase or decrease depending on the refrigerant

107. When the vapor is superheated above the normal value, the refrigerating capacity of the compressor:

- a. increases
- b. decreases**
- c. remains unchanged
- d. may increase or decrease depending on the refrigerant

108. The heat extracted in the condenser:

- a. is always more than the heat extracted in the evaporator**
- b. is always less than the heat received in the evaporator
- c. always equals the heat received in the evaporator
- d. may be more or less than the heat received in the evaporator, depending on the heat-exchanging surface of the condenser

109. Condensation of the zeotropic mixture in the condenser occurs:

- a. at varying pressure and temperature
- b. at constant pressure and temperature
- c. at constant pressure and varying temperature**
- d. at varying pressure and constant temperature

110. Which of the following is used to measure relative humidity?

- a. a pressure gauge
- b. a psychrometer**
- c. a barometer
- d. an anemometer

111. Which of the refrigerants absorbs gaseous pollutants?

- a. activated carbon**
- b. nitrogen
- c. chlorine



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d. hydrogen



112. Which of the following is measured in BTU/h?

- a. work
- b. amount of heat
- c. energy
- d. **power**

113. In which point of the refrigerating contour does the refrigerant have the highest temperature?

- a. **at the exit from the compressor**
- b. at the exit from the condenser
- c. in the receiver
- d. at the entrance to the evaporator

114. At constant condensation temperature, when the boiling temperature increases, the refrigerating factor...

- a. **increases**
- b. decreases
- c. remains unchanged
- d. may increase or decrease depending on the refrigerant

115. A ton of refrigeration (TR) equals...

- a. 24000 BTU/h
- b. 18000 BTU/h
- c. **3.5 kW**
- d. 5.4 kW

116. In the evaporator a low-pressure liquid refrigerant converts into:

- a. high-pressure liquid
- b. high-pressure vapor
- c. low-pressure mixture of liquid and vapor
- d. **low-pressure vapor**

117. Refrigerant R744 is:

- a. colorless
- b. inflammable
- c. nontoxic
- d. **all of the above**



118. The refrigerating factor always:

- a. is less than 1
- b. is more than 1**
- c. equals 1
- d. may have any value

119. Which of the following characteristics is undesirable for a refrigerant?

- a. high soil solubility
- b. low boiling temperature in normal conditions
- c. high specific heat of vaporization (evaporation)
- d. high electrical conductivity**

120. How does subcooling affect the refrigerating factor?

- a. decreases the refrigerating factor
- b. increases the refrigerating factor**
- c. does not affect the refrigerating factor
- d. may increase or decrease the refrigerating factor, depending on the refrigerant

121. At constant boiling temperature, when the condensation temperature decreases, the refrigerating factor...

- a. increases**
- b. decreases
- c. remains unchanged
- d. may increase or decrease depending on the refrigerant

122. Refrigerant R717:

- a. nontoxic
- b. inflammable
- c. very toxic and flammable**
- d. toxic and inflammable

123. When the exhaust pressure increases, the energy consumption...

- a. remains unchanged
- b. decreases
- c. increases**
- d. depends on the compressor motor



124. When the suction pressure increases, the mass flow rate of the refrigerant...
- a. decreases
 - b. increases**
 - c. remains unchanged
 - d. depends on the refrigerant type
125. What do refrigeration systems, air-conditioning and heat pumps have in common?
- a. all these have an inverse thermodynamic cycle during which heat is transferred from lower to higher temperature environment**
 - b. their common purpose is to create conditions with temperatures lower than the surrounding environment temperature
 - c. they convert electric energy into thermal energy
 - d. they have nothing in common
126. Which of the refrigerant characteristics determines the total refrigerating capacity of refrigeration systems?
- a. specific heat of vaporization (evaporation)
 - b. specific heat capacity
 - c. density
 - d. all of the above**



CONTEMPORARY EQUIPMENT MAINTENANCE PRACTICES

127. Main components of a refrigerator are

- a. compressor and condenser
- b. evaporator and condenser
- c. evaporator and thermostatic expansion valve
- d. all of the above**

128. The working cycle of a simple compression refrigerator comprises of the following processes:

- a. evaporation and condensation
- b. compression and evaporation
- c. compression and expansion
- d. compression, condensation, expansion and evaporation**

129. What kind of refrigerant oil is used in refrigerating units with R134a?

- a. polyol ester oil (POE)**
- b. mineral oil (MO)
- c. mineral plus benzyl alcohol oil (MA)
- d. polyalphaolefin oil (PAO)

130. Which of the following is incompatible with mineral oil?

- a. R12
- b. R22
- c. R134a**
- d. R502

131. Which of the following gases is used for drying refrigerant systems?

- a. nitrogen**
- b. a respective refrigerant of the system
- c. oxygen
- d. none of the above

132. In order to clean a moisture-contaminated system, it is necessary to:

- a. heat the system
- b. create a vacuum of at least 0.03 bar
- c. maintain the vacuum for 24 hours
- d. create a vacuum sufficient for evaporating the moisture at the temperature of the**



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surrounding environment



133. Which component is used both in compression and absorption refrigerators?

- a. **evaporator**
- b. absorber
- c. compressor
- d. generator

134. The permissible percentage of other refrigerants mixed with refrigerants intended for recycling is:

- a. 0.2% of the mass
- b. **2%** of the mass
- c. 5% of the mass
- d. 10% of the mass

135. What is the safe charging norm for multiple-use refrigerant cylinder?

- a. 60%
- b. 75%
- c. **80%**
- d. 100%

136. In a compression refrigerator, superheating of the refrigerant occurs:

- a. after the compressor
- b. after the condenser
- c. after the capillary tube
- d. **after the evaporator**

137. Where is the refrigerant pressure control device (a thermostatic expansion valve or a capillary tube) located?

- a. after the evaporator
- b. **before the evaporator**
- c. after the compressor
- d. before the condenser

138. Which of the following is 'refrigerant recovery'?

- a. **refrigerant extraction from the system for further storage and re-use**
- b. refrigerant release to the atmosphere
- c. refrigerant reinstatement to the original state
- d. refrigerant purification from solid particles, moisture, acids and oils



139. Which of the following is 'refrigerant recycling'?
- a. refrigerant extraction from the system for further storage and re-use
 - b. refrigerant release to the atmosphere
 - c. refrigerant reinstatement to the original state
 - d. refrigerant purification from solid particles, moisture, acids and oils**
140. Which of the following is 'refrigerant reclaim'?
- a. refrigerant extraction from the system for further storage and re-use
 - b. refrigerant release to the atmosphere
 - c. refrigerant reinstatement to the original state**
 - d. refrigerant purification from solid particles, moisture, acids and oils
141. Which of the following is prohibited?
- a. refrigerant extraction from the system for further storage and re-use
 - b. refrigerant release to the atmosphere**
 - c. refrigerant reinstatement to the original state
 - d. refrigerant purification from solid particles, moisture, acids and oils
142. What is a 'drop-in'?
- a. system conversion to an alternative refrigerant with replacement of oil in the compressor, thermostatic expansion valve and the filter
 - b. system conversion to an alternative refrigerant with replacement of the compressor
 - c. system conversion to an alternative refrigerant with replacement of the evaporator and condenser
 - d. system conversion to an alternative refrigerant without any other changes in the system except for the refrigerant**
143. What is 'retrofitting'?
- a. system conversion to an alternative refrigerant with replacement of oil in the compressor, thermostatic expansion valve and the filter**
 - b. system conversion to an alternative refrigerant with replacement of the compressor
 - c. system conversion to an alternative refrigerant with replacement of the evaporator and condenser
 - d. system conversion to an alternative refrigerant without any other changes in the system except for the refrigerant
144. What is 'system optimisation'?
- a. system conversion to an alternative refrigerant with replacement of oil in the compressor,



thermostatic expansion valve and the filter

b. system conversion to an alternative refrigerant with replacement of the compressor

- c. system conversion to an alternative refrigerant with replacement of the evaporator and condenser
- d. system conversion to an alternative refrigerant without any other changes in the system except for the refrigerant

145. Insufficient amount of the refrigerant in the system may lead to:

- a. incomplete cooling of the evaporator
- b. bubbles in the level sight glass
- c. decreased refrigerating capacity
- d. all of the above**

146. Damaged evaporator's fan may lead to:

- a. decrease of the boiling temperature
- b. incomplete cooling of the evaporator
- c. liquid refrigerant getting into the compressor**
- d. all of the above

147. The purpose of heat insulation in refrigeration systems is

- a. to conduct heat efficiently
- b. to conduct minimum heat**
- c. to accumulate heat
- d. to remove heat

148. A heat pump is a piece of equipment that is used to:

- a. convey external air heat to the air inside the space**
- b. change the direction of the heat flow
- c. to change the direction of the refrigerant flow
- d. transfer warm water from one vessel into another

149. The function of the thermostatic expansion valve in refrigeration systems is

- a. to show the refrigerant level
- b. to act as a leak detector
- c. to show oil level
- d. to control the filling of the evaporator with low-pressure liquid refrigerant**



150. Contamination of the condenser edges leads to:
- a. increased pressure difference
 - b. decreased refrigerating capacity
 - c. superheating of high-pressure pipes
 - d. all of the above**
151. A sign indicating that the dehydrating filter is contaminated is:
- a. decreased pressure difference
 - b. cooling of the dehydrating filter**
 - c. increased refrigerating capacity
 - d. all of the above
152. A high-pressure switch can switch off the compressor because:
- a. the compressor ventilator is damaged
 - b. the dehydrating filter is contaminated
 - c. the high-pressure switch is damaged
 - d. all of the above**
153. What is the material of the tubes used in ammonia-based refrigerating systems?
- a. forge iron or cast steel**
 - b. aluminum
 - c. copper
 - d. brass
154. Which gas is used to leak-test refrigerating systems prior to refrigerant recharge?
- a. dry oxygen
 - b. dry carbon
 - c. dry hydrogen
 - d. dry nitrogen**
155. A high-pressure switch can switch off the compressor when:
- a. the suction pressure drops below the permissible level**
 - b. the exhaust pressure below the permissible level
 - c. the suction pressure or the exhaust pressure drop below the permissible level
 - d. the suction level or the exhaust pressure exceed the permissible level



156. Together with compressor, which of the following ensures pressure difference between the high-pressure and low-pressure parts of a refrigerating system?
- a. solenoid valve
 - b. thermodynamic expansion valve**
 - c. dehydrating filter
 - d. hot gas damper
157. The recommended maximum speed in the suction line is:
- a. 20 m/s**
 - b. 15 m/s
 - c. 10 m/s
 - d. 5 m/s
158. There should be no refrigerant vapor :
- a. at the entrance to the compressor
 - b. at the entrance to the condenser
 - c. at the entrance to the thermodynamic expansion valve**
 - d. none of the above
159. Which of the following refrigerants can substitute for R22 by drop-in?
- a. R417A**
 - b. R410A
 - c. R404A
 - d. R407C
160. To ensure minimum friction losses, the air speed in duct air-conditioning systems should be:
- a. high
 - b. average
 - c. reasonably low**
 - d. very low
161. In the heating mode, the external block of a split-type air-conditioning system acts as:
- a. condenser
 - b. evaporator**
 - c. condenser or evaporator
 - d. air heater



162. What happens when the thermodynamic expansion valve is blocked or the capillary tube is clogged?
- a. the suction pressure drops
 - b. the pressure difference sustains for a long time in the switched off refrigerating system
 - c. the exhaust pressure increases sharply
 - d. all of the above**
163. Incorrect installation of the sensitive element of the thermodynamic expansion valve or bad contact with the tube may lead to:
- a. the liquid refrigerant getting into the compressor**
 - b. suction pressure drop
 - c. condensation temperature increase
 - d. all of the above
164. An indicator of damaged valves of the reciprocating compressor is:
- a. sharp increase of the exhaust pressure
 - b. decrease of the boiling temperature
 - c. zero or small pressure difference**
 - d. all of the above
165. Which of the following should a technician do when maintaining refrigeration systems, air conditioning or heat pumps?
- a. use protective globes when recovering or re-pumping the refrigerant
 - b. disconnect the equipment from the electrical network prior to starting the works
 - c. extract the refrigerant from the system prior to opening the system
 - d. all of the above**
166. Which of the following the technician should not do when maintaining refrigeration systems, air conditioning or heat pumps?
- a. extract the refrigerant from flexible tubes prior to their removal
 - b. recharge the refrigerant into a leaky refrigerating system**
 - c. use dry nitrogen for purging and pressure-testing of the system
 - d. use leak detector to detect refrigerant leaks in the system
167. In absorption-type lithium bromide refrigerating systems:
- a. lithium bromide is the absorbent and water is the refrigerant**



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b. lithium bromide is the refrigerant and water is the absorbent



- c. lithium bromide is the refrigerant and ammonia is the absorbent
- d. lithium bromide is the absorbent and ammonia is the refrigerant

168. In absorption-type ammonia refrigerating systems:

- a. lithium bromide is the refrigerant and ammonia is the absorbent
- b. lithium bromide is the absorbent and ammonia is the refrigerant
- c. ammonia is the refrigerant and water is the absorbent**
- d. ammonia is the absorbent and water is the refrigerant

169. The refrigerant flow in refrigerating systems is regulated by :

- a. non-inverter compressor
- b. condenser
- c. evaporator
- d. thermodynamic expansion valve**

170. Which of the following refrigerants is used in absorption-type refrigerating systems?

- a. R22
- b. R717**
- c. R410A
- d. R744

171. Which of the following refrigerants is used in household refrigerators?

- a. R744
- b. R22
- c. R600a**
- d. all of the above

172. Substances used in absorption household refrigerators are:

- a. ammonia and hydrogen
- b. ammonia and water
- c. ammonia, water, and hydrogen**
- d. water and hydrogen

173. Which of the following expansion devices is used in split air conditioning systems (HVAC)?

- a. thermodynamic expansion valve
- b. capillary tube**



- c. electronic expansion valve
- d. expander

174. Rotation compressors are used in cases when it is necessary to ensure

- a. high refrigerant supply and high condensation pressure
- b. low refrigerant supply and high condensation pressure
- c. low refrigerant supply and low condensation pressure
- d. high refrigerant supply and low condensation pressure**

175. The difference between the boiling temperature in the evaporator and the temperature of the cooled environment should be:

- a. 25°C and above
- b. as low as possible (3°C to 10°C)**
- c. 0°C
- d. none of the above

176. The suction tube section area is :

- a. larger than the section area of the discharge tube**
- b. equals the section area of the exhaust tube
- c. smaller than the section area of the exhaust tube
- d. larger or smaller than the section area of the exhaust tube, depending on the refrigerating capacity of the system

177. Moisture in the refrigerant affects :

- a. the compressor
- b. the condenser
- c. the capillary tube**
- d. the evaporator

178. In which component of the refrigerating system does subcooling of the liquid refrigerant occur?

- a. in the condenser**
- b. in the compressor
- c. in the evaporator
- d. in the capillary tube



179. Which of the following installations uses capillary tubes?

- a. a household refrigerator
- b. a window-mounted air conditioner
- c. a water cooler
- d. all of the above**

180. If necessary, the liquid receiver in refrigerating systems is added:

- a. after the compressor
- b. after the thermodynamic expansion valve
- c. after the condenser**
- d. after the evaporator

181. Which of the following refrigerants is used in aircraft refrigerating systems?

- a. R22
- b. R410A
- c. R744
- d. R729**

182. Which of the following is the ASHRAE refrigerant identifiers is used for carbon dioxide?

- a. R729
- b. R744**
- c. R717
- d. R718

183. Which of the following is the ASHRAE refrigerant identifiers is used for water?

- a. R718**
- b. R744
- c. R717
- d. R729

184. Which of the following is the ASHRAE refrigerant identifiers is used for ammonia?

- a. R718
- b. R744
- c. R717**
- d. R729



185. Which of the following is the ASHRAE refrigerant identifiers is used for air?

- a. R718
- b. R744
- c. R717
- d. **R729**

186. A snow deposit in the evaporator:

- a. improves heat exchange
- b. **increases energy consumption**
- c. increases the refrigerating factor
- d. decreases energy consumption

187. A sharp increase in the condensation pressure can be caused by:

- a. impeded cooling water supply
- b. contamination of condenser edges
- c. presence of noncondensable gas (air or nitrogen) in the system
- d. **all of the above**

188. If necessary, liquid trap in refrigerating systems is added:

- a. **before the compressor**
- b. before the thermodynamic expansion valve
- c. before the condenser
- d. before the evaporator

189. A surge in the compressor may be caused by:

- a. snow deposit in the evaporator
- b. inadequate thermodynamic expansion valve
- c. excessive refrigerant in the system
- d. **all of the above**

190. When is it possible to connect a refrigerant tank to the system from the high-pressure side?

- a. when a mono-component refrigerant is charged into the system
- b. when zeotropic mixture is charged into the system
- c. **when the pressure in the system is higher than the pressure of the refrigerant in the tank**
- d. when azeotropic mixture is charged into the system



191. When is it necessary to recharge the system with a liquid refrigerant?
- when a mono-component refrigerant is charged into the system
 - when zeotropic mixture is charged into the system**
 - when a natural refrigerant is charged into the system
 - when azeotropic mixture is charged into the system
192. When is it possible to recharge the refrigerating system with a liquid refrigerant using the system's own compressor?
- when the system has a liquid remover (trap)**
 - when zeotropic mixture is charged into the system
 - when the system has a line receiver
 - when azeotropic mixture is charged into the system
193. When is it possible to add zeotropic system into the refrigerating system?
- if the refrigerant leak does not exceed 10% of the total refrigerant amount
 - if the refrigerant leak does not exceed 25% of the total refrigerant amount
 - if the refrigerant leak occurred from the low-pressure side
 - only after using an identifier to determine that the percentage deviation in the mixture components is within the acceptable limits**
194. What is the difference between a fixed refrigerant detector and a leak detector?
- the sensitivity of fixed detectors is higher
 - fixed detectors detect more types of refrigerants
 - fixed detectors cannot locate the place of the leak**
 - no difference except for the fact that the former is stationary and the latter is portable
195. Damage triggered resulting from the freezing of the water cooled in the evaporator is mainly caused by:
- decreased boiling temperature
 - decreased heat load on the refrigerating system
 - damaged flow switch**
 - damaged thermodynamic expansion valve
196. What is the difference between the refrigerating factor and the energy efficiency factor of an air-conditioner?
- these two factors are reciprocal
 - the former is a relation between the obtained cold to the energy consumed for compression,**



and the latter is a relation between the obtained cold to the total energy consumption

- c. the former indicates refrigeration efficiency, and the latter indicates heating efficiency
- d. in case of air conditioners, these factors are equal

197. What is the permissible limit of refrigerant loss?

- a. **no refrigerant leaks occur from a normally operating refrigerating system**
- b. 10%
- c. 25%
- d. 40%

198. What is the impact of 15% decrease of oxygen content in the indoor air on humans?

- a. fainting
- b. convulsions
- c. **deterioration of the physical and mental capacity that goes unnoticeable for the individual**
- d. no impact on a healthy individuals

199. First aid to those suffering from oxygen deficiency includes the following:

- a. the person should be taken outside to some fresh air
- b. the person's gas-contaminated clothes should be taken off
- c. the person should be placed in a quiet and warm place
- d. **all of the above**

200. What is the impact of 0.04%-0.07% ammonia in the indoor air on humans?

- a. spasm of the respiratory tract
- b. **immediate irritation of eyes, nose, throat and respiratory tract**
- c. characteristic smell causing irritation
- d. no impact on healthy individuals

201. What is the impact of 2% carbon dioxide in the indoor air on humans?

- a. fast fainting and convulsions
- b. spasm of the respiratory tract
- c. **may affect the respiratory function and cause arousal with further depression of the central nervous system; rapid breathing**
- d. no impact on healthy individuals

202. Why is it necessary to replace polyether oil in the compressor if the refrigerant system has been



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leaky for a long period of time?



- a. **because the polyether oil is very hygroscopic and absorbs moisture from air**
- b. because the oil accumulates steel grit during compressor operation
- c. because the polyether oil could expire
- d. because this requirement is set out in a respective standard

203. Refrigerant leaks may be caused by:

- a. vibration
- b. corrosion
- c. incorrectly chosen materials
- d. **all of the above**

204. Key factors determining operation of the refrigerating system:

- a. technology
- b. safety
- c. cost
- d. **all of the above**

205. What is the function of a solenoid valve in a refrigerating system?

- a. it decreases the refrigerant pressure
- b. **it ensures electrical switching on/off of parts of the system**
- c. it controls switching on/off of the compressor
- d. it ensures emergency shutdown of the system

206. What is the function of a pressure switch in a refrigerating system?

- a. it decreases the refrigerant pressure
- b. it ensures electrical switching on/off of parts of the system
- c. **it protects the system from emergency operation**
- d. it ensures efficiency of the system