# Chapter 18: Refrigerated Goods

**TRUE/FALSE**

1. The first fruits that were shipped internationally were bananas.

ANS: T DIF: Easy REF: page 646

2. Until the 1940s, refirgerated cargo was shipped under ice.

ANS: T DIF: Easy REF: page 646

3. Refrigerated containers are called reefers.

ANS: T DIF: Easy REF: page 646

4. As of 2018, shipments of bananas still exceeded shipments of fish (frozen or fresh), in both tonnage and value.

ANS: F DIF: Difficult REF: page 647

5. Other goods that are transported using refrigerated equipment include pharmaceuticals, flowers, and tobacco.

ANS: T DIF: Moderate REF: page 647

6. Candies represent another group of goods that is transported using refrigerated equipment.

ANS: F DIF: Moderate REF: pager 648

7. Before reefer containers and trucks, trains transporting refrigerated cargo had to stop periodically at icing stations.

ANS: T DIF: Moderate REF: page 649

8. Eggs can be transported frozen.

ANS: F DIF: Difficult REF: page 651

9. The temperature range in between which fruits and vegetables must be transported is often within one degree of their ideal shipping temperature.

ANS: T DIF: Difficult REF: page 651

10. Respiratory heat is the heat generated by the ripening process of fruits and vegetables.

ANS: T DIF: Moderate REF: page 652

11. Transporting refrigerated goods by air guarantees that they will be kept at their ideal shipping temperatures for the duration of the flight.

ANS: F DIF: Moderate REF: page 653

12. Climacteric fruits ripen during transport.

ANS: T DIF: Easy REF: page 654

13. When goods are shipped under modified atmosphere, the mix of gases in the container is closely monitored and modified as the goods generate water vapor, ethylene, and carbon dioxide.

ANS: F DIF: Moderate REF: page 654

14. Some fruits are both substantial generators of ethylene and sensitive to an atmosphere rich in ethylene.

ANS: T DIF: Difficult REF: page 656

15. Many commodities need to be shipped in atmospheres that are rich in relative humidity.

ANS: T DIF: Moderate REF: page 656

16. Many fruits and vegetables cannot be shipped together because their odors affect each other.

ANS: T DIF: Easy REF: page 658

17. Bananas no longer represent the largest share of fruits and vegetables transported internationally.

ANS: F DIF: Moderate REF: page 659

18. The largest exporter of oranges is the United States.

ANS: F DIF: Moderate REF: page 661

19. Durians are fruits that are so foul smelling that they cannot be sold in stores and transported by consumers in public transportation.

ANS: T DIF: Easy REF: page 661

20. Internationally, fruit juice is always transported as a concentrated liquid, to eliminate the costs of shipping water.

ANS: F DIF: Difficult REF: page 666

21. The meat that is shipped in the largest quantity internationally is beef, in volumes much higher than poultry (chicken) or pork.

ANS: F DIF: Moderate REF: page 667

22. Fish produced in aquaculture farms represent a decreasing proportion of all fish shipped internationally.

ANS: F DIF: Moderate REF: page 669

23. France is the largest exporter of wine, both in volume and in value.

ANS: F DIF: Difficult REF: page 673

24. Packaging for fruits and vegetables is designed to let air circulate around the goods.

ANS: T DIF: Easy REF: page 675

25. The air circulation patterns in a reefer truck and a reefer container are similar, cooling the cargo from top to bottom.

ANS: F DIF: Moderate REF: page 679

**MULTIPLE CHOICE**

1. Fruits and vegetables differ from meat and fish in that:

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Too warm temperatures affect fruits and vegetables negatively, whereas meat and fish are unaffected. | d. | Small variations in temperatures affect meat and fish negatively, whereas fruits and vegetables are unaffected. |
| b. | Too cold temperatures affect fruits and vegetables negatively, whereas meat and fish are unaffected. | e. | Fruits and vegetables do not differ from meant and fish, in that they are affected negatively by too cold temperatures. |
| c. | Small variations in temperatures affect fruits and vegetables negatively, whereas meat and fish are unaffected. |

ANS: B

Fruits and vegetables are affected by temperatures that are too cold, whereas meat and fish are unaffected.

DIF: Easy REF: page 650

2. What is the estimated percentage of fruits and vegetables that is “wasted or discarded as a result of inefficiency in the human-managed supply chain”?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 20 percent | d. | 40 percent |
| b. | 30 percent | e. | 50 percent |
| c. | 10 percent |

ANS: E

It is estimated by the International Institute of Refrigeration that as much as 50 percent of fruits and vegetables are wasted by problems in the cold supply chain.

DIF: Moderate REF: page 651

3. The heat that is generated by the ripening activity of fruits and vegetables is called:

|  |  |  |  |
| --- | --- | --- | --- |
| a. | latent heat | d. | respitory heat |
| b. | sensible heat | e. | ripening heat |
| c. | respiratory heat |

ANS: C

Respiratory heat (and not “respitory” heat) is generated by the ripening process of fruits and vegetables.

DIF: Moderate REF: page 652

4. Before fruits and vegetables are loaded into a reefer container or truck, they need to be cooled to their optimal shipping temperature. This process removes the products’:

|  |  |  |  |
| --- | --- | --- | --- |
| a. | respiratory heat and latent heat. | d. | latent heat |
| b. | sensible heat | e. | sensible heat and latent heat |
| c. | respiratory heat and sensible heat |

ANS: B

Sensible heat is what is removed from fruits and vegetables before they are shipped.

DIF: Moderate REF: page 652

5. The temperature in a shipping container can be monitored with the use of a:

|  |  |  |  |
| --- | --- | --- | --- |
| a. | recording thermometer | d. | thermo-logger |
| b. | electronic thermometer | e. | theta recorder |
| c. | temperature logger |

ANS: C

Temperature loggers are used to monitor the temperature in a shipping container.

DIF: Easy REF: page 653

6. A shipment in a refrigerated container can be constantly monitored and the levels of oxygen, humidity, ethylene and carbon dioxide maintained to a pre-determined level. Such a shipment is said to be shipped under:

|  |  |  |  |
| --- | --- | --- | --- |
| a. | modified atmosphere | d. | controlled atmosphere |
| b. | monitored atmosphere | e. | sustained atmosphere |
| c. | constant atmosphere |

ANS: D

A controlled atmosphere is one in which the levels of different gases are continuously monitored and maintained at a pre-determined level.

DIF: Moderate REF: page 654

7. Which is NOT one of the gases generated by the ripening of fruits in a shipment?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | water vapor | d. | carbon dioxide |
| b. | ethylene | e. | all of the gases in this answer set are generated by the ripening process |
| c. | carbon monoxide |

ANS: C

Carbon monoxide is a gas that is generated only through the combustion of fossil fuels and is not generated by the ripening process.

DIF: Easy REF: page 655

8. In what way do climacteric fruits, such as bananas and apricots, differ from non-climacteric fruits, such as oranges, cherries and grapes?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Climacteric fruits are more affected by the presence of ethylene in the reefer than non-climacteric fruits. | d. | Climacteric fruits have a greater respiratory activity during shipment than non-climacteric fruits. |
| b. | Climacteric fruits have a shorter shelf life than non-climacteric fruits. | e. | Climacteric fruits require cooler transportation temperatures than non-climacteric fruits. |
| c. | Climacteric fruits have a longer shelf life than non-climacteric fruits. |

ANS: D

Climacteric fruits have a much greater respiratory activity than non-climacteric fruits.

DIF: Moderate REF: page 654

9. Fruits and vegetables are frequently not shipped with other fruits and vegetables because

|  |  |  |  |
| --- | --- | --- | --- |
| a. | they tolerate different levels of carbon dioxide | d. | they are odor emitters or odor absorbers |
| b. | they tolerate different levels of ethylene concentrations | e. | all of the responses in this answer set are reasons for which different fruits and vegetables are not shipped together |
| c. | they need to be transported at different shipping temperatures |

ANS: E

Fruit and vegetable shipments are not commingled because they tolerated different levels of carbon dioxide, ethylene, and relative humidity. They frequently need to be shipped at different temperatures, and their odors can affect other goods in the shipment.

DIF: Moderate REF: page 657

10. Which fruit represents the largest proportion of fruit transported internationally?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | citrus (oranges, lemons, grapefruits) | d. | apples |
| b. | bananas | e. | grapes |
| c. | blueberries |

ANS: B

Bananas represent the largest proportion of fruits transported internationally.

DIF: Moderate REF: page 659

11. Grapes are an unusual fruit in that it needs to be transported in an atmosphere that is:

|  |  |  |  |
| --- | --- | --- | --- |
| a. | very rich in carbon dioxide to kill off pest(s) that feed on the grapes | d. | rich in sulfur dioxide to prevent the development of mold(s) |
| b. | very low in relative humidity to prevent the development of mold(s) | e. | very low in oxygen to prevent the ripening of the fruit |
| c. | very low in ethylene, as grapes ripen very fast in the presence of that gas |

ANS: D

Great care should be taken in the unloading of grapes, as they are transported in an atmosphere that is rich in sulfure dioxide to prevent the growth of mold, and sulfure dioxide is toxic to humans.

DIF: Moderate REF: page 663

12. Which fruit is transported on pallets sealed by controlled-atmosphere envelopes, and almost exclusively by air because of its shorts shelf life?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | strawberries | d. | blueberries |
| b. | durians | e. | grapes |
| c. | bananas |

ANS: D

Blueberries are transported in controlled-atmosphere envelopes surrounding pallets, almost always by air because of their very short shelf life.

DIF: Moderate REF: page 664

13. What are the vegetables that are transported internationally in the greatest quantity?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | green beans | d. | onions |
| b. | sweet peppers (includes green, yellow, red, and orange pepers) | e. | garlic |
| c. | tomatoes |

ANS: C

Tomatoes are the vegetables that are shipped internationally in the greatest quantity.

DIF: Easy REF: page 665

14. In which form are high-Brix fruit juices transported most frequently?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | in bulk, in ships dedicated to the transport of juices, called “juicers.” | d. | in aseptic packaging, in non-refrigerated containers. |
| b. | in bulk, in 20-foot liquid-bulk ISO containers. | e. | all of the options in this answer set are possible alternatives to transport concentrated fruit juice. |
| c. | in their final consumer packages. |

ANS: A

High-Brix fruit juices (concentrated fruit juices) are generally transported in bulk in ships called “juicers.”

DIF: Moderate REF: page 666

15. What is the level of sanitation required for meats transported frozen in refrigerated containers?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | physically clean (MIL-414 standard) | d. | microbiologically clean (HACCP standard) |
| b. | chemically clean (CDC standard) | e. | thoroughly clean (CSCMP standard) |
| c. | bacterially clean (NIS standard) |

ANS: D

Meats, fish, and juice products must be transported in Hazard Analysis and Critical Control Point microbiologically clean containers.

DIF: Difficult REF: page 659

16. What is the most commonly shipped meat or meat product, internationally?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | pork | d. | pork derivative products (sausages, hotdogs, ham) |
| b. | poultry (chicken, turkey, duck, goose) | e. | beef derivative products (hamburgers) |
| c. | beef |

ANS: B

The most commonly shipped meat product (internationally) is poultry.

DIF: Easy REF: page 667

17. What proportion of fish production is consumed locally and not transported internationally?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | less than one third | d. | less than 10 percent |
| b. | less than half | e. | about two thirds |
| c. | more than half |

ANS: E

About two thirds of all fish production worldwide is consumed locally and not transported internationally.

DIF: Difficult REF: page 669

18. What is the fish that is farmed and exported in greatest quantity?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | tuna | d. | squid |
| b. | shrimp | e. | cod |
| c. | tilapia |

ANS: C

The fish that is raised for export consumption is tilapia, and dominates international trade with a production of 6.3 million tonnes, 80 percent of which is exported.

DIF: Difficult REF: page 670

19. Kiwis can be transported in plastic clam shells or plastic nets. Such packaging for perishable goods is considered:

|  |  |  |  |
| --- | --- | --- | --- |
| a. | primary packaging | d. | display packaging |
| b. | secondary packaging | e. | transport packaging |
| c. | tertiary packaging |

ANS: A

Plastic clam shells and nets are primary packages for perishable goods.

DIF: Moderate REF: page 675

20. Refrigerated containers transporting frozen goods are using energy to remove which type of heat from the cargo area?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | sensible heat from the goods when they are loaded | d. | sensible heat that was in the container when the goods were loaded |
| b. | latent heat from the goods when they are loaded | e. | all of the responses in this answer set are heats that a reefer transporting frozen goods must eliminate |
| c. | respiratory heat from the goods being transported |

ANS: D

Frozen goods do not have sensible heat, nor emit respiratory heat, and their latent heat has already been removed. The only heat that the reefer must remove is the sensible heat that entered the container when the goods were loaded.

DIF: Difficult REF: page 678

COMPLETION

1. Refrigerated goods can be transported chilled or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

ANS: frozen

DIF: Easy REF: page 652

2. The heat that is generated by the ripening of fruits and vegetables is \_\_\_\_\_\_\_\_\_ heat .

ANS: respiratory

DIF: Easy REF: page 652

3. The heat that is eliminated from fish when it is frozen is called the \_\_\_\_\_\_\_\_\_\_\_\_\_ heat.

ANS: latent

DIF: Moderate REF: page 652

4. The early shipments of refrigerated goods were made in insulated railcars, with the goods placed under a layer of \_\_\_\_\_\_\_\_\_.

ANS: ice

DIF: Easy REF: page 649

5. The ripening activity of fruits and vegetables consumes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and produces carbon dioxide, ethylene, and heat.

ANS: oxygen

DIF: Moderate REF: page 655

6. Fruits that ripen after they are harvested are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fruits.

ANS: climacteric

DIF: Moderate REF: page 654

7. Dehydration of fruit is reduced by placing them in high relative-humidity containers. Coating citrus fruits in \_\_\_\_\_\_\_\_\_\_\_\_ is done for the same purpose.

ANS: wax

DIF: Moderate REF: page 657

8. A container in which the levels of oxygen, carbon dioxide, and ethylene are changed before vegetables are loaded, but where no modification to these levels are made while the goods are transported is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-atmosphere shipment.

ANS: modified

DIF: Hard REF: page 654

9. It is unwise to combine a shipment of avocados and kiwis because avocados are high producers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ whereas kiwis are greatly affected by the presence of this gas.

ANS: ethylene

DIF: Hard REF: page 656

10. Two commodities that cannot be shipped together are apples and carrots. The reason is that apples are \_\_\_\_\_\_\_\_\_\_\_\_\_ emitters, which affects the taste of carrots.

ANS: odor, smell

DIF: difficult REF: page 658

11. Once a reefer container has been swept and rinsed with hot water, it is considered \_\_\_\_\_\_\_\_\_\_\_\_ clean.

ANS: physically

DIF: Moderate REF: page 658

12. When the inside surfaces of a refrigerated container are cleaned with soap and then rinsed, the container is said to be \_\_\_\_\_\_\_\_\_\_\_ clean.

ANS: chemically

DIF: Moderate REF: page 658

13. The Port of Wilmington in Delaware specializes in receiving shipments of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and both Chiquita and Dole have terminals there.

ANS: bananas

DIF: Easy REF: page 659

14. Durians, a fruit from southeast Asia, has such a strong \_\_\_\_\_\_\_\_\_\_\_\_\_\_ that it can only be sold by street vendors, and it is prohibited to transport it in the subway in Singapore.

ANS: odor

DIF: Easy REF: page 661

15. Field-grown tomatoes are harvested green, and then ripened uniformly in a facility with high humidity and an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-rich atmosphere.

ANS: ethylene

DIF: Moderate REF: page 665

16. Juice that is concentrated by removing some of its water is considered high-\_\_\_\_\_\_\_\_\_\_\_ juice.

ANS: Brix, brix

DIF: Moderate REF: page 666

17. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ juice is the most frequently transported juice, internationally.

ANS: orange, Orange

DIF: Moderate REF: page 667

18. Shipments of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ generate so much carbon dioxide that the container has to be ventilated before it can be unloaded.

ANS: cheese

DIF: Moderate REF: page 669

19. In Japan, the auction of frozen \_\_\_\_\_\_\_\_\_\_\_\_ results in prices where a single fish can be sold for more than $1 million.

ANS: tuna

DIF: Moderate REF: page 671

20. Unlike refrigerated truck trailers, refrigerated containers are cooled with low-pressure, high-velocity cooled air that circulates through the load from the \_\_\_\_\_\_\_\_\_\_\_ of the container.

ANS: floor, bottom

DIF: Moderate REF: page 679