Free Study Guide to Help You Pass 609 Refrigerant Recovery and Recycling Quiz – Now with Worksheets and Practice Tests

The purpose of 609 certification as defined by EPA, is to teach technicians and test their ability to properly handle and recover refrigerants, as well as to learn laws enacted to protect the "stratospheric ozone layer."

This study guide is not endorsed or affiliated with any agency. It was constructed to help students and technicians learn material in Section 609 of the Federal Clean Air Act.

These are teacher-made tests and worksheets and no questions are used from the actual 609 Certification quiz. An official training booklet is required to complete the worksheets and practice tests. You should take the necessary time to complete the worksheets and read the entire training booklet. Download the FREE booklet here… https://www.asecampus.com/ihtml/application/upload/9756.zip_files/2017_online_609_booklet.pdf

Section 609 of the Clean Air Act: Motor Vehicle Air Conditioning (MVAC) addresses six (6) areas that will impact automotive repair and service shops, training schools, auto parts stores, and other facilities handling ozone-depleting substances (ODS) and alternative refrigerants. Please read the new EPA requirements and pay special attention to:

1. MVAC service shops must certify to EPA that they have acquired and are properly using approved refrigerant recovery equipment.
2. Service shops must also verify that each person using the equipment has been properly trained and certified… https://www.epa.gov/sites/production/files/2015-08/documents/section_609_of_the_clean_air_act_motor_vehicle_air_conditioning.pdf

If you take the 609 Refrigerant Recovery and Recycling Quiz online through ASE Campus, it consist of 30 questions. The minimum passing score is 80% correct – meaning you must answer 24 correctly to pass. This is an open book test, however you must be thoroughly familiar with the training material to pass.

When you are ready to take the test, you should…

- Go to the website https://www.asecampus.com and register for the online test. When you pay with a credit or debit card, your quiz will be released and you can get started.
- Create a profile (then enter your credit card or debit card payment of $19) - https://www.asecampus.com/ihtml/application/student/interface.ase/index.htm
- Start the quiz. There is no time limit. I suggest you click "save" after each test question. This ensures that your answers are saved if you lose power or your connection to the internet.

Prior to taking the actual certification test, you must agree that you received no help from anyone in completing the test. When you pass the quiz, you will be able to print your temporary credentials IMMEDIATELY. However, you must wait 60 days to receive your official credentials from ASE.

Have fun and get your 609 credentials!

Name: _____ Score: _____

Refrigerant Recovery and Recycling Practice Quiz with Answers – Part 1

Matching Questions

__D_1. EPA Regulation 609	A. The year R-12 was phased out and transitioned to R-134a
__H_2. Year 2065	B. Hydrofluoroolefins (R-1234yf)
__A_3. Year 1994	C. Global Warming Potential
__J_4. HFC	D. Federal Clean Air Act of 1990 – legislation dealing with servicing motor vehicle air conditioning systems
__B_5. HFO	E. Chlorofluorocarbon (R-12)
__E_6. CFC	F. Carbon Dioxide (CO2) refrigerant produced naturally in the environment
__I_7. MVAC	G. Ozone Depleting Substance
__F_8. R-744	H. The year NASA forecast the ozone layer will return to its early 1980's status
__G_9. ODS	I. Motor Vehicle Air Conditioning – Cars, Buses and Trucks
__C_10. GWP	J. Hydrofluorocarbons (R-134a)

*- Non-MVAC includes Trains, Aircraft, Refrigerated Trailers and Ships

Short Answer Questions

11. Name three (3) health effects of excessive UV radiation caused by ozone depletion.
A. __Cancer__ B. ____Cataracts____ C. ___Immune System__

12. How far is the ozone layer above the Earth's surface (approximately in miles)? _10 to 30 miles_

13. Name the chemical in ozone depleting refrigerants that reacts with oxygen when exposed to UV rays of the sun. ___Chlorine and the product is chlorine monoxide_____

Using the chart below, answer the following questions...

ENVIRONMENTAL IMPACT OF MVAC REFRIGERANTS		
Refrigerant	**Global Warming Potential**	**Ozone Depleting?**
R-12 (CFC-12)	**10,900**	**Yes**
R-134a (HFC-134a)	**1, 430**	**No**
R-152a	**124**	**No**
R-1234yf (HFO-1234yf)	**4**	**No**
R-744 (CO2)	**1**	**No**

14. What refrigerant has the lowest GWP? ___R-744_____
15. What refrigerant is ozone depleting (Name all that apply)? ____R-12___
16. What refrigerant causes the most GWP? _____R-12_____
17. What is the GWP for R-134a? ____1,430_____
18. What is the GWP for R-152a? _____124_____
19. What refrigerant has a GWP of 4? __R-1234yf_____
20. What is the GWP for R-12? _____10,900_____

Note: HCFC - Hydrochlorofluorocarbons such as R-22 used in stationary refrigeration and air conditioning systems is governed under Section 608

21. The three (3) latest alternative refrigerants approved by EPA in Section 609 for new vehicles and systems are R-134a, R-152a and R-744. Name one (1) advantage and one (1) disadvantage of each…

Types of Refrigerant	**Advantage**	**Disadvantage**
R-1234yf	Close pressure / temperature relationship; uses less fuel to power MVAC	mild flammability traits
R-152a	GWP of 124, roughly 90% lower than R-134a; low cost and similar pressure / temperature	Greater flammability traits than R-1234yf
R-744	lowest direct GWP rating of any available refrigerant; serves as baseline for GWP refrigerants; higher pressures; no flammability issues	Displaces oxygen with high suffocation risk

True / False Questions

__F_ 22. R-134a is ozone depleting.
__T_ 23. GHG stands for Greenhouse Gas
__T_ 24. R-12 played a major role in depleting Earth's atmosphere
__T_ 25. SNAP means Significant New Alternatives Policy
__T__ 26. R-744 is now being used by German Automakers

Multiple Choice Questions

__C_ 27. Technician A says to prevent cross contamination of refrigerant, manufacturers use dedicated fittings when servicing the system. Technician B says R-744 <u>is not</u> used for retrofitting the A/C system with different refrigerants. Who is correct?
a. Technician A only
b. Technician B only
c. Both Technician A and B
d. Neither Technician A nor B

_D__ 28. Air conditioning systems today are called thermal management systems because:
a. They provide passenger comfort
b. They provide battery pack cooling on some vehicles
c. They provide onboard computer cooling on some vehicles
d. All of the above

_C__ 29. Technician A says that a Class I Substance has an ozone depletion potential <u>greater than</u> 0.2 CFC's. Technician B says that a Class II Substance has an ozone depletion potential <u>less than</u> 0.2 CFC's. Who is correct?
a. Technician A only
b. Technician B only
c. Both Technician A and B
d. Neither Technician A nor B

__B_ 30. The ASE Refrigerant Recovery and Recycling Program is EPA approved to accomplish ALL of the following 609 Regulations EXCEPT:
a. Anyone repairing or servicing MVAC must be trained and certified
b. Releases all restrictions on ozone depleting refrigerants and allows Class I Venting into the atmosphere
c. Prohibits the sale of Class I refrigerants smaller than 20 pounds to anyone not trained or certified
d. Equipment must meet EPA-approved standards
* - Note: Refrigerant handling equipment can't be sold unless it meets specific requirements

__B_ 31. Certifications earned by an approved ASE Refrigerant Recovery and Recycling program will meet the same requirements for ASE Technician Certification in Heating and Air Conditioning…

a. True
b. False

Essay Questions Part - I

32. EPA research suggest that greenhouse gases play a contributing role in global warming potential. In the questions below, tell the effects of harmful UV ray on the following…

a. Vegetation and crops ____ drought, severe crop reduction and bio-fuels supply____
b. Air quality? ___ ground-level ozone leading to higher smog levels___
c. Sea or ocean? __ plankton and some species' of larvae killed off or reduced_____

33. Section 609 of the Clean Air Act of 1990 set standards for recovery / recycling equipment for the following: J1990 (R-12), J2788 (R-134a) and J2843 (R-1234yf). In the blanks below, name at least four (4) requirements found on all EPA certified A/C equipment labels…

a. __Refrigerant identifier__ b. _EPA certification standards J2843 & J2927_ c. _Design pressure___
d. __Model___ e. _Manufacturer__

34. J2099 is the EPA Purity Standard for R-134a and R-1234yf. Name three (3) purity standard these refrigerants must meet (for example 50 ppm of what? 500 ppm of what? 1.5% of what?)…
a. _Water by weight 50 ppm_ b. _Lubricant by weight 500 ppm_ c. _ Noncondensable gases (Air) 1.5% of volume___

35. What does Section 609 say about what you should do about contaminated refrigerant that is removed using recovery only equipment?
___It can be recycled and then reused in MVAC systems or it can be sent to a reclaimer.
Recycled refrigerant should not be salvaged or stored in disposable refrigerant containers.
Use only DOT-approved storage containers for recycled refrigerant___

Items prohibited or allowed by 609 Regulations – Mark a "**P**" for Prohibited or "**A**" if Allowed…

_P__ a. Selling R-12 in containers less than 20 pounds to the public
_A__ b. Selling R-134a under 2 pounds with self-sealing valves to the public
_P__ c. Using 609 MVAC credentials to purchase refrigerant for stationary A/C systems
_P__ d. Servicing MVAC systems after January 1, 2018 without EPA credentials
_A__ e. Purity standards of 98% must be maintained for MVAC vehicles
_A__ f. Restrictions and requirements on refrigerant removed prior to motor vehicle disposal
_A__ g. R-134a will be listed as unacceptable for newly manufactured light duty vehicles beginning model year 2021

Essay Questions – Part - II

1. When will HFC-134a (R-134a) be officially phased out for new manufactured vehicles (check one)?

MY 2026 _____X_____ MY 2019 _____ MY 2015 _____

2. From the list below, select Acceptable EPA Approved Refrigerants that **do not allow** refrigerant retrofits to MVAC passenger vehicles, light, medium and heavy duty and off-road vehicles…

____ HFC – 134a	____ Freeze 12	_X__ HFO – 1234yf
__X_ HFC – 152a	__X_ R-744 (Carbon Dioxide)	____Free Zone (HCF Blend Delta)

3. A technician want to use HFC-134a from Self-Chilling Cans in a vending machine that was previously filled with HCFC-22. What reason does SNAP give as to **why** Self-Chilling Cans using HFC-134a is listed as Unacceptable Substitutes for ODS in Refrigeration and Air Conditioning systems?

__Unacceptably high greenhouse gas emissions from direct release of refrigerant to the atmosphere__

4. List at least three (3) recordkeeping requirements of 609 Regulations for companies servicing MVAC systems?

a. Record of trained and certified personnel.
b. Name and address of facility where refrigerant sent
c. Person that sells or distributes Class I refrigerants
d. Equipment details sent to EPA
e. All records must be kept for a minimum of three years
f. Any person who sells Class I refrigerants in containers less than 20 lbs. must post a sign stating, "It is a violation of federal law to sell containers of Class I refrigerant of less than 20 lbs. of such refrigerant to anyone who is not properly trained and certified to operate approved refrigerant recycling equipment."

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Name: _____ Score: _____

Refrigerant Recovery and Recycling Quiz - Part 2

Matching Questions

__F_1. Retrofitting	A. SAE Standard for Motor Vehicle Refrigerant Vapor Compression System; Used to help standardize A/C system designs and service
__B_2. ASHRAE	B. This agency establishes numerical designation of refrigerants; also known as American Society of Heating, Refrigerating and Air-Conditioning Engineers
__I_3. Standard J2064	C. SAE Standard for R-1234fy Service Hose, Fittings and Couplers for Mobile Refrigerant Service Equipment covers hardware specifications for fittings, couplers and hoses
__A_4. Standard J639	D. Department of Transportation rating for refrigerant storage tanks
__J_5. SDS	E. SAE Standard for R-1234yf Refrigerant Identifier Installed in Recovery and Recycling Equipment for Use with Mobile A/C Systems
__D_6. DOT-4BA	F. The process of changing for example, older R-12 systems to R-134a or different accepted refrigerants
__C_7. Standard J2888	G. SAE Standard for Recommended Service Procedures for the Containment of R-134a
__E_8. Standard J2927	H. This agency establishes purity standards for refrigerants; also known as Air Conditioning Heating and Refrigeration Institute
__G_9. Standard J2211	I. SAE standard for MVAC hoses on R-134a or R-1234yf systems
_H_10. AHRI	J. Safety Data Sheet for each refrigerant

Short Answer Questions

11. Name five (5) retrofitting label requirements when using alternative refrigerants…

A. Label covers up info about old refrigerant B. Name and address of technician & company
C. Date of the retrofit D. ASHRAE numerical designation of refrigerant
E. type, manufacturer, and amount of lubricant F. Labeled "ozone depleter" if the refrigerant contains ozone depleting substances

12. List four (4) safety rules found in Section 609 Legislation when servicing air conditioning systems…

A. Avoid breathing A/C refrigerant lubricant vapor or mist
B. Exposure to refrigerant may cause frostbite
C. Keep Safety Data Sheet (SDS) for each refrigerant
D. Work in a well-ventilated area to avoid asphyxiation

13. List four (4) safety precautions **(things you should never do)** found in Section 609 Legislation when handling refrigerant…

A. Never mix refrigerants with air for the purpose of leak testing
B. Never Use a disposable refrigerant tank for storing recycled refrigerant
C. Never transfer refrigerant into other tanks unless DOT-approved tanks - DOT-4BA or DOT-4BWD.
D. Never fill a storage tank to more than 60% of its gross weight
E. Never use electrical equipment in which switches are not at least 18 inches above the floor

14. Name four (4) methods stated in SAE Standard J1989 (R-12) and J2211 (R-134a) to ensure that discharged refrigerant is kept to a minimum when recovering from an A/C system…
A. Service hoses must have shutoff valves within 12 in. of service ends
B. Close the valves in the recovery unit's service lines and from the system's service fittings
C. Verify the system has refrigerant charge before recovery to prevent non-condensable gases (air)
D. Evacuating disposable refrigerant container that appear to be empty still have traces of refrigerant
E. Remove all remaining refrigerant before disposing of the container

Use the chart below to answer the following questions…

	REFRIGERANT FITTING SIZES	
Refrigerant	Low Side	High Side
R-12 (Post – 1987)	Threaded 7/16 in. x 20	Threaded 3/8 in. x 24
R-134a	Quick-coupler Unthreaded 13mm O.D.	Quick-coupler Unthreaded 16mm O.D.
R-152a	Quick-coupler Unthreaded 14.1mm O.D.	Quick-coupler Unthreaded 15mm O.D.
R-744	Quick-coupler Unthreaded 16.6mm O.D.	Quick-coupler Unthreaded 18.1mm O.D.
R-1234yf	Quick-coupler Unthreaded 14mm O.D.	Quick-coupler Unthreaded 17mm O.D.

15. What is the Quick-couple O.D. for R-134a Low Side? _____13mm_____
16. What is the Quick-coupler O.D. for R-134a High Side? _____16mm_____
17. Does R-12 use a threaded fitting on the high and low side? _X_ yes ____ No
18. What is the Quick-coupler O.D. for R-1234yf Low Side? ____14mm_____
19. What is the Quick-coupler O.D. for R-1234yf High Side? ___17mm_____
20. Does R-744 use an unthreaded Quick-coupler? _X___ yes ____ No
21. Which MVAC refrigerant system uses a 14.1 mm O.D. Low Side Quick-coupler? ____R-152a___
22. What is the Quick-coupler O.D. for R-152a High Side? _____15mm_____
23. Does R-12 use a Quick-coupler on the high and low side? ____ yes __x__ No
24. Why are different thread sizes and coupler sizes used with different refrigerants?
___To prevent cross-contamination of refrigerant___
25. Does R-12 use a threaded fitting on the high and low side? _X_ yes ____ No

26. In the chart below, write-in the service hose colors for R-12, R-134a and R-1234yf. Look under Recovery/Recycling/Recharge Equipment on p.17 of the ASE Section 609 Booklet…

Types of Refrigerants *	**Low Side Service Hose Color**	**High Side Service Hose Color**
R-12	Solid blue	Solid Red
R-134a	Solid blue with a black stripe	Solid red with a black stripe

R-1234yf	Blue SAE J2888 marking	Red SAE J2888 marking

*Note – Supply hoses are usually yellow, whereas R-134a uses yellow with a black stripe. R-1234yf yellow hose has SAE J2888 marking. R-152a and R-744 is not included because systems are not prevalent as of this date.

27. What does Section 609 Legislation say about "**Used R-134a Refrigerant from Non-Mobile Sources**?" Write a brief statement or summarize your response on p.19…
Never use refrigerant from non-MVAC systems. This introduces possibility of contaminants different from those that may exist in MVAC systems.

True / False Questions

__F_ 22. It is illegal to use any refrigerant with flammable characteristic in a MVAC system
__T_ 23. Refrigerant storage tanks for R-12 and R-134a should not be filled more than 60% of its gross weight
__T_ 24. To recover R-12 and R-134a, service hoses must have a shut-off valve within 12 inches of the service end
__T_ 25. R-12 and R-134a MVAC systems must hold a vacuum for 5 minutes before approved EPA 609 Recover and Recycling equipment will allow you to charge the system.
__F_ 26. When refrigerant is recovered, no oil is lost and there is no need to measure or record oil loses.
__F_ 27. It icing occurs during recovery of R-12 and R-134a systems, it is acceptable to heat the recovery tank with a torch.
__T_ 28. Recovery equipment for R-1234fy must meet SAE Standard J2843 which includes a refrigerant identifier to ensure 98% purity.

Multiple Choice Questions

__A_ 29. Technician A says retrofitting one refrigerant to another requires unique fittings and different labels. Technician B says refrigerant mixing is acceptable when retrofitting as long as the new labels and fittings match the installed refrigerants. Who is correct?
a. Technician A only
b. Technician B only
c. Both Technician A and B
d. Neither Technician A or B

__B_ 30. Technician A says that the Quick-couple O.D for the low side service port on R-1234yf is Unthreaded 17mm. Technician B says that R-134a uses a Quick-coupler Unthreaded 13mm O.D. on the low side service port.

Who is correct?
a. Technician A only
b. Technician B only
c. Both Technician A and B
d. Neither Technician A or B

__A_ 31. When testing Recycled R-134a refrigerant stored in portable tanks or containers, all of the following procedures must be followed EXCEPT:
a. Keep the container at 115 degrees F or above

b. Connect a pressure gauge and calibrate in 1 psi divisions
c. Measure the air temperature within 4 inches of the tank
d. Compare the pressure to the chart to see if it is <u>at</u> or <u>below</u> the prescribed limit

Standard Temperature Pressure Chart				Actual Reading at 67 degrees F			
°F	PSI	°F	PSI	°F	PSI	°F	PSI
65	69	77	86	65	74	75	87
66	70	78	88	66	75	76	88
67	71	79	90	67	81	77	90

Using this chart, determine if the R-134a refrigerant in this storage tank is OK to use or if it has to be recycled…

Here's the service procedures –

If the recycled refrigerant (R-134a) and the pressure exceeds the limits in this chart, shake the container and let it stand for several minutes. If the pressure falls below the limit – it is OK to use. If the pressure inside the tank or container still exceeds the limit, recycle the entire contents.

__B_ 32. Technician A says Reuse the Refrigerant. Technician B says Recycle the Entire Contents. Who is correct?
a. Technician A only
b. Technician B only
c. Both Technician A and B
d. Neither Technician A or B

__C_ 33. When using service hosed (p.22) to charge, recover, and recycle refrigerant – what requirement should be observed when connecting and removing hoses…
c. Hose with manual shut-off valves should be closed before removing hoses
d. Manual shut-off valves should be closed when hoses are not connected to the A/C system or charging source
e. Both A and B
f. d. Neither A or B

Essay Questions

34. When servicing R-1234yf systems, EPA standard J2845 stresses the importance of key safety practices (p.22 right column).

List at least five (5) of them…
d. Avoid open flames and hot surfaces, sparks and high-energy ignition sources
e. Hybrids & EVs require special service procedures to disable the high voltage system prior to MVAC service
f. Tighten refrigerant connection to the specified torque
g. Seals and O-rings should never be reused
h. Maintain good ventilation in the work area and open windows and doors when charging to prevent an accumulation of refrigerant in case of a major refrigerant leak

35. What specific safety procedures should be observed when servicing Hybrid MVAC systems?
When disabling a high-voltage system, manufacturer's procedures must be strictly followed to ensure high voltage is not present during vehicle service.

Name: _____ Score: _____

Refrigerant Recovery and Recycling Quiz - Part 3

Essay Questions

1. How does new A/C machine for R-1234yf and R-744 Systems meets SAE Standard J2845 to promote safe and responsible refrigerant management practices during recovery, recycling, and recharging? List at least four (4) requirements on p.22 - 23…
A. First the system is under a vacuum of 26.9 in. of mercury
B. The machine then monitors the applied vacuum, and notes if it decays. If the vacuum decays to a level of 25.9 in. mercury or more in 5 minutes, a leak is indicated and the machine will not permit the recharge.
C. If the system passes the vacuum decay check, the machine automatically charges the system to 10% of the amount. The machine then monitors the subsequent pressure. After 5 minutes, if pressure decreases by 10% or more, this indicates a leak is present. The remaining 90% of the refrigerant will not be administered.
D. Any leak must be found and repaired before again attempting to recharge the system.

2. True / False Questions (Key R-744 Safety Points) p.23
_T__ A. CO2 gas from R-744 can cause asphyxiation by displacing air
_T__ B. Recovery of CO2 refrigerant is necessary to ensure harmless depressurization for technicians
_T__ C. Overcharging CO2 systems is dangerous - CO2 gas can leak into passenger compartment and cause asphyxiation
__F_ D. It is acceptable to use salvaged parts like an evaporator if it meets SAE Standards

3. How does SAE Standard J2843 prevent cross-contamination of R-1234yf and R-744 refrigerants when using New A/C Machines? p. 24 List at least three (3):*
A. Find out the vehicle's service history.
B. Inspect the service fittings for signs of tampering - makeshift or damaged fittings
C. Electronic refrigerant identifiers- for detecting refrigerant cross-contamination. SAE established the J1771 standard for R-12 and R-134a refrigerant identification equipment.
Note - *Manufacturers of identifier equipment are required to label the unit, stating its level of accuracy.

4. How do you get rid of contaminated R-1234yf and R-744 refrigerants? p.24 – 2nd column. List at least two (2) ways:
A. Dedicate a recovery-only unit for refrigerant that cannot be identified
B. Contract a waste processor to disposal of the material or you can contact a re-claimer from the EPA http://www.epa.gov/section608
.

5. True / False Questions p.24
__F_ A. Technicians under Section 609 can be fined for "topping-off" an A/C system that is low on refrigerant
__F_ B. Customer are required to have leaks repaired to MVAC systems under Federal 609 legislation
__T_ C. Unknown refrigerants should be recovered in DOT-approved (gray with yellow top) recovery tanks

__T_ D. Manufacturers must label the level of accuracy of ALL refrigerant identifiers for R-12 and R-134a
__T_ E. SAE Standard J2927 give specific requirement for R-1234yf machines with built-in refrigerant identifiers

Multiple Choice Questions

__A_ 6. Two primary tools for performing leak detection is: 1) Electronic leak detectors and 2) Florescent dye detectors…

A. True
B. False

__C_ 7. Technician A says that Standard 2791 covering Electronic Leak Detectors for R-134a requires a minimum of three (3) leak detection scales that can be manually selected. Technician B says the scale selection on leak detectors for R-134a is 4g / year, 7g / year, and 14g / year. Who is correct?

A. Technician A only
B. Technician B only
C. Both Technician A and B
D. Neither Technician A or B

__D_ 8. When searching for leaks on R-1234yf systems, the technician must be extremely careful because the refrigerant is flammable. ALL of the following procedures must be followed when using an Electronic Leak Detector EXCEPT:
A. Maintain a distance of 3/8 inches between the probe and surface, and move the probe no faster than 3 inches per second
B. Perform a leak test when the system is not operating
C. Insert the leak detector into the blower motor resistor block or evaporator drain hole
D. Use an older R-12 Electronic Leak Detector with approved modifications to meet SAE J1628

__A_ 9. If florescent dye leak detection is used with UV black light kit and tool to inject dye, suppliers are required to provide an under-hood label to identify the dye and manufacturer, and the label must say, "System to be Serviced by Qualified Personnel."

A. True
B. False

__D_ 10. When using UV light for leak detection, you should:
A. Protect your eyes and skin for exposure
B. Wear UV block eyewear
C. Direct the light source away from your body and bare skin
D. All of the above

Short Answer Questions

11. List four (4) Best Practices for Leak-Finding Dyes p.26
A. Before injecting dye, check the engine compartment for a sticker that dye is already installed

B. Remove the low side service port cap and depress the valve to determine if dye in system
C. Add dye per manufacturer's instructions and place an identification label supplied by the dye manufacture near the A/C charge label
D. Verify sufficient refrigerant, then operate the system for 15 minutes to circulate the dye.
E. Inspect the entire A/C system with an ultraviolet lamp with the engine not operating
F. Verify small leak with electronic leak detector to determine if leak is repairable

12. After a leak is repaired when using florescent dye, how should you remove florescent dye residue?
Use a cleaner approved by the dye or MVAC system manufacturer

__B_ 13. When injecting dye into an A/C system, how long should the system operate to ensure the dye is fully circulated?
A. 2 minutes C. 30 minutes
B. 15 minutes D. 45 minutes
* Note – After locating an A/C system leak, the final step in repairing the leak is to check the system again for leaks after you recharge the system.

14. Why should refrigerant never be added to the high side of the A/C system when operating the engine (p.27 warning) *...
Excessive pressure can be transferred from the MVAC system into the charging apparatus, causing possible severe bodily injury

* - *Note - Work in a well-ventilated area, away from sparks or open flame. Wear eye protection at all times, and wear gloves to protect the skin*

15. List four (4) precautions when storing refrigerant in cylinders (p.27)...
A. Do not expose cylinders to temperatures in excess of 52 degrees C or 125 degrees F
B. Do not exposed to direct sunlight or any other heat source
C. Do not transported without being securely stowed
D. Do not fill with another refrigerants
E. Do not store in shafts or front of cellar windows

16. Use the chart below to answer the following questions...

Refrigerant Cylinder Identification and Fitting Size		
Refrigerants *	**Color**	**Fitting**
R-12	White	7/16 in. x 20
R-134a	Light blue (PMS color 2975)	RH Thread, ½ in. 16 ACME
R-1234yf	White with red band	LH Thread, ½ in. 16 ACME
R-744	Gray (PMS color 352)	TBD

A. What color is R-12 refrigerant cylinder? _____White_____
B. What color is R-134a refrigerant cylinder? __Light blue_____

C. Describe the color for R-1234yf refrigerant cylinder __White with red band__
D. What color is R-744 refrigerant cylinder? ___Gray___
E. What refrigerant cylinder has Right Hand Thread? __R-134a__ Left Hand Thread? _R-1234yf_
7/16" X 20 Fitting? _R-12_

17. **What affect will overcharging have on today's MVAC systems? p.28**

Overcharged system will produce higher-than-normal operating pressures, causing reduced cooling and possible system damage.

18. What affect will low refrigerant have on today's MVAC systems?
Systems that are low on refrigerant may have reduced cooling, and may suffer component damage from lack of lubrication, because the refrigerant in MVAC systems circulates the lubricant.

19. List two (2) methods to ensure that refrigerant charge methods and amounts are accurate (p.28)…
A. Determining the refrigerant charge specification found on the MVAC identification label located in the vehicle engine compartment, or in technical resources such as service manuals or online service information.
B. Charged the system by weight, using an accurate scale or other device. One calibration method would be to place a static weight of known value on the scale to verify the scale reading.

20. **Use section 609 Refrigerant Charge Calculation Sheet on p.29 to convert the following math problems…**

A. Convert 26 ounces of refrigerant to pounds (Ex. 26 oz. Divided by 16 =)
26 oz. = ___1.625_____ lbs.

B. Convert 1.25 pounds of refrigerant to ounces (Ex. 1.25 lbs. x 16 =)
1.25 lbs. = __20_____ oz.

C. Convert 1 pound and 5 ounces of refrigerant to Total ounces (Ex 1 lbs. x 16) + 5 oz. =
1 lbs 5 oz. = ___21_____ oz. (Total)

D. . Convert 0.6 pound of refrigerant to ounces (Ex. 6/10 lbs. into oz.) and (Ex. 0.6 lbs. x 16 =)
0.6 lbs. = ____9.6_____ oz. (Total)

E. Convert 14 ounces of refrigerant to tenths of a pound (Ex.14 oz. Divided by 16 = tenths of a pound)
14 oz. = __0.875_____ tenths of a pound

F. Convert 500 grams of refrigerant to ounces (Ex.500 g x .0353 =)
500 g = ___17.637_____ oz.

F. Convert 1.3 kilograms of refrigerant to pounds (Ex.1.3 kg. x 2.205 =)
1.3 kg = __2.86601_____ lbs.

CONGRATULATIONS – YOU ARE NOW FINISHED WITH SECTION 609 PRE-TEST TRAINING!

Automotive instructors, technicians, shop owners and others are free to use these materials to help your students and employees prepare and pass EPA 609 Refrigerant Recovery and Recycling Quiz. Please understand that these materials do not guarantee you will pass or receive 609 credentials. These materials are not endorsed by any organization and should only be used as instructional aids.

Download and use the 3-part worksheets and tests at the link below…
http://freestuffinder.org/EPA609_Worksheets.zip
Use underscore in your link – not a dash, or click the link below…
http://freestuffinder.org/EPA609_Worksheets.zip

Compiled by bbyrd2100@suddenlink.net
4/21/2018

Listing of All EPA Standards for R-12, R-134a, and R-1234yf Found in Refrigerant Recovery and Recycling: Review and Quiz Booklet Mar. 2017

These standards were pulled from the Refrigerant Recovery and Recycling: Review and Quiz Booklet Mar. 2017 and placed in graphic organizers to help you quickly find and identify essential functions in Section 609 of the Clean Air Act of 1990 for MVAC systems. These organizers are not affiliated or endorsed by ASE, SAE or EPA in any way.

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EPA Standards for R-12 Recover and Recycling of Refrigerant	
SAE* Standards	**Remarks**
J1989	J1989 - Recommended Service Procedure for the Containment of R-12. This standards applies specifically to R-12; J1989 also covers service with manifold gauges and refrigerant checking procedure for stored portable containers
J1990**	J1990 - Recovery and Recycle Equipment for MVAC Systems establishes minimum equipment specifications needed to recycle R-12 for reuse
J1991***	J1991 is a purity standard for recycled R-12 in ppm
J2209	J2209 specifies requirements of equipment used for R-12 recovery-only

*- SAE – Society of Automotive Engineers.
**- J1990 uses service hoses marked "SAE J2196" to show they meet that standard.
***- J1991 purity standard for R-12 specifies limits in parts per million (ppm) by weight.

SAE J639, "Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems." This standard serves as an "umbrella standard." It spells out details for system design, implementation and service, ranging from pressures and key components, to service details. SAE J639 also specifies refrigerant fitting types and sizes for each refrigerant.

SAE standard J1628 establishes procedures for using leak detection equipment. Specifically addressed are electronic leak detectors meeting the SAE Standard J2791 and J2913 for R-1234yf systems.

Keep in mind that SAE standards maybe updated, superseded, or additional ones may be added in the future.

EPA Standards for R-134a 2 Recover and Recycling of Refrigerant		
SAE Standards	**Remarks**	
J2064* J2099 J2196 J2197 J2210 J2211 J2788** J2791	J2064 covers refrigerant hose and hose assemblies for MVACS with R-134a J2099 is a purity standard that sets limits for contaminants in recycled R-134a in ppm R-134a service hose specifications are also covered under J2196 J2197 requires R-134a hoses have 1/2-in.-16 ACME thread for connection to connect equipment J2210 - J2788 supersedes the older J2210 standard J2211 addresses service with manifold gauges and refrigerant checking procedure for stored portable containers J2788 cites J2099 as the purity standard for recycled refrigerant. J2791 establishes minimum performance requirements for leak detectors used on MVAC systems that contain R-134a refrigerant. SAE Standard J2791. Detectors feature a label stating, Design certified by (name of independent testing laboratory) to meet J2791requires a minimum of three leak-detection scales	

*- J2064 includes requirements for labeling, hose dimensions, materials, construction, permeation rates, burst strength, connection integrity, and the required testing procedures.

**- J2788 only applies to refrigerant handling equipment manufactured or imported after December 31, 2007. J2099 establish purity standards for R-134a and R-1234yf and specifies limits in parts per million (ppm) by weight, and non-condensable gases (air) - by volume.

EPA Standards for R-1234yf Recover and Recycling of Refrigerant	
SAE Standards	**Remarks**
J1628	J1628 used to determine if the leak is of repairable size as defined by the vehicle or MVAC system
J2064*	J2064 covers refrigerant hose and hose assemblies for MVACS with 1234yf
J2099	J2099 is a purity standard that sets limits for contaminants in recycled R-1234yf in ppm, and by and non-condensable gases (air) - by volume
J2297	J2297 establishes standards for stability and compatibility of fluorescent dyes for use in mobile R-134a systems and R-1234yf systems. J2297 requirements for providing under-hood labels you can use to indicate fluorescent dye was installed and to identify the dye manufacturer. The label must state: “Caution— System to be Serviced by Qualified Personnel.”
J2298	J2298 covers procedures for using leak detection dyes

EPA Standards for R-1234yf Recover and Recycling of Refrigerant	
J2299	J2299 establish standards for the performance of leak-detection dye injection equipment.
J2842	J2842 - R-1234yf and R-744 Design Criteria and Certification for OEM Mobile Air Conditioning Evaporator and Service Replacements
J2843**	An identifier must be used with R-1234yf recover/recycle/recharge equipment meeting SAE J2843 J2843 requires 98% purity before it will recover and recycle. J2843 requires integration with a refrigerant identifier - internal or external to help avoid contamination J2843-compliant equipment must meet SAE J2927, R-1234yf Refrigerant identifier Installed In Recovery and Recycling Equipment for Use With MVAC Systems.
J2845	J2845 also covers refrigerant identification and leak detection J2845 - R-1234yf and R-744 Technician Training for Service and Containment of Refrigerants Used in MVAC Systems - it includes J2843 for recovery/recycling/recharging equipment, J2912 for refrigerant identification equipment and other related standards
J2851	J2851 applies to recovery-only equipment for extracting a contaminated refrigerant from a system originally filled with R-1234yf
J2888	J2888 - R-1234yf Service Hose, Fittings and Couplers for Mobile Refrigerant Systems Service Equipment

EPA Standards for R-1234yf Recover and Recycling of Refrigerant		
	covers hardware specifications for fittings, couplers and hoses.	
J2912	All external refrigerant identifiers must meet J2912, Performance Requirements for R-134a and R-1234yf Refrigerant Diagnostic Identifiers	
J2913	J2913 applies to electronic leak detectors for R-1234yf *** and incorporates three leak detection sensitivity	
J2927	J2927 applies to machine's internal refrigerant identifier.	
	J2927 details specifics for built-in refrigerant identifiers in recover/recycle/recharge machines.	

*- J2064 covers both R-134a and R-1234yf hoses and hose assemblies. Hoses marked "J2064 R-134a/R-1234yf" meet the requirements of J2064 for both R-134a and R-1234yf.

**- SAE standards J1990 (for R-12) and J2788 (for R-134a) and J2843 (for R-1234yf) establish requirements for recovery and recycling equipment - includes hardware-related items, compliance with related SAE standards, and performance criteria.

***- R-1234yf is a mildly flammable refrigerant so safety needs to be strictly followed when searching for leaks

THE END