ASSESSMENT GUIDE - 28952

DOMAIN	Refrigeration and Air Conditioning				
STANDARD	28952	V2	Demonstrate knowledge of refrigerants and their management	Level 3	5 Credits
ENTRY	There are no pre-requisite unit standards.				

LEARNER TO COMPLETE	
Name	Company
NSI No.	Email / phone

Pre-assessment confirmation

I, the **learner**,

- Understand the assessment process and assessment requirements for this unit.
- Understand the appeals and resubmission processes.
- Believe I have the skills and knowledge to successfully complete the assessment requirements.

Assessment Submission: (Tick ✓ appropriate circle)	○	1st Submission	○	1st Resubmission	○	Final Resubmission

ASSESSOR TO COMPLETE	
Name	Company
Email / phone	

Pre-assessment confirmation

I, the assessor, can confirm the learner has achieved any pre-requisite requirements.	○

ASSESSMENT JUDGEMENT & RESULT	
I, the **assessor**, have reviewed the learner's evidence for Unit Standard 28952 v2 and judge that it is sufficient and authentic.	**YES / NO**
I, the **assessor**, confirm the learner has achieved this unit standard.	**YES / NO**
Signature	Date

LEARNER INSTRUCTIONS:

YOU WILL NEED TO BE ABLE TO:

- Explain the physical properties of commonly used refrigerants
- Explain refrigerant classifications and methods for identifying refrigerants
- Describe standard industry practices for handling refrigerants and their hazards
- Describe the hazards associated with gas cylinders and their management
- Explain legislation and codes of practice for the use and management of refrigerants

IMPORTANT INFORMATION

- Carefully read through this Assessment Guide so you know exactly what is expected.
- All evidence you provide for this assessment must be your own work.
- You can attach additional material which shows you have the required skills and knowledge, e.g. job sheets, checklists, work samples, photos, screenshots, videos.
- Clearly name and label all attached evidence. . Labels for photos must describe the activity being performed in the photo.
- Your assessor may choose a verifier from your workplace to observe and/or verify your work.

What you need to do		Tick when complete
Question Set 1	Answer questions about the physical properties of commonly used refrigerant	○
Question Set 2	Answer questions about refrigerant classifications	○
Question Set 3	Answer questions about hazards associated with refrigerants, and their management	○
Question Set 4	Answer questions about gas cylinders and their safety features for use with refrigerants.	○
Question Set 5	Answer questions about standard industry practices for handling refrigerants.	○
Question Set 6	Answer questions about legislation and codes of practice for the use and management of refrigerants	○

RESUBMISSIONS:

Under Apprentice Training New Zealand (ATNZ) policy you have a maximum of **two** resubmission opportunities for this assessment. In total you will have three opportunities to meet the unit standard requirements. Information about the ATNZ resubmission process can be found in the Learner Regulations.

APPEALS:

Your Assessor, Observer or Verifier will discuss with you ATNZ's Assessment Appeals process before carrying out this assessment. Information about the Assessment Appeals process can be found in the Learner Regulations.

Question Set 1 – Physical properties of commonly used refrigerants.

Answer the following questions about physical properties of commonly used refrigerants.

- Use your own words
- You can answer the questions in writing or give your answers verbally to your assessor who will write down what you say. *You may need to arrange this in advance.*
- Your assessor may ask you additional questions to check your knowledge and understanding.

Your name		
Workplace		
Answers written by:	**Learner** ○	**Assessor** ○ When using verbal questioning, record key points *from the learner's responses as accurately and fully as possible.*

QUESTION SET 1

1. Explain the term **refrigerant** in terms of how it works to heat transfer. PC 1.1

	○

2. Match the following terms (Column A) with its correct description (Column B). PC 1.2

A. Terminology	B. Description of the terminology	Tick
Critical point	The lowest concentration of the refrigerant in the air that can ignite and cause an explosion if there is a spark or flame.	○
Toxicity	A mix of different refrigerants that have varying boiling points and don't act like a single substance.	○
Lower explosive limit	This is the highest temperature and pressure at which a refrigerant can exist in a distinct liquid and vapour phase. Beyond this point, the refrigerant no longer changes phase even if more pressure is added.	○

Azeotrope	A measure of how much a refrigerant contributes to global warming compared to carbon dioxide (CO_2).	○	
Zoetrope	How harmful a refrigerant can be to humans if inhaled or exposed to in large amounts.	○	
ODP	A measure of how damaging the refrigerant is to the ozone layer	○	
GWP	A mixture of two or more refrigerants that acts like a single substance because it boils at a constant temperature and doesn't separate when heated.	○	

3. Explain the meaning of the term ***F-gas***. PC 1.3

	○

4. Match the chemical compositions (Column B) of the F-gases (Column A). PC 1.3

F-Gas (A)	Chemical Composition (B)	Tick
R134a	44% CHF_2CF_3 / 52 % CF_3CH_3 / 4% CH_2FCF_3	○
R32	50% CH_2F_2 / 50% CHF_2CF_3	○
R125	CH_2F_4	○
R404A	C_2HF_5	○
R410A	CH_2F_2	○

5.	Explain the meaning of the term natural refrigerants and give five examples. Explain the meaning of the term ***natural refrigerants***. ○	PC 1.4
6.	Provide at least **FIVE (5)** examples of natural refrigerants 1. ○ 2. ○ 3. ○ 4. ○ 5. ○	PC 1.4

7. Complete the table below of commonly used refrigerants to compare the critical temperature, ASHRAE Safety Group classification (based on flammability and toxicity), ODP and GWP for each refrigerant. PC 1.5 PC 4.1

Complete the table. Then answer questions 8 -10

Refrigerants	Critical temp	ASRAE Safety Category	ODP	GWP	Tick
HFC–R404A	72.07°C	A1	zero	392024	
HFC–R410A					○
HFO–1234yf	94.7°C	A2L	Zero	4	
HFC–R134a	101.1°C	A1	Zero	1430	
Propane–R290	96.7°C	A3	Zero	3	
Isobutane–R600a	134.7°C	A3	Zero	3	
Ammonia–R717					○
Carbon dioxide–R744					○

8. Which refrigerant has the lowest GWP? PC 1.5 PC 4.1

○

9. Which refrigerant is more flammable – Ammonia or HFC R410a? PC 1.5 PC 4.1

○

10. Which refrigerant is the most toxic? PC 1.5 PC 4.1

○

Question Set 2 – Refrigerant classifications.

Answer the following questions about refrigerant classifications.

- Use your own words
- You can answer the questions in writing or give your answers verbally to your assessor who will write down what you say. *You may need to arrange this in advance.*
- Your assessor may ask you additional questions to check your knowledge and understanding.

Your name		
Workplace		
Answers written by:	**Learner** ○	**Assessor** ○ *When using verbal questioning, record key points from the learner's responses as accurately and fully as possible.*

QUESTION SET 2		
1.	Outline the ASHRAE system of refrigerant designation in accordance with AS/NZS 817:2016. What is the ASHRAE system of refrigerant designation?	PC 2.1
2.	How are refrigerants identified under the ASHRAE system?	PC 2.1
3.	How is the classification number created?	PC 2.1

4.	Name THREE (3) safe methods you can use to identify a refrigerant in a vessel or container.	PC 2.2 PC 3.1 PC 3.2 PC 5.7

	○

5. Complete the table below by using the information provided to derive the missing information about each cylinder

PC 2.2
PC 3.1
PC 3.2
PC 5.7

Cylinder colour	ASHRAE "R" number	Pressure (kPa) at Room Temp (22°) using this chart	ASHRAE Series	Chemical composition	✓
	**R-134a**				○
					○
		**1082 kPa**			○
			**Methane series**		○
	R-717				○
Grey	**R-744**				○

	 can also be grey/silver	**R-600a**	**220 kPa**	**Saturated hydrocarbons, miscellaneous organic compound series.**		○	
	White	**R-290**	**121 kPa**			○	

6. Explain the flammability (Groups 1, 2, and 3) and toxicity (Groups A and B) classifications of refrigerants and interpret examples in accordance with AS/NZS 817:2016. Provide TWO (2) examples of each. — PC 2.3 PC 3.2 PC 4.1

Explain the flammability and toxicity of group **A1** refrigerants

Flammability		○
Toxicity		○
Example 1		○
Example 2		○

7. Explain the flammability and toxicity of group **A3** refrigerants — PC 2.3 PC 3.2 PC 4.1

Flammability		○
Toxicity		○
Example 1		○
Example 2		○

8. Explain the flammability and toxicity of group **B1** refrigerants — PC 2.3 PC 3.2 PC 4.1

Flammability		○
Toxicity		○
Example 1		○
Example 2		○

9.	Explain the flammability and toxicity of group **B3** refrigerants **Flammability** ○ **Toxicity** ○ **Example 1** ○ **Example 2** ○	PC 2.3 PC 3.2 PC 4.1
10	The next THREE (3) questions relate to Aotearoa's new Classification System to manage Hazardous Substances. Identify the name of the new classification system **Hazard Classification System** / **Tick the correct Answer** ○ HSNO ☐ GHS 7 ☐ SDS ☐	PC 2.4 PC 3.2
11.	Explain how substances are classified under this system. ○	PC 2.4 PC 3.2
12	Name THREE (3) places you would expect to see classification information when working with refrigerants. 1. ○ 2. ○	PC 2.4 PC 3.2

	3. ○	
13	What is the definition of a **Flammable Gas** according to the system you've named in question 10. ○	PC 2.4 PC 3.2
14	Explain the purpose of an SDS (Safety Data Sheet). ○	PC 2.5 PC 3.2
15	Locate the SDS for R40. What physical hazards are listed? ○	PC 2.5 PC 3.2
16	What PPE should be worn when handling R40?	PC 2.5 PC 3.2

		○	
17	Name TWO (2) conditions for safe storage or R40? 1. 2.	○ ○	PC 2.5 PC 3.2
18	Explain the purpose of HAZCHEM or Emergency Action Codes.	○	PC 2.6
19	Explain the meaning of HAZCHEM code 2RE. **2** **R** **E**	○	PC 2.6
20	What is the HAZCHEM code for R-410A refrigerant?		PC 2.6

		○	

Question Set 3 – Hazards associated with refrigerants, and their management.

Answer the following questions about hazards associated with refrigerants, and their management.

- Use your own words
- You can answer the questions in writing or give your answers verbally to your assessor who will write down what you say. *You may need to arrange this in advance.*
- Your assessor may ask you additional questions to check your knowledge and understanding.

Your name		
Workplace		
Answers written by:	**Learner** ○	**Assessor** ○ *When using verbal questioning, record key points from the learner's responses as accurately and fully as possible.*

QUESTION SET 3		
1.	Describe the hazards associated with refrigerants in terms asphyxiation and hazards associated with pressure vessels. Describe the hazard of **Asphyxiation.** ○	PC 4.1
2.	Describe the hazards associated with pressure vessels	PC 4.1

		○	

3.	Refrigerant hazards must be managed to prevent harm or damage. The next TWO (2) questions list ways to manage these hazards. A. Complete the table below by briefly explaining how each method manages hazards of working with refrigerants. B. Give ONE (1) example of how you manage hazards using the method in your workplace.		PC 4.2

Method	**A. Explanation of how method manages hazards**	**B. ONE (1) Example from your workplace**	✓
Avoidance of leakage			○
Ventilation			○
Use of personal protective equipment			○
First aid measures			○
Labelling of cylinders and equipment			○

	Warning signs			○	
	Training and certification of fillers and handlers			○	
4.	Another way to protect people from the hazards associated with refrigerants is the use of Personal Protective Equipment (PPE). Answer the following TWO (2) questions about PPE. Describe the minimum requirements for personal protective equipment when working with refrigerants.			○	PC 4.3
5.	Describe at least THREE (3) additional personal protective equipment items you may need when working with R134a. Use the SDS as a guide.			○	PC 4.3
6.	Counterfeit refrigerants might contain unknown or improper chemical compositions that may be different from the standards of genuine refrigerants. Answer the following TWO (2) questions about the dangers of counterfeit refrigerants. Explain what the dangers of using counterfeit refrigerants may be.				PC 4.4

7.	Describe actions you can take to avoid using counterfeit refrigerants	PC 4.4

Question Set 4 –Gas cylinders and their safety features for use with refrigerants.

Answer the following questions about gas cylinders and their safety features for use with refrigerants.

- Use your own words
- You can answer the questions in writing or give your answers verbally to your assessor who will write down what you say. *You may need to arrange this in advance.*
- Your assessor may ask you additional questions to check your knowledge and understanding.

Your name		
Workplace		
Answers written by:	**Learner** ○	**Assessor** ○ *When using verbal questioning, record key points from the learner's responses as accurately and fully as possible.*

QUESTION SET 4

1. Distinguish between the types of compressed gases with reference to critical temperature and liquid or gas phase by completing the table below.

PC 5.1

For each type of compressed gas identify their critical temperature and identify their liquid or gas phase.

Types of compressed gas	**Identify their critical temperature**	**Identify their liquid or gas phase.**	✓
Permanent			○
Low pressure liquefied			
Cryogenic			
Liquefied			
High pressure liquefied			
Refrigerated liquefied			

2. Describe **how** each of the following types of cylinders are used in your workplace? Give an example of each.

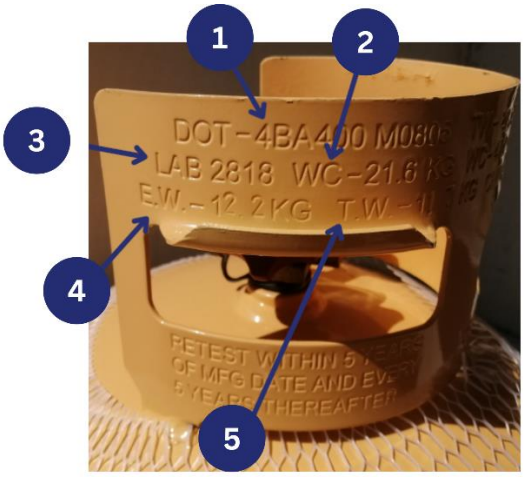
PC 5.2

Types of cylinders	**How do you use this type of cylinder in your workplace?**	**Example**	✓
Storage			○
Returnable			○
Disposable			○
Recovery			○

3.	Explain how you would know that a cylinder has EPA approval for use.	PC 5.3
4.	State the time interval between periodic inspection and test for refrigerant cylinders and describe the inspection and testing procedure for cylinders. The time interval between periodic inspection and test for refrigerant cylinders is.	PC 5.4
5.	Describe the inspection and testing procedure for refrigerant cylinders in Aotearoa.	PC 5.4
6.	Explain the purpose of over-pressure safety devices and how they work.	PC 5.5

7.	Explain the operation of the following over-pressure safety devices: **Pressure Relief Valve (PRV)** and **Burst Disc Safety Device**	PC 5.5
8.	What refrigerants are stored in cylinders that have **clockwise (Right-Handed)** valve outlet threads?	PC 5.6
9.	What refrigerants are stored in cylinders that have **anticlockwise (Left-Handed)** valve outlet threads?	PC 5.6

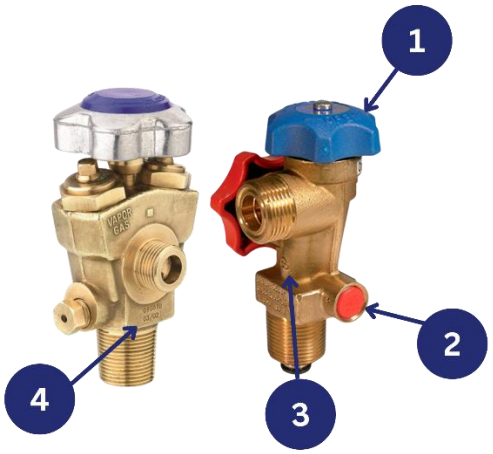
10.	Interpret the markings and labelling on cylinders and valves. Interpret the following markings and labelling found on a R-410A refrigerant cylinder in Aotearoa.	PC 5. 7



Cylinder Markings	What does this mean?	✓
1		○
2		○
3		○
4		○
5		○

11.

PC 5. 7



Identify and explain the FOUR (4) markings you may see on the valve.

Valve Markings	What does this mean?	✓
1		○
2		○
3		○
4		○

Question Set 5 –Standard industry practices for handling refrigerants.

Answer the following questions about standard industry practices for handling refrigerants.

- Use your own words
- You can answer the questions in writing or give your answers verbally to your assessor who will write down what you say. *You may need to arrange this in advance.*
- Your assessor may ask you additional questions to check your knowledge and understanding.

Your name		
Workplace		
Answers written by:	**Learner** ○	**Assessor** ○ *When using verbal questioning, record key points from the learner's responses as accurately and fully as possible.*

QUESTION SET 5		
1.	The following SIX (6) questions relate to typical industry procedures for evacuating and pressure testing refrigerant system in Aotearoa. Locate the procedure your company uses to evacuate, and pressure test a refrigerant system. Attach it here (include as supporting evidence when you upload your completed assessment).	PC 6.1
2.	List FIVE (5) key items of equipment you will need to successfully undertake the procedure.	PC 6.1

1	○
2	○
3	○
4	○
5	○

3.	Pressure testing a refrigeration system is an important step in ensuring the system is free of leaks. Describe the steps you would take to pressure test a system.	PC 6.1
4.	Procedures to **recover** refrigerants from a refrigeration system can only be undertaken by people who hold an Approved Filler certification. Explain why refrigerant recovery is a restricted activity.	PC 6.2

5.	Explain the purpose and scope of Approved Filler certification. ○	PC 7.2
6.	Name THREE (3) methods. technicians find refrigerant loss when servicing a system. Briefly describe the procedure you use for each method.	PC 6.3

Name of method	**Procedure**	✓
1.		○
2.		○
3.		○

7.	Labelling a system is important. What FOUR (4) pieces of information must be on a system **after refrigerant type and/or lubricant has been changed.** **1** ○ **2** ○ **3** ○ **4** ○	PC 6.4
8.	Describe THREE (3) methods for safe handling and storing of refrigerants in Aotearoa using approved cylinders. **Method** / **Description of method** / ✓ **1** ○ **2** ○ **3** ○	PC 6.5

Question Set 6 -Legislation and codes of practice for the use and management of refrigerants.

Answer the following questions about legislation and codes of practice for the use and management of refrigerants.

- Use your own words
- You can answer the questions in writing or give your answers verbally to your assessor who will write down what you say. *You may need to arrange this in advance.*
- Your assessor may ask you additional questions to check your knowledge and understanding.

Your name		
Workplace		
Answers written by:	**Learner** ○	**Assessor** ○ *When using verbal questioning, record key points from the learner's responses as accurately and fully as possible.*

QUESTION SET 6		
1.	Briefly outline the purpose of the following legislation, code of practices, and technical guides which relate to using and managing refrigerants. Health and Safety at Work Act (Hazardous Substances) 2017	PC 7.1
2.	Environmental Protection Authority – Guide to Gas Cylinders	PC 7.1

3.	Health and Safety at Work Act 2015	PC 7.1
4.	Land Transport Rule (Dangerous Goods) 2005	PC 7.1
5.	Ozone Layer Protection Act 1996	PC 7.1
6.	Australia and New Zealand Refrigerant handling code of practice 2007	PC 7.1