REFRIGERANTS & CHARACTERISTICS

NATURAL REFRIGERANTS

1. R717 – Ammonia (NH_3)

- **Type:** Natural
- **Safety Class:** B2L (toxic, mildly flammable)
- **GWP:** 0
- **ODP:** 0
- **Applications:** Industrial refrigeration, ice plants, cold storage, food processing
- **Notes:**
    - Excellent thermodynamic efficiency
    - Incompatible with copper
    - Requires strict safety protocols
    - Best-in-class COP for large systems
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2. R744 – Carbon Dioxide (CO_2)

- **Type:** Natural
- **Safety Class:** A1
- **GWP:** 1
- **ODP:** 0
- **Applications:** Supermarkets, heat pumps, industrial cascade systems
- **Notes:**
    - Requires very high pressures (90–120 bar)
    - Ideal for low temperatures in cascades
    - Excellent for green compliance

3. R290 – Propane

- **Type:** Hydrocarbon
- **Safety Class:** A3 (highly flammable)
- **GWP:** <5
- **ODP:** 0
- **Applications:** Freezers, residential AC, commercial refrigeration
- **Notes:**
    - High efficiency, low charge required
    - Strict charge limits due to flammability

4. R600a – Isobutane

- **Type:** Hydrocarbon
- **Safety Class:** A3
- **GWP:** ~3
- **ODP:** 0
- **Applications:** Household refrigerators
- **Notes:**
    - Very efficient at small charges
    - Common in modern fridges worldwide

5. R1270 – Propylene

- **Type:** Hydrocarbon
- **Safety Class:** A3
- **GWP:** <3
- **Applications:** Industrial refrigeration
- **Notes:**

- Very similar to R290 but with slightly different pressure curve

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HFC REFRIGERANTS

6. R134a

- **Type:** HFC
- **Safety Class:** A1
- **GWP:** 1430
- **ODP:** 0
- **Applications:** Automotive AC, refrigeration, chillers
- **Notes:**
  - Being replaced by R1234yf and R513A

7. R404A

- **Type:** HFC blend
- **Safety Class:** A1
- **GWP:** 3922
- **ODP:** 0
- **Applications:** Supermarket refrigeration, freezers
- **Notes:**
  - Very high GWP → being replaced by R448A, R449A

8. R407C

- **Type:** HFC blend
- **Safety Class:** A1
- **GWP:** 1774

- **Applications:** AC systems
- **Notes:**
    - High glide mixture

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9. R410A

- **Type:** HFC blend
- **Safety Class:** A1
- **GWP:** 2088
- **Applications:** Residential & commercial AC
- **Notes:**
    - Being replaced by R32
    - High pressure refrigerant

10. R507

- **Type:** HFC
- **Safety Class:** A1
- **GWP:** 3985
- **Applications:** Low-temperature refrigeration
- **Notes:**
    - Banned in many regions due to GWP

HCFC REFRIGERANTS

11. R22

- **Type:** HCFC
- **Safety Class:** A1

- **GWP:** 1810
- **ODP:** 0.055
- **Applications:** Older AC & refrigeration systems
- **Notes:**
    - Banned in production globally
    - Replacements: R407C, R32

12. R123

- **Type:** HCFC (low pressure)
- **Safety Class:** B1
- **GWP:** 77
- **ODP:** 0.012
- **Applications:** Centrifugal chillers
- **Notes:** Being replaced by R514A and R1233zd

HFO REFRIGERANTS (Next generation, very low GWP)

13. R1234yf

- **Type:** HFO
- **Safety Class:** A2L (mildly flammable)
- **GWP:** <1
- **Applications:** Automotive AC, small systems
- **Notes:**
    - Drop-in for R134a in many cases

14. R1234ze

- **Type:** HFO
- **Safety Class:** A2L
- **GWP:** <1
- **Applications:** Chillers, industrial systems
- **Notes:**
    - Very low pressure
    - Replaces R134a in chillers

15. R1233zd

- **Type:** HFO
- **Safety Class:** A1
- **GWP:** ~1
- **Applications:** Large chillers replacing R123
- **Notes:**
    - Non-flammable
    - Very efficient in large systems

HFO/HFC BLENDS (Modern replacements)

16. R448A (Solstice N40)

- **Type:** HFO/HFC blend
- **Safety Class:** A1
- **GWP:** 1273
- **Applications:** Supermarket refrigeration
- **Notes:**

- Replacement for R404A/507

17. R449A

- **Type:** HFO/HFC blend
- **Safety Class:** A1
- **GWP:** 1397
- **Applications:** Low-temp freezers, racks
- **Notes:** Common retrofit refrigerant

18. R452A

- **Type:** HFO blend
- **Safety Class:** A1
- **GWP:** 2140
- **Applications:** Transport refrigeration
- **Notes:** Replacement for R404A in trucks

19. R513A

- **Type:** HFO/HFC blend
- **Safety Class:** A1
- **GWP:** 573
- **Applications:** Chillers replacing R134a
- **Notes:** Non-flammable, stable operation

20. R32

- **Type:** HFC (mildly flammable)
- **Safety Class:** A2L

- **GWP:** 675
- **Applications:** Modern AC systems
- **Notes:**
    - High efficiency
    - Used in most next-gen residential AC

LOW-PRESSURE REFRIGERANTS (Centrifugal chillers)

21. R514A

- **Type:** HFO blend
- **Safety Class:** B1
- **GWP:** 2
- **Applications:** Replaces R123 in large chillers
- **Notes:**
    - Non-flammable
    - Very low GWP

22. R245fa

- **Type:** HFC
- **Safety Class:** A1
- **GWP:** 1030
- **Applications:** ORC systems (waste heat recovery)
- **Notes:**
    - Rarely used in HVAC now
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SPECIALTY & INDUSTRIAL REFRIGERANTS

23. R508B

- **Type:** HFC blend
- **Safety Class:** A1
- **GWP:** ~13,000
- **Applications:** Ultra-low temp freezers (-86°C)

24. R170 (Ethane)

- **Type:** Hydrocarbon
- **Safety Class:** A3
- **Applications:** Ultra-low temperature refrigeration

25. R23

- **Type:** HFC
- **Safety Class:** A1
- **GWP:** 12,690
- **Applications:** Cascade low temp stages