B2 · Temperature, kelvin and absolute zero; STP and SATP · Practice key

This is the worked key. Every practice question is worked step by step.

Worked examples

Read these first. There is one for each kind of question in this lesson.

Example 1 · Change degrees Celsius to kelvin

Use T (K) = t (°C) + 273. Convert 18 °C to kelvin.

1. Read the unit you are given: °C.
2. Add 273 to go from °C to K: 18 + 273 = 291 K.
3. Check: the kelvin value is the bigger one, and it is not negative.

Answer: The temperature is 291 K.

Example 2 · Change kelvin to degrees Celsius

Use T (K) = t (°C) + 273. Convert 350 K to degrees Celsius.

1. Read the unit you are given: K.
2. Subtract 273 to go from K to °C: 350 − 273 = 77 °C.
3. Check: the kelvin value, 350, is the bigger one.

Answer: The temperature is 77 °C.

Example 3 · Give the conditions of STP or SATP

Name the temperature and pressure of SATP. Give the temperature in kelvin too.

1. SATP is 25 °C and 100 kPa.
2. 25 + 273 = 298 K.

Answer: SATP is 25 °C, which is 298 K, and 100 kPa.

Practice

Questions 1 to 4 are easy. Questions 5 to 8 are medium. Questions 9 and 10 are harder.

EASY

1. Use T (K) = t (°C) + 273. Convert 40 °C to kelvin. What is the temperature in K?

1. The unit given is °C, so add.
2. 40 + 273 = 313 K.

EASY

2. Use T (K) = t (°C) + 273. Convert 300 K to degrees Celsius. What is the temperature in °C?

1. The unit given is K, so subtract.
2. 300 − 273 = 27 °C.

EASY

3. A gas is warmed. Explain what happens to its particles.

1. The particles move faster.
2. Temperature measures how fast the particles move.

EASY

4. Use T (K) = t (°C) + 273. Name the temperature and pressure of STP. Give the temperature in degrees Celsius and in kelvin.

1. STP is 0 °C and 101.325 kPa.
2. 0 + 273 = 273 K.

MEDIUM

5. Use T (K) = t (°C) + 273. A winter night is −40 °C. What is this temperature in kelvin?

1. The unit given is °C, so add.
2. −40 + 273 = 233 K.

MEDIUM

6. Use T (K) = t (°C) + 273. Dry ice is at 195 K. What is this temperature in degrees Celsius?

1. The unit given is K, so subtract.
2. 195 − 273 = −78 °C.

MEDIUM

7. Use T (K) = t (°C) + 273. Which is colder, 250 K or −30 °C? Show your work.

1. Change −30 °C to kelvin, so both are in the same unit.
2. −30 + 273 = 243 K.
3. 243 K is less than 250 K, so −30 °C is colder.

MEDIUM

8. Use 1 atm = 101.325 kPa = 760 mm Hg. Use T (K) = t (°C) + 273. A lab is at SATP. SATP is 25 °C and 100 kPa. Give its temperature in kelvin and its pressure in atmospheres.

1. 25 + 273 = 298 K.
2. 100 kPa × 1 atm / 101.325 kPa = 0.987 atm.

HARDER

9. Use T (K) = t (°C) + 273. The air warms from −12 °C in the morning to 9 °C in the afternoon. Give both temperatures in kelvin. Then find how many kelvin the air warmed.

1. −12 + 273 = 261 K.
2. 9 + 273 = 282 K.
3. 282 − 261 = 21 K warmer.

HARDER

10. Use T (K) = t (°C) + 273. A student says a gas at 20 °C is twice as hot as a gas at 10 °C. Change both temperatures to kelvin. Then say whether the student is right.

1. 10 + 273 = 283 K.
2. 20 + 273 = 293 K.
3. No. Twice 283 K is 566 K, not 293 K.
4. Only the Kelvin scale starts at a true zero, so only kelvin values can be compared this way.