Name Date

Worksheet 5.1: Ideal gas calculations

All the questions on this worksheet can be done without a calculator.

STP = standard temperature and pressure, RTP = room temperature and pressure, molar volume   
of an ideal gas at STP = 22.7 dm3 mol−1, molar volume of an ideal gas at RTP = 24 dm3 mol−1,   
Avogadro constant = 6.02 × 1023 mol−1, 1 bar = 100000 Pa.

Give your answers to three significant figures if they are non-divisible.

**1** Convert the following units:

1. 856.85°C to K \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 81 K to °C \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 67 kPa to Pa \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 0.35 bar to kPa\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. standard pressure (as in STP) in bar\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2** Calculate the number of particles in the following questions:

1. the number of NO molecules in 4.8 cm3 of nitrogen monoxide at RTP

1. the number of Ar atoms in 113.5 dm3 of argon at STP

1. the number of molecules in 40 m3 of an ideal gas at RTP

1. the number of nitrogen and oxygen molecules together in 84 cm3 of their mixture at RTP

1. the number of gas molecules in 113.5 cm3 of methane at STP

**3** Apply the combined ideal gas law equation to complete the table, assuming that the amount   
of gas does not change. Units must be included in your answers.

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| **Gas** | ***P*1** | ***V*1** | ***T*1** | ***P*2** | ***V*2** | ***T*2** |
| A | 100 kPa | 50 cm3 | 26.85°C | 100 kPa | ? | 126.85°C |
| B | 3.5 × 104 Pa | 250 cm3 | 19.85°C | ? | 200 cm3 | 312.85°C |
| C | 0.5 bar | 15 dm3 | 450 K | 0.75 bar | 10 dm3 | ? |
| D | 1 atm | 50 m3 | 200 K | ? | 100 cm3 | 250 K |
| E | 1.8 × 105 Pa | 2.5 × 10−2 dm3 | −23.15°C | 5 × 105 Pa | 1.2 × 10−2 dm3 | ? |