

Part A

1. The Celsius scale calls the melting point of ice _____ °C and the boiling point of water _____ °C. The Fahrenheit scale calls the melting point of ice _____ °F and the boiling point of water _____ °F.
2. Zero on the Kelvin scale is the same as _____ °C on the Celsius scale.
3. What is significant about the temperature referred to in Question 2?
4. Fill in the table below.

Temperature	
Kelvin	degrees Celsius
0	
1	
2	
	-270
	-269

Part B

5. The temperature in a typical fridge is _____ and in a typical freezer is _____.
6. In general, how does the average temperature of the planets change as you move further from the sun?
7. Zero Kelvin is also called _____ zero.
8. All atoms are constantly moving (or vibrating). Describe what happens to the speed of the atoms that make up a substance as the temperature of the substance gets lower and lower.

Part C

9. Describe what a bimetal strip is and what it does?

Material	Coefficient of Thermal Expansion (metres extension per metre length per degree Celsius)
Aluminium	0.000 023
Brass	0.000 018
Copper	0.000 016
Steel	0.000 012
Concrete	0.000 012

10. What does the Coefficient of Thermal Expansion tell us about a substance?
11. If you have an aluminium rod and a steel rod and you heat them equally, which one will expand the most?
12. Write down the equation for calculating how much a material will expand when its temperature changes.

13. Fill in the table below.

Material	Coefficient of Thermal Expansion	Original Length (m)	Initial Temperature (°C)	Final Temperature (°C)	Temperature Change (°C)	Change in Length (in metres)	Change in Length (in millimetres)
steel		4	15	35			
concrete		30	0	40			
aluminium		100	5	30			
concrete		100		50	40		

Part D

14. What is the coldest temperature that you can get on the Celsius scale? _____
15. If a gas at 0°C is cooled to -1°C, it will lose _____ of its volume.
16. If oxygen gas and nitrogen gas are both heated by the same amount,
- (a) the oxygen gas will expand more because oxygen atoms are heavier than nitrogen atoms.
 - (b) the nitrogen gas will expand more because nitrogen atoms are lighter than oxygen atoms.
 - (c) the two gases will expand by the same amount since all gases undergo the same thermal expansion when they undergo the same temperature change (unlike solids and liquids).

17. Why can't anything get colder than zero kelvin (or -273°C)?

18. A change of 1 Kelvin equals a change of _____ °C

19. Write the equations that link the Celsius scale and the Kelvin scale.

20. Complete the table.

Celsius scale (°C)	Kelvin scale (K)
0	
10	
20	
	303
	373
-18	

Part E

21. If a gas's temperature (in Kelvins) doubles, its volume will _____ (as long as the pressure is the same). For example, if the gas starts with a volume of 20 litres, it will thermally expand to _____ litres.
22. If a gas's temperature (in Kelvins) increases by 35%, its volume will increase by _____ (as long as the pressure is the same).

23. Calculate how the volume of a gas will change in the following conditions.

Calculating the Change in Volume of a Gas When its Temperature Changes									
A	B	C	D	E	F	G	H	I	J
Initial Volume (litres, L)	Initial Temperature (°C)	Final Temperature (°C)	Initial Temperature (Kelvin, K) (B + 273)	Final Temperature (Kelvin, K) (C + 273)	Change in Temperature (Kelvin, K) (E-D)	% Change in Temperature ($\frac{F}{D} \times 100\%$)	% Change in Volume (same as G!)	Actual Change in Volume (litres, L) ($\frac{H}{100} \times A$)	Final Volume (litres, L) (A+I)
50	20	100							
20	0	40							
1	50	373							

(Note: The calculations in columns H, I, and J assume that the pressure of the gas has not changed.)