2.1 Particles and their Behaviour: 10-minute Pack

Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A student investigates how the volume of a fixed mass of gas affects its pressure, at a constant temperature. Their results are shown below.

Volume (cm^3)	Pressure (kPa)
10	200
20	100
40	?

(a) State the pattern shown by the data in the table. **(1)**

(b) Calculate the missing pressure value when the volume is 40 cm^3, using the fact that pressure x volume stays constant for a fixed mass of gas at constant temperature. **(2)**

.....

(c) Use the particle model to explain why decreasing the volume of the container increases the pressure of the gas. **(2)**

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2 The density of liquid water is 1000 kg/m^3. The density of steam at 100°C is about 0.6 kg/m^3.

(a) Calculate how many times greater the volume of a fixed mass of water becomes when it turns into steam. **(2)**

(b) Use your answer to part (a) to explain, in terms of particle arrangement, why steam takes up so much more space than the same mass of liquid water. **(2)**

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Mark scheme · 2.1 Particles and their Behaviour: 10-minute Pack

Question 1

(a) as the volume increases the pressure decreases (they are inversely proportional), oe **B1**

(a) Answer: **As volume increases, pressure decreases (the two are inversely proportional).**

(b) pressure x volume = 200 x 10 = 2000 (kPa cm^3), so pressure = 2000 / 40 **M1**

(b) 50 (kPa) cao **A1**

(b) Answer: **50 kPa**

(c) the same number of gas particles is now contained in a smaller volume, oe **B1**

(c) so the particles collide with the walls of the container more often (in a given time), increasing the pressure, oe **B1**

(c) Answer: **The same number of particles is squeezed into a smaller space, so the particles collide with the container walls more frequently, increasing the pressure.**

Question 2

(a) for the same mass, volume ratio = density of water / density of steam = 1000 / 0.6 **M1**

(a) awrt 1670 (accept 1660 to 1680) times greater **A1**

(a) Answer: **Approximately 1670 times greater (accept 1660 to 1680)**

(b) the particles are much further apart (more spread out) in steam than in liquid water, ft from (a) **M1**

(b) because the same mass/number of particles now occupies a much greater volume, the particles must be spread over a much larger average distance from each other in the gas, matching the very large volume ratio found in (a), oe **A1**

(b) Answer: **The particles in steam are spread much further apart than in liquid water; because the same mass of particles now fills a volume around 1670 times greater, the average spacing between particles must be far larger in the gas state.**

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