**Unit 2: TT 4 Concentration**

**SECTION A: Multiple-choice questions (1 mark each)**

**Question 1**

*Answer:* A

*Explanation:*

Kinetic molecular theory of gases assumes the volume of the gas particles themselves is negligible compared to the volume of the container.

**Question 2**

*Answer:* D

*Explanation:*

Using the conversion from the data book, 1.48 atm = 150 kPa.

**Question 3**

*Answer:* C

*Explanation:*

Helium atoms have a greater mass then hydrogen molecules (4:2 ratio). Therefore the helium ions will have a lower velocity for the kinetic energy of both gases to be the same.

**Question 4**

*Answer:* B

*Explanation:*

CO2 and H2O are produced in high volumes by society. Methane is not as high in volume but it is more detrimental to the atmosphere.

**Question 5**

*Answer:* B

*Explanation:*

The volume vs temperature graph can be extrapolated until volume = 0. This will give you an estimate of absolute zero.

**Question 6**

*Answer:* A

*Explanation:*

Pressure and volume are inversely proportional. If the pressure is quadrupled, the volume will drop by a factor of four.

**Question 7**

*Answer:* C

*Explanation:*

A weak acid is weak in water but not in an acid/base reaction.

**Question 8**

*Answer:* C

*Explanation:*

64 g of oxygen is 2 mole. The temperature is 26 + 273 = 299 K. 3 atm = 304 kPa

**Question 9**

*Answer:* A

*Explanation:*

The ratio of H2 to HCl is 1:2, therefore the volume required is 3 L.

**Question 10**

*Answer:* B

*Explanation:*

3 L of Cl2 is used in the reaction, therefore 7 L remains.

**SECTION B: Short-answer questions**

**Question 1** (10 marks)

**a. i**. Particles move rapidly in straight lines. They change direction when they collide with each other or the walls of the container. 2 marks

**ii**. The particles have a range of energies, therefore they have a range of velocities. 2 marks

**iii**. An increase in temperature will increase the kinetic energy of the gas. Most particles will move faster – some however might not be affected much at all – you can only assume the average has increased. 2 marks

**b**. The dipoles will not affect the motion of particles of an ideal gas. The forces between particles are assumed to be negligible as the particles are not close together. 2 marks

**ii**. No, the volume of the gas particles is assumed to be negligible. 1 mark

**c**. Pressure is force/area -------------------------

1 mark

**Question 2** (9 marks)

**a. i**. CO2, water, CH4 2 marks

**ii**. 2C2H6(g) + 7O2(g) 🡪 4CO2(g) + 6H2O(g) 2 marks

**iii**. volcanoes, bushfires. 1 marks

**b**. Human activity is increasing the levels of CO2 and other gases in the atmosphere. This leads to the Earth trapping more of the reflected heat from the Earth’s surface. This is making the temperature of the Earth higher. 4 marks

**Question 3** (6 marks)

**a. i**. The volume is reduced by a factor of 4 so the pressure is increased by a factor of 4 to 3.2 atm. 1 mark

**ii**. The temperature has increased by a factor of 3 so the volume will increase by a factor of 3 to 108 L.

1 mark

**b**. Negative temperature values such as Celsius have make no sense – a particle cannot have negative energy. The Kelvin scale starts at absolute zero so it is a better reflection of energy levels. 2 marks

**c. i**. Convert to kPa: 0.85 atm 0.85 x 100/.987 = 86 kPa

ii. Convert to K: -120 0C + 273 = 153 K 1 mark

**Question 4** (6 marks)

**a**. 50.0 g of nitrogen gas = 50/28 mol = 1.79 mol

P=nRT/V = 1.79x8.31x301.4/35 = 128 kPa 4 marks

**b**. 96 g of hydrogen gas is added to a reactor and the conditions are adjusted to SLC.

Calculate the volume of the container. 2 marks

**Question 5** (9 marks)

**a**. **i**. volume of oxygen gas = 30x7/2 = 105 L 1 mark

**-** volume of CO2 = 60 L + volume water = 90 L = 150 L 1 mark

**ii**. oxygen is the limiting reagent (40x2/7 = 11.7 L) If 25 L of ethane reacts with 40 L of oxygen gas,

volume of CO2 = 40x4/7= 22.9 L + volume water = 40x6/7 = 34.2 L = 57 L 2 marks

**b**. **i**. n(ethane) = 80/30 =2.67 mol n(CO2) = 5.33 mol = 235 g 3 marks

**ii**. V=nRT/P = 5.33x8.31x295/125 = 105 L 2 marks