Number Of Paritcles And Valumes Of Gases

1 The table below shows the volume and temperature of four different gas samples at 100. kPa.

Gas Sample	Volume (L)	Temperature (°C)
helium	1	25
neon	2	50.
argon	1	25
krypton	2	25

Which two gas samples contain equal numbers of atoms?

(1) helium and neon
(2) helium and argon
(3) neon and argon
(4) neon and krypton

2 The volumes of four samples of gaseous compounds at 298 K and 101.3 kPa are shown in the table below.

Sample	Compounds	Volume (L)
1	$NH_3(g)$	44.0
2	$CO_2(g)$	33.0
3	HF(g)	44.0
4	$CH_4(g)$	22.0

Which two samples contain the same number of molecules?

(1) 1 and 2
(2) 1 and 3
(3) 2 and 3
(4) 2 and 4

3 At STP, which gas sample has the same number of molecules as 2.0 liters of $CH_4(g)$ at STP?

(1) 1.0 liter of $C_2H_6(g)$
(2) 2.0 liters of $O_2(g)$
(3) 5.0 liters of $N_2(g)$
(4) 6.0 liters of $CO_2(g)$

4 Which sample at STP has the same number of atoms as 18 liters of Ne(g) at STP?

(1) 18 moles of Ar(g)
(2) 18 liters of Ar(g)
(3) 18 grams of $H_2O(g)$
(4) 18 milliliters of $H_2O(g)$

5 The table below shows data for the temperature, pressure, and volume of four gas samples.

Data for Four Gases

Gas Sample	Temperature (K)	Pressure (atm)	Volume (L)
I	600.	2.0	5.0
II	300.	1.0	10.0
III	600.	3.0	5.0
IV	300.	1.0	10.0

Which two gas samples contain the same number of molecules?

(1) I and II
(2) I and III
(3) II and III
(4) II and IV

6 Which sample of gas at STP has the same number of molecules as 6 liters of $Cl_2(g)$ at STP?

(1) 3 liters of $O_2(g)$
(2) 6 liters of $N_2(g)$
(3) 3 moles of $O_2(g)$
(4) 6 moles of $N_2(g)$

7 At STP, a 12.0-liter sample of $CH_4(g)$ has the same total number of molecules as

(1) 6.0 L of $H_2(g)$ at STP
(2) 12.0 L of $CO_2(g)$ at STP
(3) 18.0 L of HCl(g) at STP
(4) 24.0 L of $O_2(g)$ at STP

8 At STP, which gaseous sample has the same number of molecules as 3.0 liters of $N_2(g)$?

(1) 6.0 L of $F_2(g)$
(2) 4.5 L of $N_2(g)$
(3) 3.0 L of $H_2(g)$
(4) 1.5 L of $Cl_2(g)$

9 At STP, which sample contains the same number of molecules as 3.0 liters of $H_2(g)$?

(1) 1.5 L of $NH_3(g)$ (3) 3.0 L of $CH_4(g)$

(2) 2.0 L of $CO_2(g)$ (4) 6.0 L of $N_2(g)$

10 At STP, a 1-liter sample of Ne(g) and a 1-liter sample of Kr(g) have the same

(1) mass (3) number of atoms

(2) density (4) number of electrons

Base your answers to questions 11 on the information below and on your knowledge of chemistry.

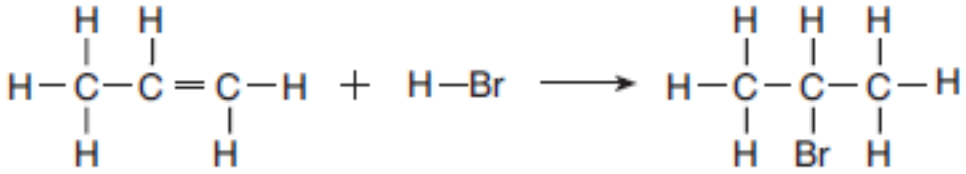
At 23°C, 85.0 grams of $NaNO_3(s)$ are dissolved in 100. grams of $H_2O(\ell)$.

11 Convert the temperature of the $NaNO_3(s)$ to kelvins.

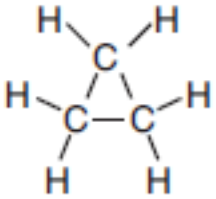
12 Convert the melting point of mercury to degrees Celsius.

Base your answers to questions 13 on the information below and on your knowledge of chemistry.

The equation below represents a reaction between propene and hydrogen bromide.



Cyclopropane, an isomer of propene, has a boiling point of –33ºC at standard pressure and is represented by the formula below.



13 Convert the boiling point of cyclopropane at standard pressure to kelvins.

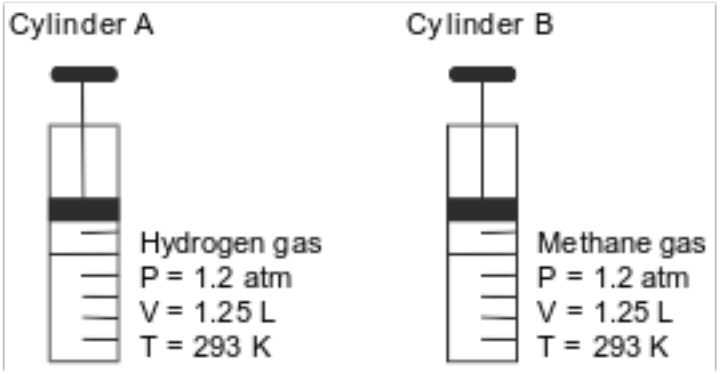
Base your answers to questions 14 on the information below and on your knowledge of chemistry.

Some properties of the element sodium are listed below. is a soft, silver-colored metal melts at a temperature of 371 K oxidizes easily in the presence of air forms compounds with nonmetallic elements in nature forms sodium chloride in the presence of chlorine gas

14 Convert the melting point of sodium to degrees Celsius.

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

Cylinder A has a movable piston and contains hydrogen gas. An identical cylinder, B, contains methane gas. The diagram below represents these cylinders and the conditions of pressure, volume, and temperature of the gas in each cylinder.



15 Compare the total number of gas molecules in cylinder A to the total number of gas molecules in cylinder B.

Answer Keys

1 2

2 2

3 2

4 2

5 4

6 2

7 2

8 3

9 3

10 3

11 Allow 1 credit for 296 K.

12 Allow 1 credit for –39°C.

13 Allow 1 credit for 240. K. Significant figures need not be shown.

14 Allow 1 credit for 98°C.

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- The number of gas molecules in cylinder A is the same as the number of gas molecules in cylinder B.