Unit 7 · States of Matter

WORKSHEET

Full marks 33

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 33

1 Key words [4]

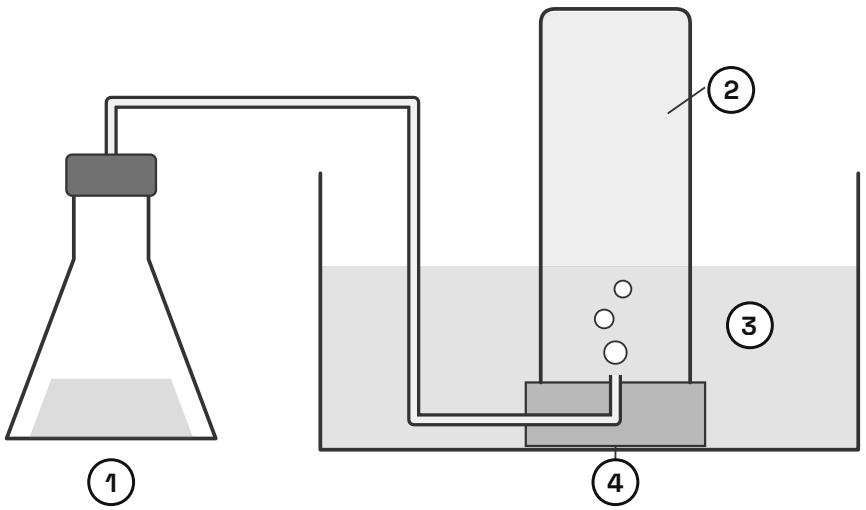
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

absolute zero	**amorphous**	**Boyle's law**	**deliquescent**	**efflorescent**	**Graham's law**
partial pressure	**surface tension**	**vapor pressure**	**viscosity**		

At constant temperature, the volume of a fixed amount of gas is inversely proportional to its pressure: this is _____. The temperature at which the volume of an ideal gas would become zero, −273.15 °C, is _____. In a mixture of gases, the pressure one gas would exert if it filled the container alone is its _____. The rate of diffusion of a gas is inversely proportional to the square root of its density: this is _____. The pressure of the vapor in equilibrium with its liquid is the liquid's _____. The force acting along the surface of a liquid, per unit length, is its _____. The resistance of a liquid to flow is its _____. A solid that takes in so much water from the air that it dissolves in it is _____.

2 Label the diagram [2]

The diagram shows oxygen being made and collected over water. Write the labels that belong in place of 1 to 4. Each carries 0.5 mark.



1. _____ **2.** _____

3. _____ **4.** _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Charles's law relates the volume of a gas to its temperature. Which quantities are kept constant? [1]

a. the temperature and the amount of gas
b. the pressure and the amount of gas
c. the pressure and the volume
d. the volume and the amount of gas

ii. How many atoms are there in one face-centered cubic unit cell? [1]

a. 1
b. 2
c. 4
d. 14

iii. Which of these liquids has the highest vapor pressure at room temperature? [1]

a. water
b. glycerol
c. ethanol
d. diethyl ether

iv. In what ratio are the rates of diffusion of oxygen and hydrogen, at the same temperature and pressure? (H = 1, O = 16) [1]

a. 1 : 4
b. 4 : 1
c. 1 : 16
d. 1 : 2

v. A gas at 27 °C is heated at constant pressure until its volume doubles. What is its temperature now? [1]

a. 54 °C
b. 300 °C
c. 327 °C
d. 600 °C

4 Short answers [7]

Write short answers to the following questions.

a. Crystals of washing soda, $Na_2CO_3 \cdot 10H_2O$, left on a shelf turn into a white powder, while pellets of caustic soda, NaOH, left in the open turn wet and sit in a puddle. Name each kind of behavior, and say what is happening. [2]

b. What is a liquid crystal? Why are liquid crystals used in display screens? [2]

c. Gypsum is $CaSO_4 \cdot 2H_2O$. Find the percentage of water of crystallization in it, and the mass of anhydrous calcium sulphate left when 8.6 g of gypsum is heated until all its water is driven off. (H = 1, O = 16, S = 32, Ca = 40) **[3]**

5 Long answer **[4]**

Write a long answer to the following question.

Write four postulates of the kinetic theory of gases. Use them to explain Boyle's law.

6 Numerical problems **[8]**

Solve the following problems. Show your working. Take R = 0.0821 L atm/(mol K), 0 °C = 273 K, and 1 mol of gas at STP = 22.4 L.

a. A 3.0 L steel cylinder holds nitrogen at 27 °C and 1.5 atm. (N = 14) **[4]**

i. How many moles of nitrogen does it hold?
ii. What is the mass of the nitrogen?
iii. What volume would the gas occupy at STP?
iv. The cylinder is left in the sun and warms to 127 °C. What is the pressure now?

Answer:

b. 4.0 g of helium and 16.0 g of oxygen are put into an empty 10.0 L flask at 27 °C. (He = 4, O = 16) **[4]**

i. Find the total pressure in the flask.

ii. Find the partial pressure of each gas.

iii. A pinhole is made in the flask. How many times as fast does helium escape as oxygen?

Answer: _____

7 Think **[3]**

Two rubber balloons are blown up to the same size, one with helium and one with air (mostly nitrogen). By the next morning the helium balloon has shrunk far more. Saugat says, "Helium is lighter than air, so it floats up out through the rubber." Give a better explanation, and estimate how many times as fast helium escapes as nitrogen. (He = 4, N = 14)

8 Activity: A shrinking bottle (not marked)

Pour a little hot water (not boiling) into an empty plastic bottle, swirl it for a minute, pour it out and screw the cap on tight at once. Then hold the bottle under a cold tap. Do it again with a second bottle, but leave the cap off.

Bottle	What happens when it is cooled?
capped	
open	

Which gas law explains what you see? Why must the cap be on?