Catholic High School
Sec 3 Chemistry
Worksheet 01 – Kinetic Particle Theory

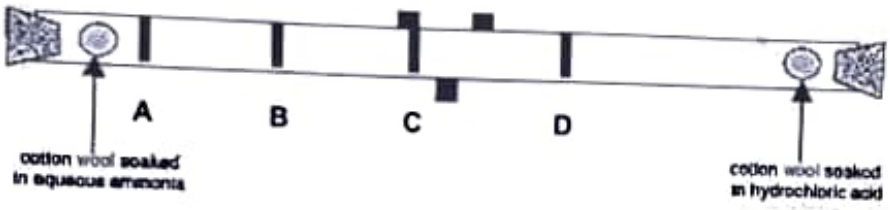
30

Name: _____ ( ) Mark:

Class: _____ Date: _____

(A) Multiple-Choice Questions [10 marks]

1. Plugs of cotton wool soaked respectively in concentrated aqueous ammonia (NH_3) and concentrated hydrochloric acid (HC*l*) are inserted at the same time into the open ends of a horizontal tube as shown in the diagram below. The ends of the tube are sealed. After a short lapse of time, a white deposit of ammonium chloride was observed.



At which one of the positions shown, **A**, **B**, **C** or **D** does the deposit form?

[Relative molecular masses: ammonia, 17, hydrogen chloride, 36.5]

[D]

2. In which conversion do water molecules lose energy?

A ice to water
B ice to steam
C steam to ice
D water to steam

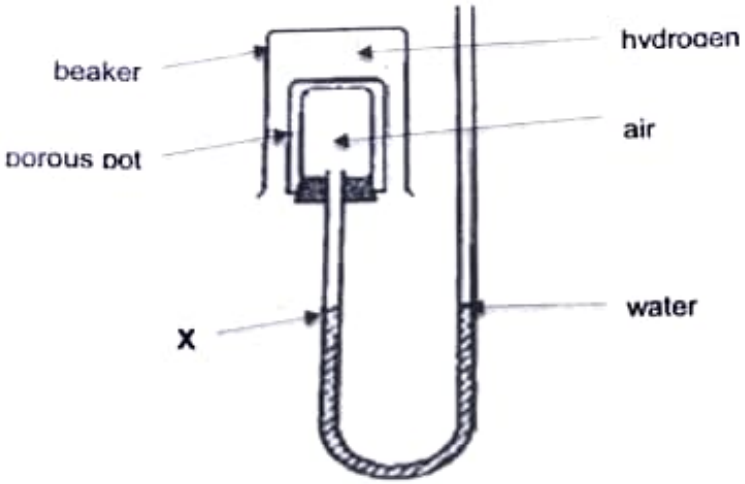
[C]

3. When x cm^3 of water and x cm^3 of ethanol are mixed, the total volume is less than 2x cm^3. This is because

A some ethanol evaporates
B water and ethanol react to produce a gas that escapes
C water molecules fit into gaps between ethanol molecules
D water and ethanol react to produce a salt which dissolves

[C]

4. A jar of hydrogen was inverted over a porous pot with the water levels initially at **X**, as shown in the diagram below.



Over a period of time, which one of the following series of changes of water level at X would be observed?

A falls, then rises and returns to **X**
B rises, then falls and returns to **X**
C falls and remains at a lower level
D rises and remains at a higher level

[C]

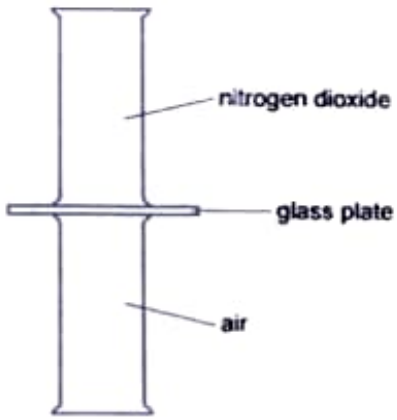
5. **Which of the following decreases as a solid is heated to become a liquid?**

A size of the particles
B motion of the particles
C space between the particles
D attractive forces between the particles

[D]

6. Nitrogen dioxide is a dark brown gas and is more dense than air.

A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of a gas jar containing air.



The glass plate is removed.

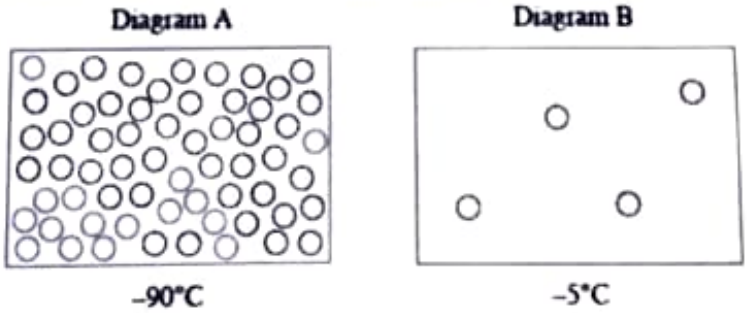
Which one of the following correctly describes the colours inside the gas jars after a long period of time?

[Taken from 5070/08/Jun/Q3]

	upper gas jar	lower gas jar
A	brown	brown
B	dark brown	light brown
C	colourless	dark brown
D	light brown	dark brown

[B]

7. The diagrams show the particles in a substance at two different temperatures but at the same pressure.

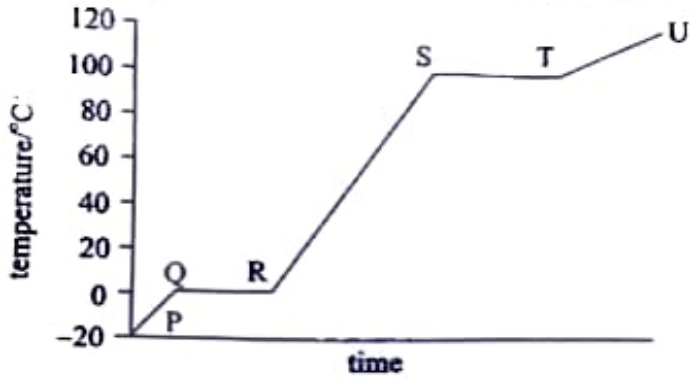


Which of the following most likely indicates the melting point and boiling point of the substance?

	Melting point/ °C	Boiling point/ °C
A	-183	-162
B	-82	-60
C	-102	-34
D	-76	-10

[C]

8. The graph shows the change in temperature with time when ice at -20 °C is heated to 120 °C

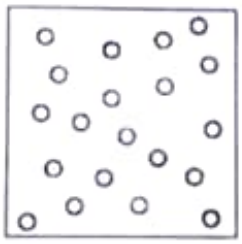


Which entry in the table shows the correct change taking place between the points?

	points	change
A	P to Q	average energy of particles remains constant
B	Q to R	ice melting
C	R to S	the volume of steam is increasing
D	T to U	water boiling

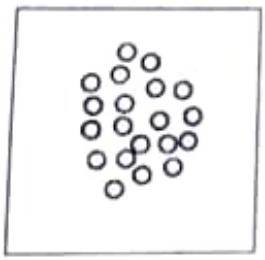
[B]

9. Helium has a melting point of -272 °C and a boiling point of -269 °C, and is much lighter than air. The following diagram represents helium particles in a sealed container at 0 °C.

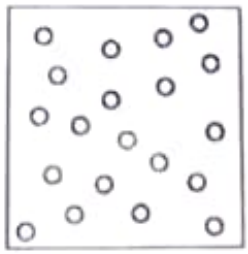


Which of the following shows helium particles after the temperature is lowered to -100 °C?

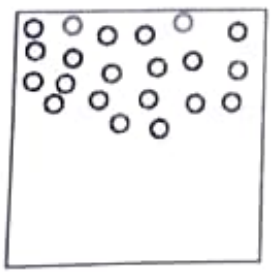
A



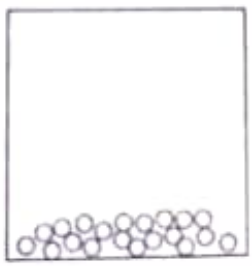
B



C



D

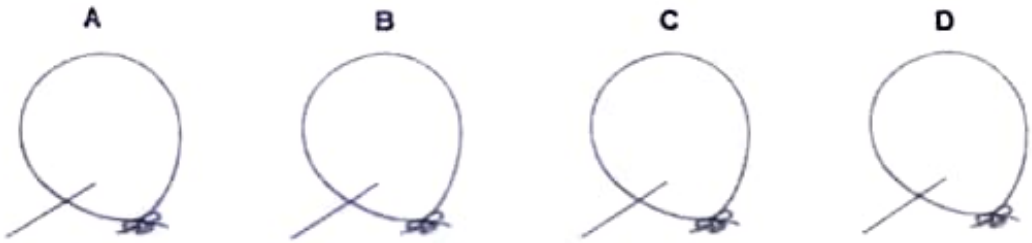


[B]

10. An inflated balloon goes down because gas molecules can diffuse through the rubber.

Four balloons are filled with different gases at the same temperature and pressure.

Which balloon would go down most quickly? [Taken from 99/Nov/Q2]

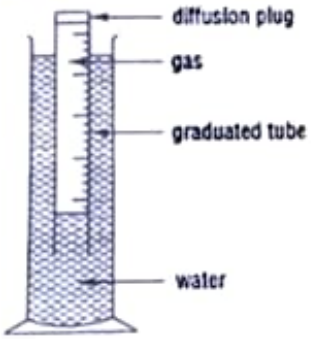


carbon dioxide, CO_2 methane, CH_4 nitrogen, N_2 oxygen, O_2

[B]

(B) Structured Questions [20 marks]

1. The diagram below shows an apparatus for measuring the rates of diffusion of gases.



The time taken for 100 cm^3 of some gases at r.t.p. to diffuse from this apparatus are:

Molecular Mass	Gas	Time/ s
28	CO, carbon monoxide	132
71	Cl_2, chlorine gas	211
16	CH_4, methane	100
28	N_2, nitrogen	?
32	O_2, oxygen	141

(a) (i) Which gas diffuses fastest? **[1]**

Methane

(ii) Why does this gas diffuse fastest? **[1]**

It has the lowest relative molecular mass.

(iii) Suggest the time that nitrogen would take to diffuse. **[1]**

(iv) Name a gas which will diffuse faster than any of the gases shown in the table. [1]

Hydrogen gas

(b) Why is this apparatus unsuitable for finding the rate of diffusion of ammonia? [1]

2. The melting and boiling points of six substances, **A - F**, are given in the table.

Substance	Melting point / °C	Boiling point / °C	physical state at 25°C
A	44	76	solid
B	-30	69	
C	-101	-35	gas
D	12	53	liquid
E	-11	12	
F	98	890	solid

(a) Complete the table. [2]

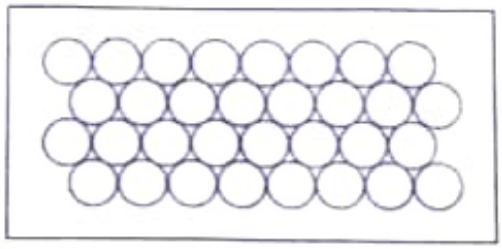
(b) Write the letter of a substance whose particles have the most movement at 10°C. [1]

(c) What change happens to the **arrangement** and **movement** of the particles of substance **B** when it is cooled from 80°C to 20°C? [2]

(d) Using the axes given, draw a graph to show how temperature changes as substance **C** is heated from -102°C to 10°C.

[2]

3. A substance melts at 650°C and boils at 1117°C. The figure below shows the arrangement of the particles in the substance at 20°C.



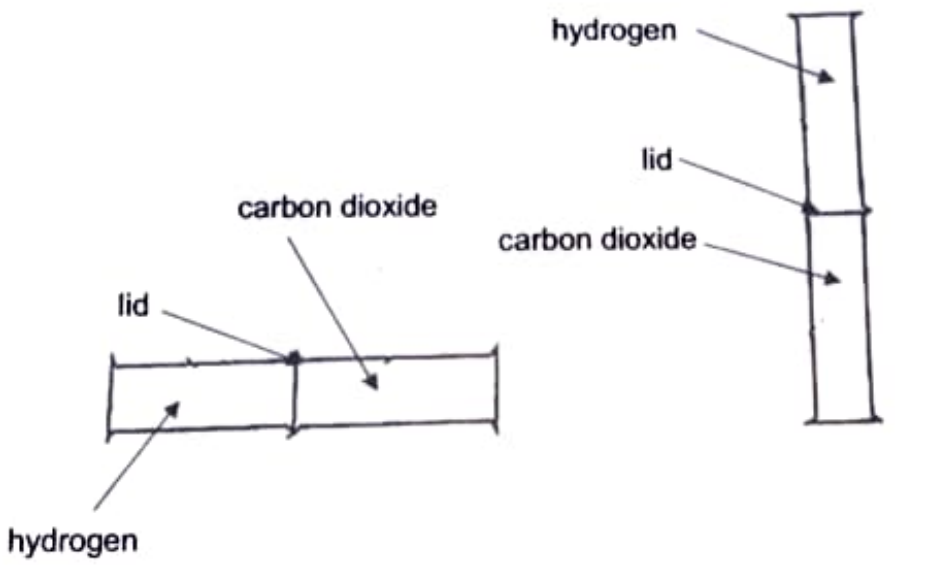
(a) Draw diagrams to represent the arrangement of the particles at 700°C and 1300°C. **[2]**

700°C

1300°C

(b) Describe the arrangements of the particles at these two temperatures. **[2]**

4. The diagram shows the start of an experiment using gas jars of hydrogen and carbon dioxide.



experiment 1

experiment 2

The lids are removed so that the gases are allowed to mix. How will the contents of the jars change?

Your answer should refer to:

- how the amounts of carbon dioxide and hydrogen change in the gas jars;
- the speed of movement of the gases in each experiment;
- the reasons for each change. **[4]**

- The End-