

## STATE OF MATTER

1. The value of compressibility factor for one mole of a gas Under critical states is :

- 1) 3/8      2) 2/3      3) 8/27      4) 27/8

2. VanderWaal's equation for one mole of CO<sub>2</sub> gas at low pressure will be :

- 1)  $\left(P + \frac{a}{V^2}\right)V = RT$       2)  $P = \frac{RT}{V-b}$       3)  $p v = RT$       4)  $P(V-b) = RT - \frac{a}{V^2}$

3. Gas	O <sub>2</sub>	N <sub>2</sub>	NH <sub>3</sub>	CH <sub>4</sub>
a (. in L <sup>2</sup> atm mol <sup>-2</sup> )	1.360	1.390	4.170	2.253

From the above data, the gas that can be most easily liquefied is

- 1) O<sub>2</sub>      2) N<sub>2</sub>      3) NH<sub>3</sub>      4) CH<sub>4</sub>

4. Which of the following are correct statements ?

- 1) Vander Waal's constant a is a measure of attractive force
- 2) Vander Waal's constant b is also called co-volume or excluded volume
- 3) b has units L mol<sup>-1</sup>
- 4) all of the above

5. Compressibility factor for H<sub>2</sub> behaving as real gas is

- 1) 1      2)  $\left(1 - \frac{a}{RTV}\right)$       3)  $1 + Pb/RT$       4)  $RT/1-a$

6. If  $\bar{V}$  is the observed molar volume of real gas and  $\bar{V}_{id}$  is the molar volume of an ideal gas then Z is

- 1)  $\frac{\bar{V}\bar{V}_{id}}{\bar{V}_{id}}$       2)  $\frac{\bar{V}}{\bar{V}_{id}}$       3)  $\frac{\bar{V}_{id}}{\bar{V}}$       4)  $\frac{\bar{V}^2}{\bar{V}_{id}}$

7. Volume of a molecule is related to Vander Waal's constant 'b' and 'Avagadro Number No' by equation :

- 1)  $V = \frac{b}{N_0}$       2)  $V = 4bN_0$       3)  $V = \frac{4b}{N_0}$       4)  $V = \frac{b}{4N_0}$

8. Consider following statements :

(A) : The gas whose critical temperature is above room temperature can be liquified by applying sufficient pressure to the gas.

(B) : The gas whose critical temperature is below room temperature can be liquified by the temperature below  $T_c$ .

Select correct statement

- 1) A      2) B      3) both      4) none

9. The deviation from the ideal gas behaviour of a gas can be expressed as

2)  $Z = \frac{PV}{nRT}$       3)  $Z = \frac{nRT}{PV}$       4)  $Z = \frac{VR}{PT}$

1)  $Z = \frac{P}{VRT}$

10. In Vander Waal's equation of state of the gas law, the constant 'b' is a measure of

- 1) Intermolecular repulsions      2) Intermolecular collisions per unit volume  
3) Volume occupied by the molecules      4) Intermolecular attraction

11. Assertion (A) : Compressibility factor for hydrogen varies with pressure with positive slope at all pressures

Reason (R) : Even at low pressures, repulsive forces dominate in hydrogen gas

- 1) A & R are true, R explains A      2) A & R are true, R does not explain A  
3) A is true R is false      4) A is false R is true

12. The critical temperature of a substance is defined as :

- 1) The temperature above which the gas decomposes  
2) The temperature above which a substance can exist only as a gas  
3) melting point of the substance  
4) boiling point of the substance

13. When a compressed gas is allowed to expand through a porous plug at temperature above its inversion temperature, there is

- 1) a fall in temperature  
2) a rise in temperature  
3) neither a fall nor a rise in temperature  
4) a fall in temperature first, followed by a rise in temperature.

**14. The Joule Thomson coefficient is zero at**

- 1) Inversion temperature
- 2) Critical temperature
- 3) Absolute temperature
- 4) Below  $0^{\circ}\text{C}$

**15.  $\text{NH}_3$  can be liquefied at ordinary temperature without the application of pressure. But  $\text{O}_2$  cannot, because**

- 1) its critical temp. is very high
- 2) its critical temp. is low
- 3) its critical temp. is moderate
- 4) its critical temperature is higher than that of ammonia.

**16. The gas which can be liquified under high pressure at  $4^{\circ}\text{C}$  is**

- 1) nitrogen
- 2) hydrogen
- 3) oxygen
- 4) ammonia

**17A gas can be liquefied by**

- 1) Cooling
- 2) Compressing
- 3) Both
- 4) None

**18. The gas causes heating effect during Joule Thomson effect at ordinary temperature is**

- 1)  $\text{O}_2$
- 2)  $\text{CO}_2$
- 3)  $\text{H}_2$
- 4)  $\text{SO}_2$

**19. The cooling caused by the expansion of a compressed gas below its inversion temperature without doing external work is called**

- 1) Joule Thomson effect
- 2) Inversion effect
- 3) Boyal effect
- 4) All of these

**20. When an ideal gas undergoes unrestricted expansion**

- 1) cooling occurs as the molecules are at above inversion temp.
- 2) no cooling occurs as no attractive interactions exist among molecules
- 3) cooling occurs as molecules collide with each other
- 4) cooling does not occur as their workdone is equal to loss in kinetic energy.

**21. A gas X causes heating effect when allowed to expand. This is because**

- 1) X is an Inert gas
- 2) X has very low inversion temperature
- 3) X is ideal gas
- 4) X has very low boiling point

**22. A gas can be liquefied by pressure alone when its temperature is**

- 1) Higher than its critical temperature
- 2) Lower than its critical temperature
- 3) Equal to its critical temperature
- 4) None

**23. Most favourable conditions to liquefy a gas are**

- 1) Low T and high P    2) High T and low P    3) Low T and low p    4) High T and high p

**24. The behaviour of temporary gases like CO<sub>2</sub> approaches that of permanent gases like N<sub>2</sub>, O<sub>2</sub> etc at**

- 1) Below critical temperature  
2) Above critical temperature  
3) Above absolute zero temperature  
4) Below absolute zero temperature

**25. The relationship between P<sub>c</sub>, V<sub>c</sub> and T<sub>c</sub> is**

- 1) P<sub>c</sub>V<sub>c</sub> = RT                      2) P<sub>c</sub>V<sub>c</sub> = 3RT<sub>c</sub>    3) 3 P<sub>c</sub>V<sub>c</sub> = 8RT<sub>c</sub>    4) 8 P<sub>c</sub>V<sub>c</sub> = 3RT<sub>c</sub>

**26) The compressibility factor for H<sub>2</sub> and He is usually:**

- 1) >1    2) =1    3) < 1    4) either of these

**27) A real gas most closely approaches the behaviour of an ideal gas at:**

- 1) 15 atmosphere and 200 K    2) 1 atmosphere and 273 K  
3) 0.5 atmosphere and 500 K    4) 15 atmosphere and 500 K

**28) In the van der Waals' equation, the constant "a" and "b" with temperature shows which trend**

- 1) Both remains same                      2) 'a' remains same, b varies  
3) 'a' varies, b remains same              4) both varies

**29) The pressure of real gas is less than the pressure of an ideal gas because of:**

- 1) increase in the number of collision              2) finite size of the molecules  
3) increase in the kinetic energy                      4) intermolecular forces

**30) Which forces of attraction are responsible for liquefaction of H<sub>2</sub>**

- 1) Coulombic forces                              2) dipole forces and van der waals' forces  
3) Hydrogen bonding                              4) none of these

**KEY**

1) 1    2) 1    3) 3    4) 4    5) 3    6) 2    7) 4    8) 3    9) 2    10) 3

11) 1    12) 2    13) 2    14) 1    15) 2    16) 4    17) 3    18) 3    19) 1    20) 2

21) 2   22) 2   23) 1   24) 2   25) 4   26) 1   27) 3   28) 4   29) 4   30) 2

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