

# CHEMISTRY

## BOOKS - DISHA CHEMISTRY (HINGLISH)

### STATES OF MATTER

#### Mcqs

1. A compound exists in the gaseous state both as monomer A and dimer  $A_2$ . The M wt of

monomer is 48. In an experiment 96 g of the compound was confined in a vessel of 33.6 L and heated to  $273^{\circ}\text{C}$ . Calculate the pressure developed, if the compound exists as a dimer to the extent of 50% by weight under the conditions

A. 0.9 atm

B. 4.0 atm

C. 2.0 atm

D. 1.0 atm

**Answer: C**



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2. The molecular velocities of two gases at the same temperature are  $u_1$  and  $u_2$  and their masses are  $m_1$  and  $m_2$  respectively. Which of the following expressions are correct?

A.  $\frac{m_1}{u_1^2} = \frac{m_2}{u_2^2}$

B.  $m_1 u_1 = m_2 u_2$

C.  $\frac{m_1}{u_1} = \frac{m_2}{u_2}$

D.  $m_1 u_1^2 = m_2 u_2^2$

**Answer: D**



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3. A container contains certain gas of mass 'm' at high pressure. Some of the gas has been allowed to escape from the container and after some time the pressure of the gas becomes half and its absolute temperature  $\frac{2}{3}$ rd. The amount of the gas escaped is

A.  $\frac{2}{3}m$

B.  $\frac{1}{2}m$

C.  $\frac{1}{4}m$

D.  $\frac{1}{6}m$

**Answer: C**



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4. Let the most probable velocity of hydrogen molecules at a temperature of  $t^{\circ}C$  be  $V_0$ .

When the temperature is raised to

$(2t + 273)^{\circ}C$  the new rms velocity is

(suppose all the molecules dissociate into atoms at latter temperature

A.  $2\sqrt{3}V_0$

B.  $\sqrt{6}V_0$

C.  $\sqrt{3\left(2 + \frac{273}{t}\right)}V_0$

D.  $\sqrt{\frac{2}{3}}V_0$

**Answer: B**



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5. By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is

A. doubled?

B. 2

C. 2.8

D. 4

**Answer: D**



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6. The correct value of the gas constant 'R' is close to:

A. 0.082 litre-atmosphere K

B. 0.082 litre-atmosphere  $eK^{-1}mol^{-1}$

C. 0.082 litre<sup>-1</sup>atmosphere<sup>-1</sup> $Kmol^{-1}$

D. 0.082litre<sup>-1</sup>atmosphere<sup>-1</sup> $Kmol^{-1}$

**Answer: B**



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7. If  $10^4 \text{ dm}^3$  of water is introduced into a  $1.0 \text{ dm}^3$  flask at 300 K, how many moles of water are in the vapour phase when equilibrium is established? (Given: Vapour pressure of  $H_2O$  at 300 K is 3170 Pa,  $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ )

- A.  $5.56 \times 10^{-3} \text{ mol}$
- B.  $1.53 \times 10^{-2}$
- C.  $4.46 \times 10^{-2} \text{ mole}$
- D.  $1.27 \times 10^{-3} \text{ mole}$

**Answer: D**





8. A vessel is filled with a mixture of  $O_2$  and  $N_2$ . At what ratio of partial pressures will be the mass of gases be identical

A.  $P_{(O_2)} = 8.75P_{(N_2)}$

B.  $P_{(O_2)} = 0.78P_{(N_2)}$

C.  $P_{(O_2)} = 0.875P_{(N_2)}$

D.  $P_{(O_2)} = 11.4P_{(N_2)}$

**Answer: C**

9. Helium has the van der waals constant  $b=24$  mL.  $mol^{-1}$  the molecular diameter of helium will be

A. 267 pm

B. 133.5 pm

C. 26.7 pm

D. Data not sufficient for calculation the diameter

**Answer: A**



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**10.** A bubble of the gas released at the bottom of a lake increases to eight times the original volume when it reaches at the surface. Assuming that the atmospheric pressure is equivalent to pressure exerted by a column of water 10 m high, what is the depth of the lake

A. 80 m

B. 90 m

C. 10 m

D. 70 m

**Answer: D**



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**11.** Air at sea level is dense. This is a practical application of

A. Boyle's law

B. Charle's law

C. kelvin's law

D. Brown's law

**Answer: A**



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**12.** Which of the following represents Gay lussac's law?

I.  $\frac{P}{T} = \text{constant}$

II  $P_1T_2 = P_2T_1$

$$\text{III. } P_1 V_1 = P_2 V_2$$

Choose the correct option.

A. I, II and III

B. II and III

C. I and III

D. I and II

**Answer: D**



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13. A bubble of air is underwater at temperature  $15^{\circ}C$  and the pressure 1.5 bar. If the bubble rises to the surface where the temperature is  $25^{\circ}C$  and the pressure is 1.0 bar, what will happen to the volume of the bubble?

A. Volume will become greater by a factor of 1.6

B. Volume will become will become greater by a factor 1.1



C. volume will become smaller by a factor of 0.70

D. volume will become greater by a factor of 2.5.

**Answer: A**



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**14.** When  $r$ ,  $P$  and  $M$  represent rate of diffusion, pressure and molecular mass, respectively,

then the ratio of the rates of diffusion ( $r_A / r_B$ ) of two gases A and B, is given as:

A.  $(P_A / P_B)(M_B / M_A)^{1/2}$

B.  $(P_A / P_B)^{1/2}(M_B / M_A)$

C.  $(P_A / P_B)(M_A / M_B)^{1/2}$

D.  $(P_A / P_B)^{1/2}(M_A / M_B)$

**Answer: A**



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15. Longest mean free path stands for:

A.  $H_2$

B.  $N_2$

C.  $O_2$

D.  $Cl_2$

**Answer: A**



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**16.** The root mean square velocity of an ideal gas at constant pressure varies with density (d) as

A.  $d^2$

B.  $d$

C.  $\sqrt{d}$

D.  $1 / \sqrt{d}$

**Answer: D**



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17. The correct order of viscosity of the following liquids will be

A. Water < Methyl alcohol < dimethyl ether < glycerol

B. methyl ether < methyl alcohol < water < glycerol

C. glycerol < dimethyl ether < water < methyl alcohol

D.

**Answer: C**



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**18.** The molecular velocity of any gas is

A. inversely proportional to absolute temperature

B. directly proportional to square of temperature

C. directly proportional to square root of temperature

D. directly proportional to square root of temperature

**Answer: C**



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**19.** Which of the following volume (V)-temperature (T) plots represents the

behaviour of one mole of an ideal gas at one atmospheric pressure?

A. 

B. 

C. 

D. 

**Answer: C**



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20. The rms velocity of hydrogen is  $\sqrt{7}$  times the rms velocity of nitrogen. If  $T$  is the temperature of the gas, then

A.  $T(H_2) = T(N_2)$

B.  $T(H_2) > T(N_2)$

C.  $T(H_2) < T(N_2)$

D.  $T(H_2) = \sqrt{7}T(N_2)$

**Answer: C**



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21. If  $Z$  is a compressibility factor, van der waals equation at low pressure can be written as

A.  $Z = 1 + \frac{RT}{Pb}$

B.  $Z = 1 - \frac{a}{VRT}$

C.  $Z = - \frac{Rb}{RT}$

D.  $Z = 1 + \frac{Pb}{RT}$

**Answer: B**



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22. Refer to the figure given:

Which of the following statements is wrong?



A. For gas A,  $a=0$  and  $Z$  will linearly depend on pressure

B. For gas B,  $b=0$  and  $Z$  will linearly depend on pressure

C. Gas C is a real gas and we can find 'a' and 'b' if intersection data is given

D. all van der waals gases will behave like gas C and give positive slope at high pressure

**Answer: B**



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**23.** Equal masses of  $H_2O_2$  and methane have been taken in a container of volume  $V$  at temperature  $27^\circ C$  in identical conditions. The

ratio of the volumes of gases  $H_2$  :  $O_2$  methane  
would be:

A. 8 : 16 : 1

B. 16 : 8 : 1

C. 16 : 1 : 2

D. 8 : 1 : 2

**Answer: C**



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24. Which one of the following statement is NOT true about the effect of an increase in temperature on the distribution of molecular speed in a gas?

- A. The area under the distribution curve remains the same as under the lower temperature
- B. The distribution becomes broader
- C. The fraction of the molecules with the most probable speed increases

D. The most probable speed increases

**Answer: C**



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**25.** As the temperature is raised from  $20^{\circ}C$  to  $40^{\circ}C$ , the average kinetic energy of neon atoms changes by a factor of which of the following?

A. 313/293

B.  $\sqrt{(313 / 293)}$

C.  $1 / 2$

D. 2

**Answer: A**



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**26.** The ratio between the root mean square speed of  $H_2$  at 50 K and that of  $O_2$  at 800 K is,

A. 4



B. 2

C. 1

D. 43834

**Answer: C**



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27. Positive deviation from ideal behaviour takes place because of

A. molecular interaction between atoms  
and  $PV/nRT > 1$

B. Molecular interaction between atoms  
and  $PV/nRT < 1$

C. Finite size of atoms and  $PV/nRT > 1$

D. Finite size of atoms and  $PV/nRT < 1$

**Answer: C**



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28. Equal masses of methane and oxygen are mixed in an empty container at  $25^{\circ}C$ . The fraction of the total pressure exerted by oxygen is

A.  $\frac{1}{3}$

B.  $\frac{1}{4}$

C.  $\frac{1}{3} \times \frac{273}{298}$

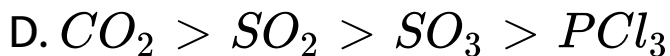
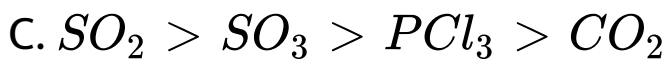
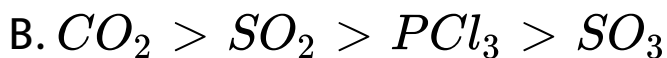
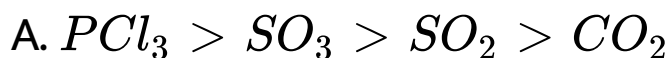
D.  $\frac{1}{4}$

**Answer: D**



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29. The rate of diffusion of  $SO_2$ ,  $CO_2$ ,  $PCl_3$  and  $SO_3$  are in the following order



**Answer: D**



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30. The van der waal's equation for  $n=1$  mole may be expressed as

$$V^3 - \left(b + \frac{RT}{P}\right)V^2 + \frac{aV}{P} - \frac{ab}{P} = 0$$

Where  $V$  is the molar volume of the gas, which of the following is correct?

A. For a temperature less than  $T_c$ ,  $V$  has three real roots

B. For a temperature more than  $T_c$ ,  $V$  has one real and two imaginary roots

C. For a temperature equal to  $T_c$  all three roots of V are real and identical

D. All of these

**Answer: D**

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**31.** By how many folds the temperaure of a gas would increase when the root mean square velocity of the gas molecules in a container of

fixed volume is increased from  $5 \times 10^4 \text{ cm} / \text{s}$   
to  $10 \times 10^4 \text{ cm} / \text{s}$ ?

A. Two

B. three

C. Six

D. four

**Answer: D**



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32. The density of neon will be highest at

A. S.T.P.

B.  $0^{\circ} C$ , 2 atm

C.  $273^{\circ} C$ , 1 atm

D.  $273^{\circ} C$ , 2 atm

**Answer: B**



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33. Above Boyle point, real gases show (X)\_\_\_\_\_from ideality and Z values are (Y)\_\_\_\_\_tha one

A. X=negative deviation, Y=Less

B. X=Negative deviation, Y=greater

C. X=Positive deviation, Y=Less

D. X=Positive deviation, Y=greater

**Answer: D**



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- 34.** Induced dipole moment depend upon the
- I. dipole moment present in the permanent dipole
  - II. Polarisability of the electrically neutral molecules.

Identify the correct option.

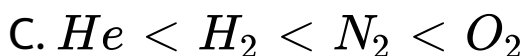
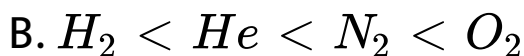
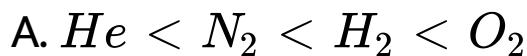
- A. I is correct but II is wrong
- B. I is wrong and II is correct
- C. Both I and II are wrong
- D. Both I and II are correct

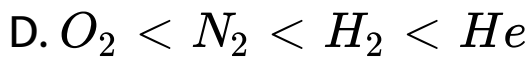
**Answer: D**



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**35.** Following table represents critical temperature of some gases. Arrange these gases in their increasing order of liquification.



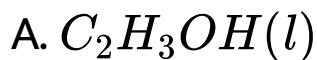


**Answer: C**



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**36.** Which of the following liquid will exhibit highest vapour pressure?



D.  $H_2O(l)$

**Answer: B**



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**37.** Generally, liquid drops assume spherical shape because

- A. a sphere has maximum surface area
- B. a sphere has minimum surface area
- C. sphere is symmetrical in shape

D. none of these

**Answer: B**



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**38.** Internal energy and pressure of a gas per unit volume are related as

A.  $P = \frac{2}{3}E$

B.  $P = \frac{3}{2}E$

C.  $P = \frac{1}{2}E$

D.  $P=2E$

**Answer: A**



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**39.** Two vessels containing gases A and B are interconnected as shown in the figure. The stopper is opened, the gases are allowed to mix homogeneously. The partial pressures of A and B in the mixture will be, respectively.



A. 8 and 5 atm

B. 9.6 and 4 atm

C. 4.8 and 2 atm

D. 4 and 4 atm

**Answer: C**



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40. Match the following graphs of ideal gas (column-I) with their co-ordinates (column-II)



A. A-III,B-I,C-II

B. A-III:B-II,C-I

C. A-II,B-III,C-I

D. A-I,B-III,C-II

**Answer: C**



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41. Which of the following statement(s) is/are true for London force

(i) These forcea are always attractive

(ii) these forces are important for long distance too.

(iii) the ir magnitude depends on the polarisability of the particle.

A. (i) and (ii)

B. (i) only

C. (iii) only

D. (i) and (iii)

**Answer: D**



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**42.** Kinetic theory of gases presuems that the collisions between the molecules to the perfectly elastic because

- A. the gas molecules are tiny particles and not rigid in nature
- B. the temperature remains constant irrespective of collision
- C. collision will not split the molecules
- D. the molecules are larger particle and rigid in nature

**Answer: A**



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**43.** Which of the following statement is correct?

(i) Real gases show deviations from ideal gas law because molecules interact with each other.

(ii) Due to interaction of molecules the pressure exerted by the gas is given as:

$$p_{real} = p_{ideal} + \frac{an^2}{V^2}$$

(iii) Value of 'a' is measure of magnitude of intermolecular attractive forces within the gas and depends on temperature and pressure of gas.

(iv) At high pressure volume occupied instead of moving in volume  $V$ , these are not restricted to volume  $(V-nb)$

- A. (i) and (iv)
- B. (i), (ii) and (iii)
- C. (i), (iii) and (iv)
- D. (i) and (iii)

**Answer: A**



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44. The units of constant in van der waals' equation is

A.  $dm^6 \text{ atm mol}^{-2}$

B.  $dm^3 \text{ atm mol}^{-1}$

C.  $dm \text{ atm mol}^{-1}$

D.  $\text{atm mol}^{-1}$

**Answer: A**



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