



PHYSICS GURUKUL

DPP - Daily Practice Problems

Chapter-wise Sheets

Date : Start Time : End Time :

CHEMISTRY

CC05

SYLLABUS : States of Matter

Max. Marks : 74

Time : 60 min.

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 20 Questions divided into 5 sections.
Section I has 6 MCQs with ONLY 1 Correct Option, 3 marks for each correct answer and -1 for each incorrect answer.
Section II has 4 MCQs with ONE or MORE THAN ONE Correct options.
For each question, marks will be awarded in one of the following categories:
Full marks: +4 If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
Partial marks: +1 For darkening a bubble corresponding to each correct option provided NO INCORRECT option is darkened.
Zero marks: If none of the bubbles is darkened.
Negative marks: -2 In all other cases.
Section III has 4 Single Digit Integer Answer Type Questions, 3 marks for each Correct Answer and 0 marks in all other cases.
Section IV has Comprehension/Matching Cum-Comprehension Type Questions having 5 MCQs with ONLY ONE correct option, 3 marks for each Correct Answer and 0 marks in all other cases.
Section V has 2 Matching Type Questions, 2 mark for the correct matching of each row and 0 marks in all other cases.
- You have to evaluate your Response Grids yourself with the help of Solutions.

Section I - Straight Objective Type

This section contains 6 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct.

1. If P_c , V_c and T_c are critical constants, then the value of R will be

(a) $R = \frac{P_c V_c}{T_c}$ (b) $R = \frac{5}{3} \cdot \frac{P_c V_c}{T_c}$
(c) $R = \frac{3}{2} \cdot \frac{P_c V_c}{T_c}$ (d) $R = \frac{8}{3} \cdot \frac{P_c V_c}{T_c}$

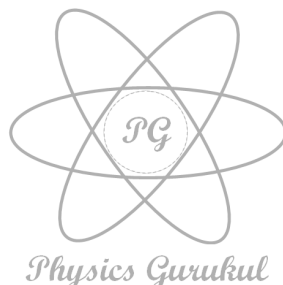
2. 14 g of N_2 and 36 g of ozone are at the same pressure and temperature. Their volumes will be related as

(a) $2V_{N_2} = 3V_{O_3}$
(b) $3V_{N_2} = 2V_{O_3}$
(c) $3V_{N_2} = 4V_{O_3}$
(d) $4V_{N_2} = 3V_{O_3}$

RESPONSE GRID

1. (a)(b)(c)(d) 2. (a)(b)(c)(d)

Space for Rough Work



C-18

DPP/ CC05

3. A perfect gas is found to obey the relation $PV^{3/2} = \text{constant}$. If the gas is compressed to half of its volume at temperature T adiabatically, the final temperature of the gas will be
 (a) $2T\sqrt{2}$ (b) $4T$ (c) $T\sqrt{2}$ (d) $2T$
4. When $\text{CO}_2(\text{g})$ is passed over red hot coke it partially gets reduced to $\text{CO}(\text{g})$. Upon passing 0.5 L of $\text{CO}_2(\text{g})$ over red hot coke, the total volume of the gases increased to 700 mL. The composition of the gaseous mixture at STP is
 (a) $\text{CO}_2 = 300 \text{ mL}; \text{CO} = 400 \text{ mL}$
 (b) $\text{CO}_2 = 0.0 \text{ mL}; \text{CO} = 700 \text{ mL}$
 (c) $\text{CO}_2 = 200 \text{ mL}; \text{CO} = 500 \text{ mL}$
 (d) $\text{CO}_2 = 350 \text{ mL}; \text{CO} = 350 \text{ mL}$
5. The ratio between most probable velocity, mean velocity and r.m.s velocity is :
 (a) $\sqrt{2} : \sqrt{8/\pi} : \sqrt{3}$ (b) $\sqrt{2} : \sqrt{3} : \sqrt{8/\pi}$
 (c) $1 : 2 : 3$ (d) $1 : \sqrt{2} : \sqrt{3}$
6. Virial equation of state can be written as follows to express the compressibility factor (Z).

$$Z = 1 + \frac{B}{V} + \frac{C}{V^2} + \frac{D}{V^3} + \dots$$
 The correct relationship for van der Waal's constant 'b' is
 (a) $B = b$ (b) $B = b - \frac{a}{RT}$
 (c) $b = D^3$ (d) $b = C^2$
7. Pressure at this temperature is 3.3103 atm.
 (d) 2.1029 L of air should be let out at 1 atm to restore the tyre to 3 atm at 47°C .
8. The van der Waal's constants for HCl are 371.843 KPa and $b = 40.8 \text{ cm}^3\text{mol}^{-1}$. Choose the correct options—
 (a) The critical pressure is 8.273 MPa
 (b) The critical temperature is 224.8 K
 (c) The critical volume is 122.4 cm^3
 (d) The critical temperature is 324.8 K
9. A gas described by van der Waal's equation –
 (a) behave similar to an ideal gas in the limit of large molar volumes
 (b) behaves similar to an ideal gas is in limit of large pressures
 (c) is characterised by van der Waal's coefficients that are dependent on the identity of the gas but are independent of the temperature.
 (d) has the pressure that is lower than the pressure exerted by the same gas behaving ideally
10. Select the correct statements of the following :
 (a) Ideal gas can be liquefied by cooling it to a very low temperature and applying a very high pressure
 (b) Helium can be liquefied by cooling it to a characteristic temperature and compressing
 (c) At ordinary temperatures compressed helium gas get heated up when passed through an orifice into vacuum under adiabatic conditions
 (d) At ordinary temperatures hydrogen is less compressible than an ideal gas

Section II - Multiple Correct Answer Type

This section contains 4 multiple correct answer(s) type questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONE OR MORE** is/are correct.

7. A car tyre has a volume of 10 litre when inflated. The tyre is inflated to a pressure of 3 atm at 17°C with air. Due to driving the temperature of tyre increases to 47°C . Choose the correct options –
 (a) Pressure at this temperature is 2.3103 atm.
 (b) 3.1029 L of air should be let out at 1 atm to restore the tyre to 3 atm at 47°C .

Section III - Integer Type

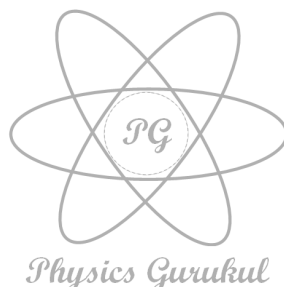
This section contains 4 questions. The answer to each of the questions is a single digit integer ranging from 0 to 9.

11. A 10 L box contains 41.4 g of a mixture of gases C_xH_8 and C_xH_{12} . The total pressure at 44°C in flask is 1.56 atm. Analysis revealed that the gas mixture has 87% total C and 13% total H. Find out the value of x .
12. A gas diffuse 1/5 times as fast as hydrogen. If its molecular weight is $10y$. What will be the value of y ?

RESPONSE
GRID

3. (a)(b)(c)(d) 4. (a)(b)(c)(d) 5. (a)(b)(c)(d) 6. (a)(b)(c)(d) 7. (a)(b)(c)(d)
 8. (a)(b)(c)(d) 9. (a)(b)(c)(d) 10. (a)(b)(c)(d) 11. (0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
 12. (0)(1)(2)(3)(4)(5)(6)(7)(8)(9)

Space for Rough Work



13. The rate of diffusion of methane at a given temperature is twice that of a gas X . If the molecular weight of X is 8 y then what will be the value of y?
14. At 400 K, the root mean square (rms) speed of a gas X (molecular weight = 40) is equal to the most probable speed of gas Y at 60 K. The molecular weight of the gas Y is
15. According to Figure-2 what is the critical temperature and pressure of CO_2 ?
- (a) -42°C and 10 atm (b) -38°C and 80 atm
(c) 31.1°C and 75.3 atm (d) 31.1°C and 1 atm
16. According to Fig.-1, which of the following is correct when CO_2 is compressed at a temperature corresponding to the isotherm ABCD?

Section IV - Comprehension Type

Directions (Qs. 15-18) : Based upon the given paragraphs, 4 multiple choice questions have to be answered. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct.

PARAGRAPH-1

In the Figure-1 below, isotherms of CO_2 at several temperatures near the critical point are shown. At the critical point (critical state), the distinction between the liquid and gaseous states disappears and the density of the gaseous substance is equal to that in the liquid state. For every gas this occurs at specific values of temperature and pressure, called critical temperature and critical pressure respectively. At temperatures and pressures above the critical point value, a gas is said to be in a supercritical state. The supercritical fluid has the density and ability to dissolve other substances similar to values expected for liquids.

Figure-2 depicts the phase diagram of CO_2 . Various curves in the diagram show the equilibrium between two phases and the areas represent different phases. The point, called triple point, describing the equilibrium between three phases has specific values of temperature and pressure.

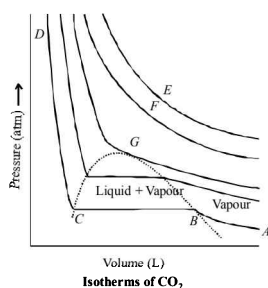


Figure 1

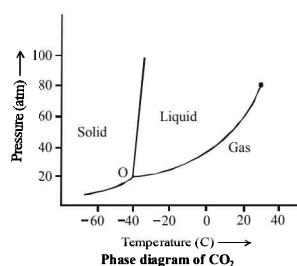


Figure 2

- (a) Liquefaction of CO_2 is complete at the point B
(b) Liquefaction of CO_2 is complete at the point C
(c) Volume of CO_2 system remains constant along BC
(d) Proportions of liquid and gaseous CO_2 do not change along BC .

PARAGRAPH-2

The ideal gas equation, $PV = nRT$ is not obeyed by real gases under certain conditions. The deviation from ideal behaviour was attributed to the fact that P_{ideal} is related to P_{real} by the equation

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

In this 'a' is a measure of intermolecular interaction between gaseous molecules that gives rise to non-ideal behaviour.

Again the volume correction was introduced by taking into account the volume occupied by gaseous molecules and the effective volume is $(V - nb)$, where nb represents the volume occupied by n moles of molecules of real gas.

van der Waals equation of real gases is written as

$$\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$$

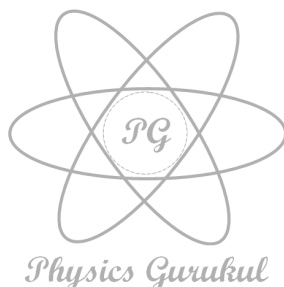
17. The van der Waals equation for real gases will reduce to which one of the following forms under conditions of relatively high pressure?

- (a) $PV = RT - Pb$ (b) $PV = RT + Pb$
(c) $PV = RT - \frac{a}{V^2}$ (d) $PV = RT - \frac{a}{V}$

RESPONSE
GRID

13. (0) (1) (2) (3) (4) (5) (6) (7) (8) (9) 14. (0) (1) (2) (3) (4) (5) (6) (7) (8) (9) 15. (a) (b) (c) (d)
16. (a) (b) (c) (d) 17. (a) (b) (c) (d)

Space for Rough Work



c-20

DPP/ CC05

18. The van der Waals equation for a gas that has non-zero value of force of attraction between molecules but has the molecules to be point masses, will become
- (a) $PV = nRT + nbP$ (b) $P(V - nb) = nRT$
 (c) $PV = nRT$ (d) $PV = nRT - \frac{an^2}{V}$

Section V - Matrix-Match Type

This section contains 2 questions. It contains statements given in two columns, which have to be matched. Statements in column I are labelled as A, B, C and D whereas statements in column II are labelled as p, q, r and s. The answers to these questions have to be appropriately bubbled as illustrated in the following example. If the correct matches are A-p, A-r, B-p, B-s, C-r, C-s and D-q, then the correctly bubbled matrix will look like the following:

	p	q	r	s
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. T_b and T_i are the Boyle's and inversion temperatures respectively for a real gas. Match the following characteristics with appropriate temperatures.

Column I (Gas Characteristics)

Column II (Temperature)

- | | | |
|---------------------------------------------------------------------------------|----|--------------------------|
| (A) Attractive intermolecular forces become dominant over repulsive forces when | p. | $>T_i$ |
| (B) Repulsive forces become dominant | q. | $<T_i$ |
| (C) Gas becomes more or less ideal gas when | r. | Any value of temperature |
| (D) $\mu_{J.T.}$ for ideal gas is zero at $s. = T_b$ | | |
20. The van der waal's constants a and b of a real gas are $3.6 \text{ L}^2 \text{ atm mol}^{-2}$ and 0.05 L mol^{-1} respectively. If 200 g of gas (molecular mass 40) is placed in 10 L vessel at 300 K, then match the following:

Column I

Column II

- | | | |
|----------------------------------------------------|----|------|
| (A) Pressure correction (atm) | p. | 0.25 |
| (B) Free space for the molecules to move about (L) | q. | 0.06 |
| (C) Actual volume occupied by gas molecules (L) | r. | 0.9 |
| (D) Effective volume occupied by gas molecules (L) | s. | 9.75 |

RESPONSE
GRID

18. (a) (b) (c) (d) ; 19. A - ; B - ; C - ; D -
 20. A - ; B - ; C - ; D -

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 5 - CHEMISTRY

Total Questions	20	Total Marks	74
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	26	Qualifying Score	37
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

