CHEMISTRY

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

STATES OF MATTER

Practice Exercise Exercise 1

1. A plot of volume (V) versus temperature (T) for a gas at constant pressure is a straight line

passing through the origin.

The plots at different values of pressure are shown in figure. Which of the following order of pressure is correct foir this gas?

A. $p_1 > p_2 > p_3 > p_4$

B. $p_1 = p_2 = p_3 = p_4$

C. $p_1 < p_2 < p_3 < p_4$

D. $p_1 < p_2 = p_3 < p_4$

Answer: C

2. In order to increase the volume of a gas by

10% , the pressure of the gas should be

A. increase by 1%

B. decreased by 10%

C. increased by 10%

D. decreased by 1%

Answer: B

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

A. 90 m

B. 10 m

C. 70 m

D. 80 m

Answer: C

4. Which is a correct statement of Gay-Lussac's law describing the behaviour of a fixed amount of gas?

    A. As pressure increases, volume increase at constant temperature

    B. As pressure increases, volume decreases at constant temperature

C. As temperature increases, pressure decreases at constant volume

D. As temperature increases, pressure increases at constant volume

Answer: D

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5. Which of the following is the correcrt representation of Gay-Lussac's law?

A.

B.

C.

D.

Answer: D

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6. A gas is at a pressure of 2 atm at $0°$ is filled in a container . At what temperature, pressure of gas will be 4 atm?

A. 514 k

B. 546 k

C. 612 k

D. 653 k

Answer: B

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7. A gas at 300 k is compressed to reduce its

volume to half of its volume. At what

temperature, will it become half of its initial volume?

A. 98 k

B. 100 k

C. 150 k

D. 162 k

Answer: C

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8. By Avogadro's law, V=kn

If volume occupied by 1 mole of a gas at STP is

22.4 L, then what will be the value of k if we

take 0.5 mole of gas under same condition of

temperature and pressure

   A. $22.4L \; \text{mol}^{-1}$

   B. $11.2L \; \text{mol}^{-1}$

   C. $44.8L \; \text{mol}^{-1}$

   D. $5.6L \; \text{mol}^{-1}$

Answer: A

9. Gas equation $PV = nRT$ is obeyed by

A. isothermal process

B. adiabatic process

C. Both (a) and (b)

D. None of these

Answer: C

10. A sample of unknown gas is placed in a 2.5 L bulb at a pressure of 360 Torr and at a temperature of $22.5°C$ and Is found to weight 1.6616 g. What is the molecular weight of the gas?

A. 80 g

B. 64 g

C. 55 g

D. 34 g

Answer: D

11. Under isobaric condition, volume becomes 1.5 times when temperature changes from

A. $40°C$ to $60°C$

B. $273°C$ to $546°C$

C. Both (a) and (b)

D. None of these

Answer: B

12. A 1 L flask contains 32 g O_2 gas at $27°C$. What mass of O_2 must be released to reduce the pressure in the flask to 12.315 atm?

A. 8 g

B. 16 g

C. 24 g

D. 0 g

Answer: B

13. Match the following graphs of ideal gas with their coordinates.Choose the correct option from the codes given below.

A.
A	B	C
2	3	1

B.
A	B	C
3	2	1

C.
A	B	C
1	2	3

D.
$$\begin{array}{ccc} A & B & C \\ 3 & 2 & 1 \end{array}$$

Answer: A

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14. A quantity of gas is collected in a graduated tube over the mercury. The volume of gas at $18°C$ is 50 mL and the level of mercuty in the tube is 100mm above the outside mercuty level. The barometer reads

750 torr. Hence, volume of gas 1 atm and $0°C$ is approximately:

A. 22 ml

B. 40 ml

C. 20 ml

D. 44 ml

Answer: B

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15. The kinetic molecular theory of gases predicts pressure to rise as the temperature of a gas increases. It is because

A. gas molecules collide more frequently with the container walls

B. gas molecules collide less frequently with the container walls

C. gas molecules have less kinetic energy

D. gas molecules collide less energetically with container walls

Answer: A

16. As the temperature increases, average kinetic energy of molecules increases. What would be the effect of increase of temperature on pressure provided the volume is constant ?

A. Increases

B. Decreases

C. Remains same

D. Becomes half

Answer: A

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17. The ratio of root mean square velocity of average velocity of a gas molecule at a particular temperture is

A. $1 : 1.086$

B. $2 : 1.86$

C. $1.086:1$

D. $2.086:1$

Answer: C

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18. A mixture of hydrogen and helium is prepared in such a way that the number of collisions on the wall per unit time by molecules of each gas is same. The gas which has higher concentration is

A. hydrogen

B. helium

C. both have same concentration

D. it cannot be determined

Answer: B

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19. 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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20. The ratio between the root mean square

speed of H_2 at $50K$ and that of O_2 at $800K$ is

A. 4

B. 2

C. 1

D. $1/4$

Answer: C

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21. For a monatomic gas, kinetic energy $= E$.

The relation with rms velocity is

A. $u = \left(\dfrac{2E}{M} \right)^{1/2}$

B. $u = \left(\dfrac{3E}{2M} \right)^{1/2}$

C. $u = \left(\dfrac{E}{2M} \right)^{1/2}$

D. $u = \left(\dfrac{E}{3M} \right)^{1/2}$

Answer: A

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22. Which curve in figure represents the curve of ideal gas?

A. Only B

B. C and D

C. E and F

D. A and B

Answer: A

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23. The wrong statement among the following is

A. a gas shows negative deviation, when long range attractive intermolecular forces are dominating

B. the gas would exert pressure if it was real

C. at $270°C$, the intercept of pV vs p isotherm of ideal gas is equal to 24.6 L

atm mol^{-1}

D. above their respective Boyle's temperature, N_2 shows throughout positive deviation $(Z > 1)$, while 0_2 shows negative deviation $(Z < 1)$ followed by positive deviation $(Z > 1)$

Answer: D

24. Compressibility factor for CO_2 at 400 k and 71.0 bar is 0.8697. Molar volume of CO_2 under these

A. 22.4 L

B. 2.24 L

C. 0.41 L

D. 19.5 L

Answer: C

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25. At a high pressure, van der Waals' equation reduces to

A. $\left(p + \dfrac{an^2}{V^2}\right)V = nRT$

B. $p(V - b) = nRT + pV$

C. $pV = nRT$

D. $p(V - nb) = nRT$

Answer: D

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26. In van der Waals' equation of state of the gas law the constnat 'b' is a measure of .

A. intermolecular repulsions

B. intermolecular attraction

C. volume occupied by the molecules

D. intermolecular collisions per unit volume

Answer: C

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27. The value of van der Waals constant a for the gases O_2, N_2, NH_3, and CH_4 are 1.360, 1.390, 4.170, and 2.253$L^2 atm mol^{-2}$, respectively. The gas which can most easily be liquefied is

A. O_2

B. N_2

C. NH_3

D. CH_4

Answer: C

28. A gas obeys the equation of state $P(V - b) = RT$ (The parameter b is a constnat The slope for an isochore will be .

A. negative

B. zero

C. $\dfrac{R}{(V - b)}$

D. $\dfrac{R}{P}$

Answer: C

29. The term that corrects for the attractive forces present in a real gas in the van der Waal's equation is

A. nb

B. $\dfrac{n^2 a}{V^2}$

C. $-\left(\dfrac{n^2 a}{V^2}\right)$

D. $-nb$

Answer: B

30. Compressibility factor for H_2 behaving as real gas is:

A. 1

B. $\left(1 - \dfrac{a}{RTV}\right)$

C. $\left(1 + \dfrac{pb}{RT}\right)$

D. $\dfrac{RTV}{1 - a}$

Answer: C

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31. A person living in shimla observd that cooking without using pressure cooker takes more time. The reason for this observation is that at high altitude

A. pressure increases

B. temperature decreases

C. pressure decreases

D. temperature increases

Answer: C

32. A liquid boils, when

A. vapour pressure becomes equal to the atmospheric pressure

B. atmospheric pressure is lower than vapour pressure

C. vapour pressure becomes higher

D. temperature becomes very high at constant pressure

Answer: A

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

A. C_2H_5OH

B. NH_3

C. HF

D. H_2O

Answer: B

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34. What is SI unit of viscosity coefficient (η)

?

A. pascal

B. Nsm^{-2}

C. $km^{-2}s$

D. Nm^{-2}

Answer: B

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35. Increase in kinetic energy can overcome intermolecular forces of attraction. How will the viscosity of liquid be affected by the increase in temperature ?

A. Increase

B. No effect

C. Decrease

D. No regular pattern will be followed

Answer: C

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36. Which of the following is correct regarding viscosity?

A. It is internal resistance of a liquid to flow

B. It increases with increase in temperature of the liquid

C. Coefficient of viscosity is not represented by η

D. All of the above

Answer: A

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37. Which of the following is correct statement?

A. Surface tension of a liquid decreases with increase in temperature

B. Vapour pressure of a liquid decreases with increase in temperature

C. Viscosity of a liquid decreases with decrease in temperature

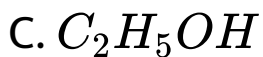D. In gravity free environments, droplets of a liquid on flat surface are slightly flattened
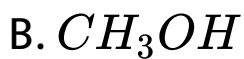
Answer: A

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38. The surface tension of which of the following liquid is maximum?

A. H_2O

B. CH_3OH

C. C_2H_5OH

D. C_6H_6
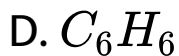
Answer: A

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39. The surface tension of a liquid is affected

by

A. intermolecular forces among the

molecules

B. temperature

C. the addition of active agent

D. All of the above

Answer: D

40. Which of the following property of water can be used to explain the spherical shape of rain droplets ?

A. Viscosity

B. Surface tension

C. Critical phenomena

D. Pressure

Answer: B

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1. A helium atom is two times heavier than a hydrogen molecule. At $298K$, the average kinetic energy of a helium atom is

    A. two times that of hydrogen molecule

    B. same as that of hydrogen molecule

    C. four times that of hydrogen molecule

    D. half that of hydrogen molecule

Answer: B

2. As the temperature is raised from $20°C$ to $40°C$ the averge kinetic energy of neon atoms changes by a factor .

A. $\dfrac{1}{2}$

B. $\sqrt{\dfrac{313}{293}}$

C. $\dfrac{313}{293}$

D. 2

Answer: C

3. The compressibility of a gas is less than unity at STP, therefore,

    A. $V_m > 22.4$ L
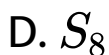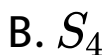
    B. $V_m < 22.4$ L

    C. $V_m = 22.4$ L

    D. $V_m = 44.8$ L

Answer: B

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4. $3.2g$ of S is heated to occupy a volume of $780ml$ at $450°C$ and $723mm$ pressure. Formula of sulphure is

A. S_2

B. S_4

C. S_6

D. S_8

Answer: D

5. If density of a certain gas at $30°C$ and 768 Torr is $1.35 kg/m^3$, then density at STP is

    A. $1.48 kg/m^3$

    B. $1.27 kg/m^3$

    C. $1.35 kg/m^3$

    D. $1.00 kg/m^3$

Answer: A

6. The density of phosphorus vapour at STP is 5.54 gL^{-1}. Hence, molecular formula of phosphorus is

A. P_2

B. P_3

C. P_4

D. P_8
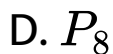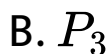
Answer: C

7. The intermolecular interaction that is dependent on the inverse cube of distance between the molecules is

A. ion-ion interaction

B. ion-dipole interaction

C. London force

D. hydrogen bond

Answer: A

8. If Z is a compressibility factor, van der Waals' equation at low pressure can be written as

A. $Z = 1 + \dfrac{RT}{pb}$

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

C. $Z = 1 - \dfrac{pb}{RT}$

D. $Z = 1 + \dfrac{pb}{RT}$

Answer: B

9. The compressibility factor of gases is less than unity at STP. Therefore,

    A. $V_m(molar \ \ volume) > 22.4 \ \ L$

    B. $V_m < 22.4 \ \ L$

    C. $V_m = 22.4 \ \ L$

    D. $V_m = 44.8 \ \ L$

Answer: B

10. For the non-zero volume of the molecules, real gas equation for n mol of the gas will be

A. $\left(p + \dfrac{a}{V^2}\right)V = RT$

B. $pV = nRT + nbp$

C. $p(V - nb) = nRT$

D. `(b) and (c) true

Answer: D

11. A 34.0 L cylinder contains 212 gO_2 gas 27° C.

What mass of $O_2(g)$ must be released to reduce the pressure to 2.463 atm ?

A. 103.2 g

B. 108.8 g

C. 100.0 g

D. 32.0 g

Answer: A

12. At 298 k, which of the following gases has the lowest average molecular speed?

A. CO_2 at 0.20 atm

B. He at 0.40 atm

C. CH_4 at 0.80 atm

D. NO at 1.00 atm

Answer: A

13. Select the correct statements.

A. Gases tend to behave non-ideally at low temperatures and high pressures

B. Gases tend to behave ideally at high temperatures and low pressures

C. The extend to which Z deviates from 1 is a measure of the non-ideality of a gas

D. All of the above statements are correct

Answer: D

14. Which of the following gases follows non-ideal behaviour?

A. N_2 gas having density $1.25g$ L^{-1} at STP

B. 2.8 g CO gas in 0.1 L flask exerting a pressure of 24.63 atm at 300 k

C. 1.6 g CH_4 in 0.5 L flask at 273 K exerting

a pressure of 4 atm

D. 0.1 g H_2 gas at STP occupies volume of

1.12 L

Answer: C

15. To liquefy gaseous substances whose

critical temperatures are below room

temperature requires

A. high pressure and lowering of temperature (below T_c)

B. low pressure and raising of temperature (above T_C)

C. high pressure and raising of temperature (above T_C)

D. low pressure and lowering of temperature (below T_C)

Answer: A

16. NH_3 gas is liquefied more easily than N_2.

Hence

A. van der Waals' constant a and b of

$NH_3 >$ that of N_2

B. van der Waals' constant a and b of

$NH_3 <$ that of N_2

C. $a(NH_3) > a(N_2)$ but b

$(NH_3) < b(N_2)$

D. $a(NH_3) < a(N_2)$ but   b

$(NH_3) > b(N_2)$

Answer: A

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17. A gas at a pressure of 5.0 atm is heated from $0°C$ to $546°C$ and simultaneously compressed to one-third of its original volume. Hence, final pressure is:

A. 15.0 atm

B. 30.0 atm

C. 45.0 atm

D. $\dfrac{5}{9} atm$

Answer: C

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18. At $400K$, 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.

A. 8

B. 12

C. 16

D. 4

Answer: D

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19. Which assumption of kinetic molecular theory is not followed when a real gas shows non-ideal beahaviour?

A. Gas molecules move at random with no attractive forces between them

B. The velocity of gas molecules is dependent on temperature

C. The amount of space occupied by a gas is much greater than the space occupied by the actual gas molecules

D. In collisions with the walls of the container or with other molecules, energy is conserved

Answer: A

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20. A 100 mL flask contained H_2 at 200 Torr, and a 200 mL flask contained He at 100 Torr. The two flask were then connected so that each gas filled their combined volume.

Assuming no change in temperature,total pressure is

A. 300 Torr

B. 66.66 Torr

C. 150 Torr

D. 133.33 Torr

Answer: D

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21. A flask containing $12g$ of a gas relative molecular mass 120 at a pressure of $100atm$ was evacuated by means of a pump until the pressure was $0.01atm$. Which of the following in the best estimate of the number of molecules left in the flask $(N_0 = 6 \times 10^{23}mol^{-1})$?

    A. 6×10^{19}

    B. 6×10^{18}

    C. 6×10^{17}

D. 6×10^{13}

Answer: B

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22. Four gases PQ,R and S have almost same values of 'b' but their 'a' values (a and b are van der Waals'constant) are in the order $Q < R < S < P.$ At   a   particular temperature, among the four gases, the most easily liquefiable one is

A. P

B. Q

C. R

D. S

Answer: A

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23. Equal masses of H_2, O_2 and methane have been taken in a container of volume V at temperature $27°C$ in identical conditions. The

ratio of the volume 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 of the following properties of liquids arises(s) due to the molecular and thermal interaction?

A. vapour pressure

B. Surface tension

C. Viscosity

D. All of these

Answer: D

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25. Pick out the false statement.

A. Vapour pressure of a liquids is the measure of the strength of intermolecular attractive forces

B. Liquid with stronger intermolecular interaction are more viscous than those with weaker intermolecular force

C. Vapour pressure of all liquids is same at their freezing points

D. Both (a) and (b)

Answer: C

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26. Water boils at lower temperature on high altitude because:

    A. the atmospheric pressure is low

    B. the atmospheric pressure is high

    C. the temperature is low

D. the temperature is high

Answer: A

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27. Explain why cooking is faster in a pressure cooker.

A. loss of heat due to radiation is minimum

B. food particles are effectively smashed

C. water boils at higher temperature inside

the pressure cooker

D. food is cooked at constant volume

Answer: C

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28. Viscous force is represented as $F = \eta A \dfrac{dv}{dx}$. Where,$\eta$ is proportionaly constant called as

A. coefficient of viscosity

B. coefficient of velocity

C. surface tension constant

D. None of the above

Answer: A

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29. On the top of a mountain, water boils at

A. high temperature

B. same temperature

C. high pressure

D. low temperature

Answer: D

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30. During the evaporation of liquid

A. the temperature of the liquid will rise

B. the temperature of the liquid will fall

C. may arise or fall depending on the nature

D. the temperature remains unaffected

Answer: B

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