



# CHEMISTRY

## BOOKS - ARIHANT CHEMISTRY (HINGLISH)

### STATES OF MATTER

#### Exercise

1. To which of the following Dalton's law of partial pressure is not applicable ?

A.  $SO_2$  and  $NO_2$  at room temperature

B.  $N_2$  and  $H_2$  at room temperature

C.  $SO_2$  and  $O_2$  at room temperature

D.  $HCl$  and  $NH_3$  at room temperature

**Answer:**



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2. A sample of gas has a volume of 0.2 litre at 1 atm pressure and  $0^\circ C$ . At the same pressure but at  $273^\circ C$  its volume will become

A. 0.1 L

B. 0.4 L

C. 0.8 L

D. 0.6 L

**Answer:**



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**3.** A vessel is filled with a mixture of equal masses of oxygen and nitrogen. What is the

ratio of partial pressure of oxygen and nitrogen ?

A.  $p_{O_2} = 0.5p_{N_2}$

B.  $p_{O_2} = 0.875p_{N_2}$

C.  $p_{O_2} = p_{N_2}$

D.  $p_{O_2} = 1.14p_{N_2}$

**Answer:**



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4. At  $25^{\circ}\text{C}$  and 760 mm of Hg pressure of a gas occupies 600 ml volume. What will be its pressure at a height where temperature is  $10^{\circ}\text{C}$  and volume of the gas is 640 mL ?

A. 676.6 mm Hg

B. 600 mm Hg

C. 700 mm Hg

D. 752 mm Hg

**Answer:**



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5. The pressure of 1 atmosphere is equal to

A. 760 cm

B.  $10^5 Nm^{-2}$

C.  $10^4 \text{ dynecm}^{-2}$

D. 1 bar

**Answer:**



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6. A vessel contains a mixture of different types of gases. Which of the following statements is correct?

A. On the average, the heavier molecules have higher speed

B. The average translational energy of different types of molecules is the same

C. The average speed of different molecules is same

D. On an average, the heavier molecules have higher transitional energy

**Answer:**



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7. Diffusion of He gas is

A. 4 times faster than  $CO_2$

B. 4 times faster than  $SO_2$

C. 4 times faster than  $NO_2$



D. 4 times faster than  $CO_2$

**Answer:**



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8. The vapour density of a gas is 11.2. The volume occupied by 11.2 g of the gas is NTP is

A. 22.4 L

B. 11.2 L

C. 1 L

D. 2.24 L

**Answer:**



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**9.** The volume of 2.8 g of carbon monoxide at  $27^{\circ}\text{C}$  and 0.821 atm pressure is

A. 30 L

B. 3 L

C. 0.3 L

D. 1.5 L

**Answer:**



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**10.** What will be the temperature when the rms velocity is four times of that at 300 K ?

A. 300 K

B. 900 K

C. 4800 K

D. 1200 K

**Answer:**



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**11.** The density of neon is lowest at

A. STP

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

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

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

**Answer:**



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**12.** When 3.2 g sulphur is vaporised at  $450^{\circ}\text{C}$  and 723 mm Hg pressure, the vapours occupy a volume of 780 mL. What is the molecular formula of S vapours ?

A.  $S_2$

B.  $S_4$

C.  $S_6$

D.  $S_8$

**Answer:**



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**13.** At what temperature, the rms velocity of  $SO_2$  be same as that of  $O_2$  at 303K ?

A. 273 K

B. 606 K

C. 303 K

D. 403 K

**Answer:**



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**14.** The value of compression factor , Z for critical constant is

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

B.  $\frac{3}{4}$

C.  $\frac{2}{3}$

D.  $\frac{3}{8}$

**Answer:**



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

A. 4

B. 2



C. 1

D. 43469

**Answer:**



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**16.** A vessel contains He and  $H_2$  in the molar ratio 1:5. The ratio of mean translational kinetic energies, at the same temperatures is

A. 1:1

B. 1 : 2

C. 2 : 1

D. 1 : 5

**Answer:**



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**17.** The ratio of root mean square velocity to average velocity of a molecule at a particular temperature is

A. 1 : 1.086

B. 2 : 1.86

C. 1086 : 1

D. 2.086 : 1

**Answer:**



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**18.** The RMS speed of helium, in  $m s^{-1}$

(atomic mass =  $4.0 \text{ g mol}^{-1}$ ) at 400 K is

A. 16.8

B. 60

C. 168

D. 1580

**Answer:**



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**19.** A mixture of gases having different molecular weights is separated by which method ?

A. Atomlysis

B. Metathesis

C. Ostwald and Walker method

D. Reverse osmosis

**Answer:**



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**20.** The units of van der Waal's constant  $a$  and  $b$  respectively are

A.  $L^{-2} \text{atm}^{-1} \text{mol}^{-1}$  and  $L \text{mol}^{-2}$

B.  $L^2 \text{atm} \text{mol}^{-2}$  and  $\text{mol}^{-1} \text{L}$

C.  $L \text{atm} \text{mol}^2$  and  $\text{mol} \text{L}$

D.  $L \text{atm}^2 \text{mol}^{-1}$  and  $\text{mol} \text{L}^{-1}$

**Answer: B**



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**21.** If van der Waal's parameters for gases P,Q,R and S are given as

Gas	$a$ (time <sup>2</sup> atm/mol <sup>2</sup> )	$b$ (time/mol)
<i>P</i>	4.0	0.027
<i>Q</i>	8.0	0.030
<i>R</i>	12.0	0.027
<i>S</i>	6.0	0.024

A. P

B. Q

C. R

D. S

**Answer:**



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22. A balloon is filled with hydrogen at room temperature. It will burst, if pressure exceeds 0.2 bar. If at 1 bar pressure the gas occupied 2.27 L volume, up to what volume can the balloon be expanded ?

A. 6.25 L

B. 11.35 L

C. 8.35 L

D. 10.50 L

**Answer:**







23. The average velocity of an ideal gas molecule at 300 K is 2 m/s. The average velocity at 1200 K will be

A. 6 m/s

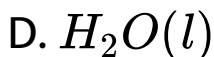
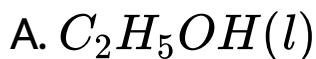
B. 4 m/s

C. 2 m/s

D. 8 m/s

**Answer:**

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



**Answer:**

25. Which of the following relation is correct for an ideal gas regarding its pressure ( $p$ ) and translational kinetic energy per unit volume ( $E$ )?

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

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

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

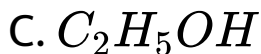
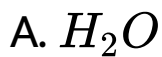
D.  $p = 2E$

**Answer:**



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



**Answer:**



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**27. Which of the following is not a crystalline solid ?**

A. KCl

B. CsCl

C. Glass

D. Rhombic sulphur

**Answer:**



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**28.** The arrangement  
*ABC, ABC, ABC.....* is referred as

- A. octahedral close packing
- B. hexagonal close packing
- C. tetrahedral close packing
- D. cubic close packing

**Answer:**



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**29.** How many  $Cl^-$  ions are there around  $Na^+$  ion in a NaCl crystal?

A. 3

B. 4

C. 6

D. 8

**Answer:**



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**30.** Which of the following statements is not true about NaCl structure?

A.  $Cl^-$  ions are in fcc arrangement

B.  $Na^+$  ions have coordination number four

C.  $Cl^-$  ions have coordination number six



D. Each unit cell contains 4 NaCl molecules

**Answer:**



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**31.** The number of atoms in 100g of a fcc crystal with density= $10\text{gcm}^{-3}$  and cell edge as 200gm, is equal to

A.  $3 \times 10^{25}$

B.  $5 \times 10^{24}$

C.  $1 \times 10^{25}$

D.  $2 \times 10^{25}$

**Answer:**



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**32.** Which of the following expression is correct for a CsCl unit cell with lattice parameter,  $a$ ?

A.  $r_{cs^+} + r_{cl^-} = 2a$

$$\text{B. } r_{cs^+} + r_{cl^-} = \frac{a}{\sqrt{2}}$$

$$\text{C. } r_{cs^+} + r_{cl^-} = \frac{\sqrt{3}}{2}a$$

$$\text{D. } r_{cs^+} + r_{cl^-} = \frac{3}{2}a$$

**Answer:**



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**33.** In diamond, the coordination number of carbon is:

A. four and its unit cell has eight carbon atoms

B. four and its unit cell has six carbon atoms

C. six and its unit cell has four carbon atoms

D. four and its unit cell has four carbon atoms

**Answer:**



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34. The molar volume of KCl and NaCl are 37.46 mL and 27.94 mL respectively. The ratio of the unit cube edges of the crystals is

A. 1.296

B. 1.116

C. 1.341

D. 0.95

**Answer:**



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35. Calcium crystallises in a face centred cubic unit cell with  $a = 0.556 \text{ nm}$ . Calculate the density if it contained 0.1% Schottky defects.

A.  $1.5463 \text{ g / cm}^3$

B.  $1.4962 \text{ g / cm}^3$

C.  $1.5448 \text{ g / cm}^3$

D.  $1.5943 \text{ g / cm}^3$

**Answer:**



**36.** Calculate the ionic radius of a  $Cs^+$  ion, assuming that the cell edge length for CsCl is 0.4123 nm and the ionic radius of a  $Cl^-$  ion is 0.181nm.

A. 0.176nm

B. 0.231nm

C. 0.357nm

D. 0.116nm

**Answer:**



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**37.** Iron crystallises in a bcc system with a lattice parameter of  $2.861\text{\AA}$ . Calculate the density of iron in the bcc system.

A.  $7.92\text{gmL}^{-1}$

B.  $8.96\text{gmL}^{-1}$

C.  $2.78\text{gmL}^{-1}$

D.  $6.72\text{gmL}^{-1}$



**Answer:**



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**38.** A monoclinic crystal has dimensions

A.  $a \neq b \neq c, \alpha = \gamma = 90^\circ, \beta = 90^\circ$

B.  $a \neq b \neq c, \alpha = \beta = \gamma = 90^\circ$

C.  $a \neq b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$

D.  $a \neq b \neq c, \alpha = \beta = , \gamma = 120^\circ$

**Answer:**



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39. In  $A^+B^-$  ionic compound, radii of  $A^+$  and  $B^-$  ions are 180 and 187pm respectively. The crystal structure of the compound will be

A. NaCl type

B. CsCl type

C. ZnS type

D. similar to diamond

**Answer:**



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**40.** A compound having bcc geometry has atomic mass 50. Calculate the density of the unit cell, if the edge length is 290pm.

A.  $6.81gcm^{-3}$

B.  $3.40gcm^{-3}$

C.  $13.62gcm^{-3}$

D. none of these

**Answer:**



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**41.** If ' $a$ ' stands for the edge length of the cubic systems: simple cubic, body centred cubic and face centred cubic then the ratio of radii of the spheres in these systems will be respectively,

A.  $\frac{1}{2}a, \sqrt{3}a : \frac{1}{\sqrt{2}}a$

B.  $\frac{1}{2}a, \sqrt{3}a : \frac{\sqrt{2}}{2}a$

$$C. 1a : \sqrt{3}a : \sqrt{2}a$$

$$D. \frac{1}{2}a : \frac{\sqrt{3}a}{4} : \frac{1}{2\sqrt{2}}a$$

**Answer:**



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**42.** Calculate the approximate number of unit cells present in 1g of gold. It is well known that gold crystallises in the face cubic lattice (atomic mass of gold is 197u).

A.  $7.64 \times 10^{20}$

B.  $6.02 \times 10^{23}$

C. 197

D. 4

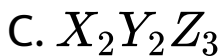
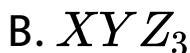
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**43.** A solid compound contains X, Y and Z atoms in a cubinc lattice with X atoms occupying ht corners. Y atoms in the body

centred positions and Z atoms at the centres of faces of the unit cell. What is the empirical formula of the compound?



**Answer:**



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44. The volume of atoms present in a fcc unit cell of a metal ( $r$ =atomic radius).

A.  $\frac{16}{3} \pi r^3$

B.  $\frac{12}{3} \pi r^3$

C.  $\frac{24}{3} \pi r^3$

D.  $\frac{20}{3} \pi r^3$

**Answer:**



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45. A metal crystallizes in  $b$  lattice. The percent fraction of edge length not covered by atom is

A. 0.114

B. 0.104

C. 0.134

D. 0.124

**Answer:**



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**46.** The temperature  $30.98^{\circ}C$  is called critical temperature ( $T_C$ ) of carbon dioxide. The critical temperature is the

A. lowest temperature at which liquid carbon dioxide is observed

B. highest temperature at which gas carbon dioxide is observed

C. highest temperature at which solid carbon dioxide is observed

D. highest temperature at which liquid carbon dioxide is observed

**Answer:**



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**47.** Point out the correct statement for the set of characteristics of ZnS crystal.

A. Coordination number (4:4), ccp,  $Zn^{2+}$  ion in all the alternate tetrahedral voids

B. Coordination number (6:6), hcp,  $Zn^{2+}$

ion in all the alternate tetrahedral voids

C. Coordination number (6:4), hcp,  $Zn^{2+}$

ion in all the alternate octahedral voids

D. Coordination number (4:4), ccp,  $Zn^{2+}$

ion in all the tetrahedral voids

**Answer:**



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**48.** KCl crystallizes into the same type of lattice as does NaCl. Given that  $r_{Na^+} / r_{Cl^-} = 0.50$  and  $r_{Na^+} / r_{K^+} = 0.70$ , Calculate the ratio of the side of the unit cell for KCl to that for NaCl:

A. 0.124

B. 1.1226

C. 0.891

D. 1.414

**Answer:**



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49. If the pressure of a gas contained in a closed vessel is increased by 0.4% when heated by  $1^{\circ}C$ , then its initial temperature must be:

A.  $-23^{\circ}C$

B.  $+23^{\circ}C$

C.  $250^{\circ}C$

D.  $523^{\circ}C$

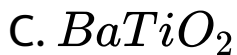
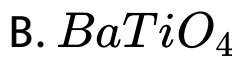
**Answer:**



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50. Barium titanate has the perovskite structure, i.e. a cubinc lattice with  $Ba^{2+}$  ions at the corners of the unit cell, oxide ions at the face centres and titanium ions at the body centred. The molecular formula of barium titante is





**Answer:**



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51. 1L of a gas is at a pressure of  $10^{-6}$  mm of Hg at  $25^\circ C$ . How many molecules are present in the vessel.



A.  $3.2 \times 10^6$

B.  $3.2 \times 10^{13}$

C.  $3.2 \times 10^{10}$

D.  $3 \times 10^4$

**Answer:**



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**52.** 1L of a gas is at a pressure of  $10^{-6}$  mm of Hg at  $25^\circ C$ . How many molecules are present in the vessel.

A.  $3.2 \times 10^6$

B.  $3.2 \times 10^{13}$

C.  $3.2 \times 10^{10}$

D.  $3.2 \times 10^4$

**Answer:**



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**53.** An ideal gas cannot be liquified because

- A. its critical temperature is always above  $0^{\circ}C$
- B. its molecules are relatively smaller in size
- C. it solidifies before becoming a liquid
- D. forces operating between its molecules are negligible

**Answer:**



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54. A compound is made of two elements  $P$  and  $Q$  are in p arrangement while atoms  $P$  occupy all the tetrahedral voids. What is the formula of the compound?

A.  $PQ$

B.  $PO_2$

C.  $P_2Q$

D.  $P_3Q$

**Answer:**



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55. What is the temperature at which the kinetic energy of 0.3 mole of helium is equal to the kinetic energy of 0.4 mole of argon at 400K

A. 400K

B. 873 K

C. 533K

D. 300K

**Answer:**



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**56.** For a crystal, the angle of diffraction ( $2\theta$ ) is  $90^\circ$  and the second order line has a  $d$  value of  $2.28\text{\AA}$ . The wavelength (in  $\text{\AA}$ ) of X-rays used for Bragg's diffraction is

A. 1.612

B. 2

C. 2.88

D. 4

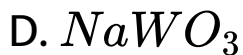
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57. A solid has a structure in which  $W$  atoms are located at the corners of a cubic lattice,  $O$  atom at the centre of edges, and  $Na$  atom at the centre of the cube. The formula for the compound is





**Answer:**



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**58.** Which of the following is most volatile compound?





C. HBr

D. HF

**Answer:**



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**59.** The root mean square velocity of a gas is double when temperature is

A. increased four times

B. increase two times

C. reduced to half

D. reduced to one fourth

**Answer:**



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**60.** The molar volume of  $CO_2$  is maximum at

A. NTP

B.  $0^\circ C$  and 2.0 atm

C.  $127^\circ C$  and 1atm

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

**Answer:**



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61. The RMS speed of hydrogen is  $\sqrt{7}$  times the RMS speed of nitrogen. If  $T_1$  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:**



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**62.** Which gas has the highest partial pressure in atmosphere?



C.  $O_2$

D.  $N_2$

**Answer:**



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