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**Assignment – I**

1. A certain mass of a gas occupies 39 mL at 760 mm pressure. What volume would it occupy if the pressure is raised to 780 mm provided that temperature remains constant ?
2. A vessel of 120 mL capacity contains a certain mass of a gas at 20˚C and 750 mm pressure. The gas was transferred to a vessel whose volume is 180 mL. Calculate the pressure of the gas at 20˚C.
3. 103 mL of carbon dioxide were collected at 27˚C and 763 mm pressure. What will be its volume if the pressure is changed to 721 mm at the same temperature ?
4. 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 occupies 2.27 L volume, upto what volume can the balloon be expanded ?
5. 200 mL of a gas are found to have a pressure of 750 mm. What will be its volume if the pressure is doubled at the same temperature?
6. A balloon filled with a ideal gas is taken from the surface of sea deep to a depth of 100m. What will be its volume in terms of its original volume?
7. A bulb ‘X’ of unknown volume containing a gas at one atmospheric pressure is connected to an evacuated bulb of 0.5 litre capacity through a stopcock. On opening the stopcock, the pressure in the whole system after some time was found to have a constant value of 570mm at the same temperature. What is the volume of the bulb X ?
8. A gas occupies a volume of 2.5 L at 9 x 105 N m­-2. Calculate the additional pressure required to decrease the volume of the gas to 1.5 L, keeping the temperature constant.

**Answers**

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| --- | --- | --- | --- | --- | --- |
| 1. 38 mL | 2. 500 mm | 3. 109 mL | 4. 11.35 L | 5. 100 mL | 6. 9.3 % |
| 7. 1.5 L | 8. 6 x 105 Nm-2 |  |  |  |  |

**Assignment – II**

1. 20 mL of hydrogen are measured at 15 ˚C are heated to 35 ˚C. What is the new volume at the same pressure ?
2. At what temperature centigrade will the volume of a gas at 0 ˚C double itself , pressure remaining constant?
3. An open vessel contains 200 mg of air at 17˚C. What weight percent of air would be expelled if the vessel is heated to 117˚C?
4. On a ship sailing in pacific ocean where temperature is 23.4˚C, a balloon is filled with 2 L air. What will be the volume of the balloon when the ship reaches Indian ocean where temperature is 26.1˚C?
5. 300ml of oxygen gas at - 10˚C are heated to 10˚C. what is the new volume if pressure remains constant?
6. 25 dm3 of ammonia at 283 K are heated until its volume is 30 dm3. To what temperature must it have been raised to accomplish the change?
7. What will be the volume of hydrogen when 3 L of it are cooled from 15 ˚C to – 73 ˚C at constant pressure.
8. What volume of air will be expelled from a vessel containing 400cm3 at 7˚C when it is heated to 27˚C at the same pressure?

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1. It is desired to increase the volume of a gas by 20% without changing the pressure. To what temperature, the gas must be heated if the initial temperature of the gas is 27˚C?
2. A 10 litre container is filled with a gas to a pressure of 2 atm at 0˚C. At what temperature will the pressure inside the container be 2.50 atm?
3. A steel tank containing at 15 atm pressure at 15˚C is provided with a safety value that will yield at a pressure of 30 atm. To what minimum temperature must the air be heated to blow the safety valve?
4. A gas cylinder containing cooking gas can withstand a pressure of 14.9 atmospheres. The pressure gauge of the cylinder indicates 12 atmosphere at 27˚C. Due to sudden fire in the building, the temperature starts raising. At what temperature the cylinder will explode?
5. 500 ml of nitrogen at 27˚C are cooled to – 5˚C at the same pressure. Calculate the new volume.
6. 400 ml of oxygen at 27˚C were cooled to – 15˚C without the change in pressure. Calculate the contraction in volume.
7. An iron cylinder contains helium at a pressure of 250 kPa t 300 K. The cylinder can withstand a pressure of 1 X 106 Pa. The room in which cylinder is placed catches fire. Predict whether cylinder will blow up before it melts or not. (M.P. of the cylinder = 1800 K)

**Answers**

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| --- | --- | --- | --- | --- | --- | --- |
| 1. 21.38 mL | 2. 273 ˚C | 3. 25.37 % | 4. 2.018 L | 5. 322.8 mL | 6. 339.6 K | 7. 2.08 L |
| 8. 28.6 cm3 | 9. 87 ˚C | 10. 68 ˚C | 11. 303 ˚C | 12. 99.5 ˚C | 13. 446.7 mL | 14. 56 mL |

15. P2 = 1500 kPa , As the cylinder can withstand a pressure of 106 Pa = 103kPa , hence it will blow up

**Assignment – III**

1. At 25˚C and 760 mm of Hg pressure, a gas occupies 600 mL volume. What will be its pressure at a height where temperature is 10˚C and volume of the gas is 640 mL?
2. 35 mL of oxygen were collected at 6 ˚C and 758 mm pressure. Calculate its volume at NTP.
3. At 27˚C and 1 atmospheric pressure, a gas has volume V. What will be its volume at 177˚C and a pressure of 1.5 atmosphere?
4. A sealed tube which can withstand a pressure of 3 atmospheres is filled with air at 27˚C and 760 mm pressure. Find the temperature above which it will burst.
5. A volume of hydrogen measures one cubic decimeter at 20˚C and at a pressure of half an atmosphere. What will be its volume at 10˚C and at 700 mm pressure?
6. 300 litres of ammonia gas at 20˚C and 20 atmosphere pressure are allowed to expand in a space of 600 litres capacity and to a pressure of 1 atmosphere. Calculate the drop in temperature.
7. One litre flask containing vapours of methyl alcohol ( Mol mass = 32 ) at pressure of 1 atm and 25˚C was evacuated till the final pressure was 10-3mm. How many molecules of methyl alcohol were left in the flask?
8. 28.32 L of chlorine were liberated at normal conditions of temperature and pressure. Calculate the volume of the gas at 12 ˚C and 780 mm pressure.
9. Calculate the number of moles of hydrogen contained in 18 L of the gas at 27˚C and 70 cm pressure. Given that R = 0.0821 Litre atm K –1 mol – 1  . Further, if the mass of hydrogen taken as above is found to be 1.350 g , Calculate the molecular mass of Hydrogen.
10. Temperature at the foot of a mountain is 30˚C and pressure is 760 mm whereas at the top of the mountain these are 0˚C and 710 mm. Compare the densities of the air at the foot and at the top of the mountain.
11. 10g of O2 were introduced into a evacuated vessel of 5 litres capacity maintained at 27˚C. Calculate the pressure of the gas in atmospheres in the container.

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1. 8 g methane is placed in 5 L container at 27˚C. Find Boyle constant.
2. Calculate the number of moles of hydrogen gas present in 500 cm3 of the gas taken at 300 K and 760 mm pressure. If this sample of hydrogen is found to have a mass equal to 4.09 X 10 – 2 g, calculate the molar mass of the hydrogen.
3. Calculate the temperature at which 28g of N2 will occupy a volume of 10 litres at 2.46 atmosphere.
4. 2.802g of N2 gas is kept in a litre flask at 0˚C. Calculate the pressure exerted by the gas.
5. Calculate the molar volume of a gas at STP .
6. A 500 ml sample of a gas weighs 0.326g at 100˚C and 0.5 atm. What is the molecular mass of the gas?
7. A large flask fitted with a Stop-cock is evacuated and weighed; its mass is found to be 134.567g. It is then filled to a pressure of 735 mm at 31˚C with a gas of unknown molecular mass and then reweighed; its mass is 137.456g. The flask is then filled with water and weighed again; its mass is now 1067.9g. Assuming that the gas is ideal, calculate the molar mass of the gas.
8. What is the density of SO2 gas at 27˚C and 2 atmospheric pressure ? (R = 0.0821 Litre atm K –1 mol – 1 ).
9. The density of a gas is found to be 1.56g/litre at 745 mm pressure and 65˚C. Calculate the molecular mass of the gas.
10. The density of a gas 3.80 g L-1 at STP. Calculate its density at 27˚C and 700 torr pressure.
11. The density of a gas found to be 3.43g/litre at 300 K and 1 atm pressure. Calculate the molar mass of the gas.
12. If the density of a gas at the sea level at 0˚C is 1.29 Kg m-3, what will be its molar mass ? (Assume that pressure is equal to 1 bar).
13. At 0˚C, the density of a gaseous oxide at 2 bar is same as that of nitrogen at 5 bar. What is the molecular mass of the oxide.

**Answers**

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| 1. 676.6 mm | 2. 34.16 mL | 3. “V” | 4. 627˚C | 5. 0.524 dm3 |
| 6. 263.7 K | 7. 3.24 x 1016 | 8. 28.8 L | 9. 0.67 mole , 2.015 g/mol | |
| 10. 0.964 : 1 | 11. 1.54 atm | 12. 12.315 L atm | 13. 2.03 X 10 – 2 mole , 2.01 g/mol | |
| 14. 299.6 K | 15. 2.24 atm | 16. 22.4 L | 17. 39.9 amu | 18. 80.25 g/mol |
| 19. 5.1969 g/L | 20. 44.2 u | 21. 3.185 g/L | 22. 84.5 g/mol | 23. 29.3 g/mol |
| 24. 70 g/mole |  |  |  |  |

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