**SINDHI HIGH SCHOOL, HEBBAL**

**UNIT TEST III-2024-25**

**PHYSICS (042)**

**Grade: XI Max. Marks: 25**

**Date:11/12/2024 Reading time: 8.10am-8.20am**

**No of sides: 2 Writing time: 8.20am-9.20am**

**General Instructions:**  
(1) There are 14 questions in all. All questions are compulsory.  
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.  
(3) All the sections are compulsory.  
(4) Section A contains nine questions, seven MCQ and two Assertion Reasoning based of 1 mark each,

Section B contains two questions of two marks each, Section C contains one question of three marks,

Section D contains one case study based question of four marks and Section E contains one long

answer questions of five marks.

(5) Use of calculators is not allowed.

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| **SECTION A** | | |
| 1. | 1g of water at atmospheric pressure has volume 1cm3 and when boiled it becomes 1681cm3 of steam. The heat of vaporisation of water is 540cal/g. Then the change in its internal energy in this process is  a) 540cal b) 500cal c) 1681cal d)380cal | **1** |
| 2. | Two cylinders of equal size are filled with equal amount of ideal diatomic gas at room temperature. Both the cylinders are fitted with pistons. In cylinder A the piston is free to move, while in cylinder B the piston is fixed. When same amount of heat is added to  both the cylinders, the temperature of the gas in cylinder A raises by 20 K. What will be the rise in temperature of the gas in cylinder B?  a) 28 K b) 20 K c) 15 K d) 10 K | **1** |
| 3. | In an adiabatic process the pressure is increased by 2/3%. If CP/CV = 3/2, then the volume decreases by about  a) 4/9% b) 2/3% c) 4% d) 9/4% | **1** |
| 4. | A thermodynamic system is taken from an original state D to an intermediate state E by the linear process as shown in the figure. Its volume is then reduced to the original volume from E to F by an isobaric process. The total work done by the gas from D to E to F will be  a) -450J b) 450J c) 900J d) 1350J | **1** |
| 5. | Average velocity of a gas becomes 4 times, then what will be the effect on rms velocity at the same temperature?  a) 1.4times b) 4times c) 3times d) 2times | **1** |
| 6. | The amount of heat needed to raise the temperature of 4 moles of rigid diatomic gas from 00C to 500C, when no work is done, is \_\_\_\_\_\_\_\_\_ (R is the universal gas constant)  a) 750R b) 500R c) 250R d) 175R | **1** |
| 7. | If the temperature is changed from 270C to 3270C, the ratio of kinetic energy of molecules at two temperatures is  a) 3:2 b) 2:3 c) 1:2 d) 2:1 | **1** |
| **For Questions 8 and 9, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.**  **a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.**  **b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.**  **c) If Assertion is true but Reason is false.**  **d) If both Assertion and Reason are false**  **e) If Assertion is false but Reason is true** | | |
| 8. | **Assertion (A):** When amount of an ideal gas undergoes adiabatic change from state (P1,V1,T1) to state (P2,V2,T2), the work done is  W=  where and R= universal constant  **Reason (R):** In the above case, when work is done on the gas, the temperature of the gas would rise. | **1** |
| 9. | **Assertion (A):** The average momentum of a molecule in a sample of an ideal gas depends on temperature  **Reason (R):** The rms speed of oxygen in a gas molecule is v. If the temperature is doubled and the oxygen molecules dissociate into oxygen atoms, the rms speed will become 2v. | **1** |
| **SECTION B** | | |
| 10. | 0.76g of petroleum was burnt in a bomb calorimeter which contains 2kg of water and has a water equivalent 500g. The rise in temperature was 30C. Determine the calorific value of petroleum. | **2** |
| 11. | 1.0 m³ of water is converted into 1671 m³ of steam at atmospheric pressure and 100°C temperature. The latent heat of vaporisation of water is 2.3 x 106 J/kg. If 2.0 kg of  water is converted into steam at atmospheric pressure and 100°C temperature, then how much will be the increase in its internal energy? Density of water = 1.0 x 103 kg m-³ and atmospheric pressure =1.01 x 105 Nm-². | **2** |
| **SECTION C** | |  |
| 12. | Derive an expression for pressure of an ideal gas enclosed in a container. | **3** |
| **SECTION D** | | |
| 13. | **CASE STUDY:**  The Kinetic theory was developed by Maxwell and Boltzmann to explain the behaviour of gases based on the idea that gases consist of rapidly moving atoms or  molecules. The inter atomic forces binding the atoms are negligible and their size is negligible. The theory is consistent with various gas laws and Avogadro's hypothesis. It gives molecular interpretation of temperature pressure. Specific heat capacities. Compared to solids and liquids, it is easier to understand the properties of gases. This is because molecules in gases are far apart.  (i) Real gas behave as ideal gas at  a) extremely low temperature b) extremely high temperature  c) extremely low pressure d) Both (b) and (c)  (ii) A balloon is filled at 27°C and 1 atm pressure by 500m³ He. At -3°C and 0.5 atm pressure, the volume of He will be  a) 700 m³ b) 900 m3 c) 1000 m³ d) 500 m³    (iii) An ideal gas is heated from 27°C to 627°C at constant pressure. If initial volume was 4 m³, then the final volume of the gas will be  a) 2 m³ b) 4 m³ c) 6 m³ d) 12 m³    (iv) What will be the average value of energy along one degree of freedom for an ideal gas in thermal equilibrium at a temperature T? (kB is Boltzmann constant)?  a) 3/2 kBT b) 1/2 kBT c) kBT d) 2/3 kBT | **1X4=4** |
| **SECTION E** | | |
| 14. | (i) Deduce an expression for the work done by an ideal gas during an adiabatic process  (ii) A sample of gas (γ = 1.5) is compressed adiabatically from a volume of 1600 cm³ to 400 cm³. If the initial pressure is 150 kPa, what is the final pressure and how much  work is done on the gas in the process? | **5** |