FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

COURSE- PHY 123

COMPILIED BY TEAM CLEVER-B

1. What is the average speed of Oxygen gas molecules at temperature of 300K? A: 45m/s B: 54m/s **C: 445m/s** D: 545m/s
2. The first Law of thermodynamics is expressed as: (A: $dw = du + dq$ B: $\boldsymbol{du = dq - dw}$ **C:** $dq = dw - du$ D: $dq = du - dw$
3. In Nacl ,Na ions are positively charged and chlorine ions are negatively charged. Inspite of the Coulomb's attraction between them, why do the two ions not collapse? A: because of the presence of free electrons B: because of its low melting point C: because of its high specific heat **D: because of short range repulsive forces.**
4. Which of the following conditions is applicable during coalescence of curves at the point of inflexion in Van der Waals isotherms; A: $\left(\frac{dq}{dt}\right)p = 0$ B: $\left(\frac{dp}{dv}\right)T = 0$ C: $\boldsymbol{\left(\frac{d2p}{dV2}\right)T = 0}$ D: $\left(\frac{dp}{dV}\right)V = 0$
5. If bodies A and B are each separated in thermal equilibrium with body C, then A and B are in thermal equilibrium with each other. This is concept is known as? A: Avogadro's Law B: Graham's Law C: Charles's Law D: **Zeroth's Law**
6. Which of the following is not TRUE about molecules; A: made up of atoms B: posses both kinetic and potential energies C: combination of molecules made up matter **D: molecules of each substance are identical same structure but different masses**
7. The differences observed in solids, liquids and gases may be accounted for by? A: the spacing and forces acting between the molecules B: their relative masses **C: the difference molecules in each of them** D: their melting points
8. At low humidity in the an environment, the human skin is usually? A: damp and smooth B: dry and rough **C: damp and rough** D: dry and smooth
9. If the pressure of the vapour on top of an enclosed liquid is equal to the atmospheric pressure, what will be the temperature of the liquid enclosed? A: room temperature B: boiling point **C: freezing point** D: standard point
10. In the Van der waal's equation for real gas. The term $\frac{a}{V2}$ is called? A: Co-Volume B: intermolecular force **C internal Pressure** D: Cohesive force
11. Which of the following processes below can be explained using the kinetic theory? I Change of state II Diffusion III Radiation IV Osmosis A: I,III and IV **B: I, II and IV** C: I,II,III, and IV D: I, II and III
12. A temperature of 20°c is the same as ---in °F? A: 36 **B: 68**C: 43.1
13. Which of the following is the correct equation for an ideal gas in isothermal process? A: PV = nRT **B: W = nRT ln $\frac{Vf}{V1}$** C: PV^{δ} = constant
14. A cylinder contains 12 L of oxygen at 20°C and 15 atom. The temperature is raised to 35°C, and the volume is reduces to 8.5 L. what is the final pressure of the gas in atmosphere? Assume the gas is ideal. A: 12 atoms B: 14 atoms **C: 22 atoms** D: 24 atoms

15. One mole of oxygen expands at a constant temperature of 310K from an initial volume of 12 L to a final volume of 19 L. How much work is done by the gas during the expansion? A: 118J B: 180J **C: 1180J** D: 1810J
16. Here are five numbers 5, 11, 32, 67 and 89. What is the root means square value of there numbers? **A: 51.2** B: 40.8 C: 7.21 D: 6.39
17. Which of the following equation is true about the average speed of the molecule? **A: $V_{avg} = \frac{\sqrt{8RT}}{\pi M}$** B: $V_{avg} = \frac{\sqrt{3RT}}{M}$ C: $V_{avg} = \frac{\sqrt{2RT}}{M}$
18. The nature of the Van der weal equation is that all isotherms below. Critical temperature have..... A:Inflexion point **B: Two turning points** C: One turning point D: Melting point
19. Which of the following phenomena CANNOT be explained by the molecular theory of matter? A: Expansion **B:Evaporation** C: Radiation D: Conduction
20. 200g of water at 90°C is mixed with 100g of water at 30°C. what is the final temperature? A:50°C B: 60°C **C: 70°C**
21. Hot water is added to three times the mass of water at 10°C and the resulting temperature is 20°C. what is the initial temperature of the hot water? A: 100°C B: 80°C **C: 50°C**
22. The thermometric property of a thermocouple is the change in ..... A: Equivalent resistance B: Electromotive force **C: Current**
23. From the statement below, the qualities of a good thermometer are I. High thermal capacity II. High sensitivity III. Easy readability IV. Accuracy over a wide range of temperature A: I, III and IV B: II, III, IV C: I and II **D: I, II, III and IV**
24. A metal of volume 40cm^3 is heated from 30°C to 90°cthe increase in volume is? A: 1.20cm^3 B: 0.40cm^3 **C: 0.14cm^3**
25. What is the amount of heat needed to raise the temperature of 75g of water from 16°c to 25°c **A: 2835J** B: 3528J C: 5285J
26. Calculate the thermal energy required to boil completely to stem 0.20kg of water at 100°c (Lv =2.3 x 10^6Jkg^{-1}). **A: 0.46 x 10^6 J** B: 6.4 x10^6 J C: 7.2 x10^6 J
27. Which of the following most affects the rate of evaporation. **(A: Temperature, Pressure, Surface area** (B) Pressure, nature of the liquid, colour of the liquid C: Area, Viscosity and surface tension
28. Which of the following forms the microscopic properties of a gas? (A) Mass, temperature, velocity (B) Volume, temperature, pressure **(C) Density ,mass, velocity** (D) Number of mole, pressure, density
29. The relationship between Volume and temperature is investigated when pressure and amount of gas (n) are kept constant is known as; (A) Avogadro's Law **(B) Charles's Law** (C) Boyle's Law (D) Pressure Law
30. Suppose 100cm3 of a given mass of oxygen in a cylinder is warmed from 27oc to 100oc while it pressure remained constant. What is the new volume? **(A) 1243.3cm^3** (B) 1423.6cm^3 (C) 1544.4 cm^3 (D) 1678.6cm^3
31. A piece of copper of mass 0.75kg cools from 40°c to 15°c.How much heat is given out? **(A) 400JKg^{-1}C^{-1}** (B) 500JKg^{-1}C^{-1} (C) 600kg^{-1}C^{-1} (D) 800Kg^{-1}C^{-1}
32. The equation $P^xV^yT^z$ = Constant is Boyle's Law. What the valves of x,y,z? (A) X=0, Y =0, Z=1 (B) X =1, Y =1, Z =1 **(C) X=1, Y=1, Z=0** (D) X=1, Y=1, Z=-1

33. Before starting a journey from Bosso campus the tyre pressure of a car was 3.0 x 105 Nm-2 at 300K. At the end of the journey at Gidan Gwanu campus the pressure rose to 4 x 105 Nm-2. Calculate the temperature of the tyre after the journey, assuming the volume is constant. **(A) 127°c** (B) 130°c (C) 147°c (D) 176°c
34. When a fixed mass of an ideal gas expands at constant temperature, which of the following properties of the gas molecules increase? **(A) average separation** (B) average kinetic energy (C) average speed (D) average number per unit volume
35. The pressure of a gas when cooled at constant volume will decrease because the molecules, (A) decreases in number (B) break up into small into small molecules **(C) collides less frequently with the walls of the container** (D) have the same kinetic energy
36. Which of the following gas Laws is equivalent to workdone. **(A) Van der waals** (B) Boyle's (C) Graham's (D) Charles
37. In a gas experiment, the pressure of the gas is plotted against the reciprocal of the volume of the gas at constant temperature. The slope of the graph represents? **(A) work** (B) Force (C) Momentum (D) Power
38. The most probable speed of the gas molecules is given as? (A) $\frac{\sqrt{3p}}{\rho}$ (B) $\frac{\sqrt{3RT}}{M}$ **(C)** $\frac{\sqrt{2RT}}{M}$ (D) $\sqrt{c2}$
39. When the process is adiabatic, no energy is transferred as heat, then the energy required for the work can only come from....? (A) intermolecular force between gas molecules (B) internal pressure exerted by the gas molecules **(C) internal energy of the gas** (D) collisions of gas molecules with the wall of the container
40. If the internal energy of the gas decreases in adiabatic process, which of the following is likely to decrease proportionately? (A) Pressure (B) Volume **(C) Temperature** (D) Density
41. The Pressure exerted by n moles of an ideal gas, in terms of the speed of its molecules, is? (A) $PV = nRT$ **(B)** $\boldsymbol{P = \frac{nMV2rms}{3V}}$ (C) $PV = \frac{nMV2rms}{3P}$ (D) P =$\frac{\sqrt{3RT}}{M}$
42. Air in the cylinder of diesel engine at 20°c is compressed from an initial pressure of 1atm and volume of 200cm^3 to a volume of 15cm^3. Assuming that air behaves as an ideal gas ($\gamma = 1.40$) and the compression is adiabatic, find the final pressure. (A) 34.2 atm (B) 36.4 atm **(C) 37.6 atm** (D) 39.8 atm
43. The volume of an ideal gas in adiabatically reduced from 200 L to 74.3 L. The initial pressure and temperature are 1.0 atm and 300 K. The final pressure is 4.00 atm. What is the final temperature? **A: 446 K** B: 564 K C: 644 K D: 464 K
44. When 1.0 mol of oxygen (O2) gas is heated at constant pressure starting at 0oC, how much energy must be added to the gas as heat to double its volume? **A: 8.0 kJ** B: 4 kJ C: 10 kJ D: 6 kJ
45. Ten particles are moving with the following speeds; four at 200 m/s, two at 500 m/s and four at 600 m/s. Calculate their root mean square speeds. A: 520 m/s **B: 458** m/s C: 420 m/s D: 660 m/s
46. The temperature of 2.00 mol of an ideal monoatomic gas is raised to 15.0 K at constant volume. What are the workdone by the gas A: 273 J **B: 0 J** C: +373 J D: -374 J
47. The speeds of 10 molecules are, 2.0, 3.0, 4.0, ... 11 km/s. What is the root mean square speed? **A: 6.5 km/s** B: 8.2 km/s C: 5.5 km/s D: 7.6 km/s
48. A bubble of 5.00 mol of helium is submerged at a certain depth in liquid water when the water (and thus the helium) undergoes a temperature increase of 20.0 oC at constant pressure. As a

result, the bubble expands. The helium is monatomic and ideal. How much energy is added as heat to the helium during the increase and expansion? A: 2182 J B: 8082 J **C: 2080 J** D: 3280 J

49. The equation of state for an ideal gas holds for real gas at A: low volume **B: low pressure** C: high pressure D: high temperature
50. A container is filled with 42.0 g of nitrogen gas. Calculate the internal energy of the gas when its temperature is 301 K. Calculate the internal energy of the gas when its temperature is 301 K. The atomic weight of nitrogen is 14.0 g A: 4.8 x 103 J **B: 5.6 x 103 J** C: 6.2 x 103 J
51. A mass of an ideal gas of volume 400 cm3 at 288 K expands adiabatically and its temperature falls to 273 K. What is the new volume if ?= 1.40 A: 524 cm3 B: 374 cm3 **C: 457 cm3**
52. The first law of thermodynamics is given as A: dW = dQ + dU B: dQ = dU - dW C: dQ = dW - dE **D: dE = dQ - dW**
53. If the density of nitrogen at S.T.P is 1.25 Kgm-3, calculate Vrms of nitrogen molecules at 227 oC. 1 atm = 1.0 x 105 Pa. **A: 6.6 x 102 m/s** B: 3.4 x 102 m/s C: 1.2 x 102 m/s
54. Which of these assumptions usually made about kinetic theory for an ideal gas is incorrect? A: molecules exert no forces on one another except when they collide **B: the molecules of the gas obeys general gas law** C: molecules are in random motion obeying Newton's law
55. Which of these is true about the applications of 1st law of thermodynamics in free expansion? A: Eint = 0, Q = W **B: Q = W = Eint =0** C: W = 0, Eint = Q D: Q = 0, Eint = -W
56. What is the average translational kinetic energy of nitrogen molecules at 1600 K? A: 4.6 x 10-20 J B: 6.3 x 10-20 J **C: 3.3 x 10-20 J** D: 5.1 x 10-20 J
57. The density of air at 0 oC and at a pressure of 1.01 x 105 N/m2 is 1.29 Kg/m3. What is the root mean square speed of its molecules? A: 548 m/s **B: 485 m/s** C: 845 m/s D: 584 m/s
58. Which of the the following laws state that under the same conditions of temperature and pressure, equal volumes of gas contain equal numbers of molecules? A: Zeroth law **B: Avogadro's law** C: Graham's law D: Pressure's law
59. At what frequency do molecules (dia. 290 Pm) collide in (an ideal) oxygen gas (O2) at temperature 400 K and pressure 2.00 atm? **A: 7.03 x 109 S-1** B: 4.0 x 109 S-1 C: 5.6 x 109 S-1
60. The temperature of 2.0 mol of an ideal monatomic gas is raised 15 K at constant volume. What is the workdone by the gas. A: 473 J B: 374 J C: 734 J **D: 0 J**
61. An ideal gas undergoes isothermal compression from an initial volume of 4.0 m3 to a final volume of 3.0 m3. There is 3.50 mol of the gas, and its temperature is 10 oC. How much work is done by the gas? A: 1.23 kJ B: -4.28 kJ **C: -2.37 kJ** D: 6.18 kJ
62. Which of the following statements is correct about the nature of the Van der Waals equation? A: No isothermals below Tc have a single point of inflexion B: All isothermal above Tc have two turning points C: All isothermal above Tc have single point of inflexion **D: All isotherms below Tc have two turning points**
63. Here are five numbers: 5, 11, 32, 67 and 89. What is the root mean square value of these numbers **A: 52.1** B: 40.8 C: 56.2 D: 60.2
64. Which of the following statements about the kinetic theory of gases is not correct? **A: relates pressure and volume** B: deduction in Graham's law C: compares macroscopic and microscopic properties

65. A container holds a mixture of three non reacting gases; 2.40 mol of gas 1 with CV1 = 12.0 J/mol.K, 1.50 mol. of gas 2 with CV2 = 12.8 J/mol.K, and 3.20 mol of gas 3 with CV3 = 20.0 J/mol.K. What is Cv of the mixture? **A: 15.8 J/mol.K** B: 13.6 J/mol.K C: 11.9 J/mol.K
66. A certain gas occupies a volume of 4.3 L at a pressure of 1.2 atm and a temperature of 310 K. It is compressed adiabatically to a volume of 0.76 L. Determine the final pressure. A: 17.4 atm B: 11.2 atm **C: 14.0 atm**
67. A steel tank contains 300 g of ammonia gas (NH3) at a pressure of 1.35 x 106 Pa and a temperature of 77 oC. What is the volume of the tank in litres? **A: 38.0 L** B: 18.2 L C: 62.8 L
68. The pressure at a point in a fluid in static equilibrium depends on A: The container of the fluid **B: The depth of that point** C: Horizontal dimension of the fluid
69. The condition called standard temperature and pressure (STP) for a gas is defined to be a temperature of 0 oC = 273 K and a pressure 1 atm = 1.01 x 105 Pa. Find the volume of one mole of any gas at STP. A: 2.24 m3 **B: 22.4 m3** C: 27.3 m3
70. An ideal gas at 300 K is adiabatically expanded to twice its original volume and then heated until the pressure is restored to its initial value. What is the final temperature? **A: 600 K** B: 400 K C: 450 K
71. At pressure P and absolute temperature T a mass M of an ideal gas fills a closed container of volume V. An additional mass 2M of the same gas is introduced into the container and the volume is then reduced to V/3 and the temperature to T/3. The pressure of the gas will now be **A: 3P** B: 27P C: 9P
72. A quantity of ideal gas at 10.0 oC and 100 kPa occupies a volume of 2.50 m3. How many moles of the gas are present? A: 4 B: 5 **C: 3**
73. A vessel of volume 50 cm3 contains hydrogen at a pressure of 1.0 Pa and at a temperature of 27 oC. Estimate the number of molecules in the vessel. A: 1.0 x 1016 B: 2.1 x 1016 **C: 1.2 x 1016**
74. The Figure below shows a cycle consisting of five paths, AB is isothermal at 300 K, BC in adiabatic with work = 5.0 J, CD is at constant pressure of 5 atm, DE is isothermal and EA is adiabatic with a change in internal energy of 8.0 J. What is the change in internal energy of the gas along path CD? **A: -3.0 J** B: -4.8 J C: 7.2 J
75. A cylinder contains 10 litres of air at 3 atm and 300 K. if the pressure is suddenly doubled what is the volume. **A: 6.1 litres** B: 7.2 litres C: 10.6 litres
76. Which of the following statements is not correct about the behaviour of a Van der waals gas in the figure below? A: The Slope is positive **B: DB is the region of super cooling** C: Along BC small increase in volume is accompanied by an increase in gas pressure
77. Determine the average value of the translational kinetic energy of the molecules of an ideal gas at 100 oC, where Boltzmann constant is 1.38 x 10-23 J/K **A: 7.72 x 10-21 J** B: 8.27 x 10-21 J C: 9.26 x 10-21 J
78. The molar mass M of oxygen is 0.0320 kg/mol. What is the average speed of oxygen gas molecules at T = 300 K? **A: 445 m/s** B: 544 m/s C: 483 m/s D: 454 m/s
79. Which of the statement is correct about a reversible adiabatic process? **A: piston is moved slowly** B: pistons is moved quickly C: piston is moved vertically D: piston remain neutral