KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF PHYSICS

PHYS 133 – SECOND MAJOR EXAMINATION
(TERM 062)
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Name: _____ **ID #** _____

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1. A storage tank contains 20 kg of nitrogen (N_2) at an absolute pressure of 4 atm. What will be the pressure if nitrogen is replaced by an equal mass of oxygen (O_2). (Atomic weight of N_2 is 28 g/mole and that for O_2 is 32 g/mole.

2. What is the pressure inside a 0.5 m^3 container holding 80.0 kg nitrogen gas at 20° C? (R=8.31 J/mole-K, atomic weight of nitrogen is 28 g/mole).

3. At what temperature will the Fahrenheit and the Kelvin scales give the same reading?

4. Find the translational kinetic energy of a gas at 20° C. (Boltzman constant is 1.38 x 10^{-23} J/K).

5. A steel bar has the precisely desired length when at 20° C. How much stress is required to keep it at this length if the temperature increases to 40°C? [Elastic Module for steel is 2×10^{11} N/m^2].

6. If you to build a pipe open at one end closed at the other end and to resonate at 20KHz as the second harmonics what the pipe length must be?

7. the intensity level of a given wave is 50 dB at a distance of 50 km from the source. What was the intensity level when it passed a point only 1 km from the source.

8. The frequency of a certain car siren is 2000 Hz when at rest. What frequency do you detect if you move with a speed of 30.0 m/s toward the car?

9. A given mass vibrates according to the equation

$$X = 0.4 \sin (5+),$$
Find
a) The frequency of vibration
b) The displacement of the mass at t=2 sec.

10. If a car generates 20 hp when traveling at 100 km/h. what must be the force exerted on the car due to friction and air resistance?

   [1 hp = 746 w]

11. A vertical steel column with a cross-sectional area of 0.2 m^2 has a mass of 25 ton placed on it. E(steel) $=2 \times 10^{11}$ N/m^2).

Find:

a) The stress within the column

b) The strain on the column

12. A 200 kg horizontal beam is supported at each end. A 500 kg mass rests at one third of the way from one end. What is the vertical force on each of the supports?