IV. [12 points and 70 minutes] Could you please answer (7) questions from the following questions:

1. On the highway between Cairo and Alexandria, a car is traveling at a speed of 38 in./sec. Is this car exceeding the speed limit of 120 km/h. What if the driver is outside Egypt and is familiar with speeds measured in mil./h? What is the speed of the car in mil./h?

2. An auditorium measures 40.0 m x 20.0 m x 12.0 m. The density of air is 1.20 kg/m³. What are (a) the volume of the room in cubic feet and (b) the weight of air in the room in pounds?

3. Deduce Poiseuille's equations for flow of liquids through tubes?

4. Define: Half life time, decay constant, and activity of a radioactive substance, then state the physical units of radioactive activity?

5. Write short notes on production of X-rays experimentally, then state the physical properties of X-rays?

6. A 0.500 kg block connected to a spring for which the force constant is 20 N/m oscillates on a horizontal.
   - Calculate the total energy of the system and the maximum speed of the block if the amplitude of the motion is 3 cm?
   - What is the velocity of the block when the position is 2 cm?

7. A cable used to support an actor as he swung onto the stage. Suppose that the tension in the cable is 940 N as the actor reaches the lowest point. What diameter should a 10 m long steel wire have if we do not want it to stretch more than 0.5 cm under these conditions? (E=2.5x10⁵ N/m).

8. Convert the following temperatures into Fahrenheit scale:
   345 °K , 375 °C, - 45 °C and 0 °K.

9. Deduce an equation to determine the temperature °C, on a scale employing any property X.

Best regards

A. Elada

Prof. Dr. Amin El Adawy