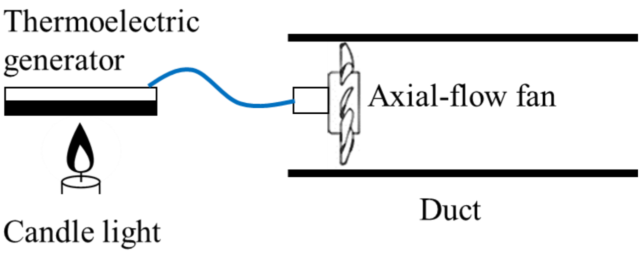
VG100 In-Class Quiz #1 Student No.______________ Student Name______________

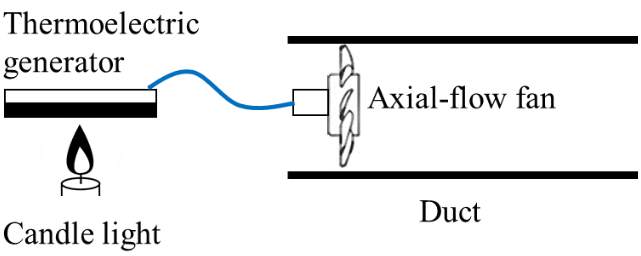
1. How much energy could be generated by completely burning a matchstick?

2. Determine the Wind Energy for (a) per unit mass, and (b) a flow rate of 1154 kg/s for air.

3. Draw the boundary of your "thermodynamic system" and provide a list of energy forms which enter or leave the system.
   (a) Select the fan as your system



   (b) Select the overall system, except for the candle light, as your system.



4. In the coming lab, you can measure the fan speed U (m/s), fan exit pressure (Pa), pipe exit diameter D (m), voltage V (volt) and current A (amp). How could you calculate the fan efficiency?

VG100 In-Class Quiz #2 Student No.______________ Student Name______________

1. Describe the difference of the physics between the premixed and non-premixed flame。

2. Should the electrical conductivity and thermal conductivity of good thermoelectric materials be higher or lower? Why?

3. Calculate the maximum efficiency for an ideal TE material, ZT_{avg}=1, T_h=250C; T_c=20C

$$\eta_{max} = \frac{T_h - T_c}{T_h} \frac{\sqrt{1 + ZT_{avg}} - 1}{\sqrt{1 + ZT_{avg}} + \frac{T_c}{T_h}}$$

VG100 In-Class Quiz #3   Student No._____________   Student Name_____________

1. Describe the physical modes of energy transfer by conduction.

2. What is the unit of thermal diffusivity? What is the physical meaning?

3. What are the assumptions made in Bernoulli's equation?

4. Draw the velocity triangles at the inlet and exit of a fan blade. Also show how a fan blade should be twisted from the hub to the tip. Why?

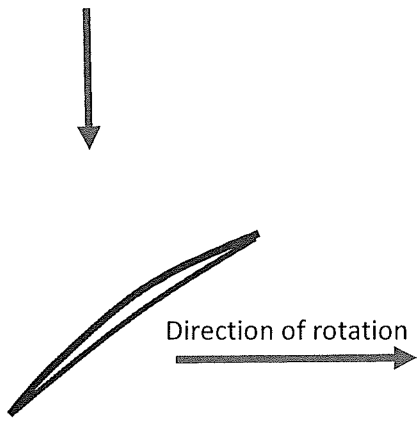
VG100 In-Class Quiz #4 Student No._____________ Student Name_____________

1. Explain the physics of the Coanda Effect.

2. Explain the essential nature of turbulence.

3. Explain the cause of boundary layer separation and why it is not favourable in many engineering applications.

4. Sketch a guide vane shape after the fan blade shown below. Draw all the velocity triangles at the inlet and exit of the fan blade, and the inlet of the guide vane.



VG100 In-Class Quiz #5   Student No.____________   Student Name____________

1. How many basic modes of fracture exist?

2. Why can the ducted fan produce a lot more thrust than an open rotor ? What are the other factors to consider in practice when choosing between ducted and ductless designs?

3. Describe how heat can be transferred by convection in liquids and gases.

4. Explain why convection can not take place in solids.

5. Why do the “microscopic air gaps” have to be filled to improve the heat sink performance?

VG100 In-Class Quiz #6 Student No.____________ Student Name____________

A long structural component of a bridge has an elliptical cross section. It is known that when a steady wind blows past this type of bluff body, vortices may develop on the downwind side that are shed in a regular fashion at some definite frequency. Since these vortices can create harmful periodic forces acting on the structure, it is important to determine the shedding frequency. For the specific structure of interest, D=0.1 m, H=0.3 m and a representative wind velocity is 50 km/hr. Standard air can be assumed. The shedding frequency is to be determined through the use of a small-scale model that is to be tested in a water tunnel. For the model Dm=20 mm and the water temperature is 20°. Determine the model dimension, and the velocity at which the test should be performed. If the shedding frequency for the model is found to be 49.9 Hz, what is the corresponding frequency for the prototype?

$$\mu_w = 1.0 \times 10^{-3}\ kg\ m^{-1}s^{-1},\ \ \rho_w = 998\ kg\ m^{-3}$$