# General remarks and frequent mistakes in Mid-Term Exam

The total points that you obtained during the midterm exam with a breakdown between the different exercises are now available in Moodle.

The mid-term exam counts 40 points and the final exam 60 points for a total of 100 points. These 100 points will be converted to a grade from 1 to 6 at the end and a scale adjustment will be applied only at the end. We suggest you focus on understanding the mistakes made during the mid-term rather than worrying too much about the number of points, which are meaningless now.

To help you, we summarize below frequent errors for each exercise and general advice for the final exam.

Please remember that these points may come back at the final exam, so please pay attention.

## Question 1:

This question basically required writing Bernoulli equation between multiple points to derive the pressure and velocity in the siphon.

Many of you did not even attempt to solve this exercise. We recommend to always write something down, maybe the Bernoulli equation between relevant points. Often, writing down equations could jump start your "*idea machine"* and score you some points! So do not leave a question empty ever.

We found that the most common mistakes made was about using gauge pressure and inverting signs.

## Questions 2:

This problem focuses on momentum balance and Bernoulli equation with friction to calculate the reaction force.

Most of you did well here, so well done!

The most common problem was, again, negative/positive signs in the momentum balance. Also, note that, friction force always applies in the opposite direction of the flow. Additionally, volume force in this question could not be neglected since the question asked you to take it into account.

## Questions 3:

This question was related to heat exchangers. In general, you did well in this exercise, the best one, so really well done!

Some frequent mistakes observed include the calculation of the logarithmic mean temperature in the heat exchanger $\Delta T_{lm}$. For some reason, some of you calculated $\Delta T_{lm}$ using °C and then added 273°C to probably convert the result to Kelvins. However, this is unfortunately wrong. Since the calculation of $\Delta T_{lm}$ includes $\Delta T_1$ and $\Delta T_2$ which are temperature differences, you can calculate $\Delta T_{lm}$ by using all the temperatures either in °C or K and you will get the exact same answer (you can try yourself if you are not convinced). Therefore, if you use °C, you should not add 273°C to the result. There were also a couple of mistakes regarding the units when calculating the heat transfer rate ($\dot{Q}$).

As general advice for all exercises, please carefully check the units in your calculations and do not hesitate to write them down to avoid these kinds of mistakes! Some of you were also confused with the different areas of a cylinder: do not confuse the cross-sectional area (i.e. $\frac{\pi D^2}{4}$) which is the area in which a fluid is flowing over a certain length when a fluid flows inside the tube and the surface area ($\pi \cdot D \cdot L$) which the outside surface. In a heat exchanger, the heat transfer occurs through the outside surface. Finally, the little difficulty in the exercise was that you have more than 1 tube in which the heat transfer occurs. Therefore, you should multiply the outside surface area of one tube by the number of tubes to have the total exchange area.

Questions 4:

This question was related to heat transfer in a cylindrical geometry.

Unfortunately, here many of you used the formula for a slab (i.e. L/kA for conduction). However, this is not correct for cylindrical geometry! You can check the slides, Module 3 p77-79, for the correct formulas to use and the derivation of the formulas. The surface area changes along r, which is different compared to the case with a slab. Therefore, you cannot use the same formula for conduction than for a slab.

Additionally, we have seen many mistakes in the numerical application. The formulas use the radius, but we were giving you the diameter in the exercise. Many of you just used the diameter without converting it to the radius.

General advice

We have also noticed that many of you added very few details about your calculations. This is not a problem if you do the exercise correctly. However, if the exercise is not solved correctly, not having details makes it difficult for us to understand what your mistake is. As general advice, write details. It will then be easier for us to understand what your mistake was and to give you more points.

We generally give points for formulas and intermediate calculation results, so the more details we have the more points we can give you. If you only write a single calculation/number with everything, not even explaining which formula you are using and the result is wrong, it is going to be difficult for us to give you many points. Instead, if you just write 1 sentence to explain which formula you are using, which values you are using and even intermediate results, it is going to be easier to add points.

Be smart, check the solutions and old exams solutions to have an idea on how you could report things!