

# Midterm $\beta$ , Physics 1P23/1P93

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Name	
Student ID	

No examination aids other than those specified on this examination script are permitted (FHB 5.1.2.A). Use or possession of unauthorized materials will automatically result in the award of a zero grade for this examination.

**This is a closed-book test, only calculators are allowed**  
**Formulas not on the supplied formula sheet must be derived**

**Attempt all questions**

Question	Mark	Out of
1	a b c d	2
2	a b c d	2
3	a b c d	2
4	a b c d	2
5	a b c d	2
6		10
7		10
Total		30

This exam contains 3 pages. Please, verify that your copy is complete.

*For questions 1–4: circle the correct answer on the cover page.*

- (2) 1. A large stone is resting on the bottom of the swimming pool. The normal force of the bottom of the pool on the stone is equal in magnitude to the
- a. weight of the water displaced by the stone.
  - b. weight of the stone.
  - c. difference between the weight of the stone and the weight of the displaced water.
  - d. sum of the weight of the stone and the weight of the displaced water.
- (2) 2. An industrial fabrication process stamps out thin metal pieces, each in the shape of a square with a circular hole in the middle, from a large thin sheet. These pieces are mounted in a large machine. As these pieces heat up during regular machine operation, the diameter of the circular hole will
- a. decrease.
  - b. stay the same.
  - c. increase.
  - d. behave unpredictably causing the machine to malfunction.
- (2) 3. You are driving a convertible with its soft ragtop roof up and the windows closed, at the 100 km/h speed limit. You observe that the roof
- a. bows inward.
  - b. is not changed from when the car was at rest.
  - c. bows outward.
  - d. impossible to tell without knowing the atmospheric pressure.
- (2) 4. When the translational speed of molecules in an ideal gas triples, by what factor does its absolute temperature change?
- a.  $\frac{1}{9}$
  - b.  $\frac{1}{3}$
  - c. 3
  - d. 9
- (2) 5. Object 1 has three times the specific heat capacity and twice the mass of Object 2. The two objects are given the same amount of heat. If the temperature of Object 1 changes by an amount  $\Delta T_1$ , then the change in temperature of Object 2 is:
- a.  $\Delta T_2 = 6 \Delta T_1$
  - b.  $\Delta T_2 = \frac{3}{2} \Delta T_1$
  - c.  $\Delta T_2 = \frac{2}{3} \Delta T_1$
  - d.  $\Delta T_2 = \frac{1}{6} \Delta T_1$

- (10) 6. Suppose an occlusion in an artery reduces its diameter by 15%, but the volume flow rate in the artery remains the same. By what factor has the pressure drop across the length of this artery increased?
- (10) 7. Two metal rods, one silver and the other gold, are attached to each other. The free end of the silver rod is connected to a steam chamber, with a temperature of  $100^{\circ}\text{C}$ , and the free end of the gold rod to an ice water bath, with a temperature of  $0^{\circ}\text{C}$ . The rods are 5.0 cm long, and have a square cross-section, 2.0 cm on a side. What is the temperature at the point where the two rods are in contact with one another? The thermal conductivity of silver is  $k_{Ag} = 417 \text{ W}/(\text{m}\cdot\text{K})$ , and that of gold is  $k_{Au} = 291 \text{ W}/(\text{m}\cdot\text{K})$ . No heat is exchanged between the rods and the surroundings, except at the ends.