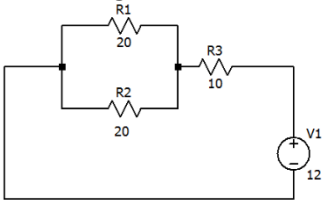
Examples of problems and Essay Topics that could appear in 1033C Exams.

In answering the problems it is not enough to have the correct answer, you must wrote 2 or 2 lines of text explaining the physics reasoning of your solution. For essays you can bring a PC to class or just write longhand.

1. On the Earth where the acceleration due to gravity g=10 m/s^2, a small pebble dropped from a height (unknown) reaches the ground in 4 seconds. The same pebble is transported to planet Vulcan where g= 2.5 m/s^2. How long does it take the pebble to hit the ground on Vulcan?
2. Two rockets ships are on a collision course. Each ship has a mass of 1000 tons and is moving at 100 m/s. When they collide the two ships fuse at the point of collision. State the final speed of the fused ships, and write down the law that you used.
3. The force between two electrically charged cylinders is 2 newtons when they are 1 meter apart. What is the force when they are 50 centimeters apart?
4. Helium gas is stored in a strong steel cylinder. If the pressure at 300 K is 200 bar, what is the pressure if it is heated to 450K?
5. Jane who has a mass of 150 kg sits in a canoe that has a mass if 75 kg. Jane jumps out of the canoe with velocity of 2m/s. What is the recoil velocity of the canoe?
6. A 12 volt battery is connected across the circuit of resistances shown in the figure. Calculate the current through R1. (The values of the resistances is in ohms.)



7. Explain in words how Eratosthenes measured the diameter of the Earth. (one page maximum).
8. A rocket ship of mass 100,000 kg is traveling at 50m/s. It burns 2000 kg of fuel that is converted to hot gas and ejected at 1000 m/s. What is the velocity of the rocket after the burn?
9. A car driving at 10 m/s passes a stationary police vehicle. At the moment of passing the police Vehicle, the car accelerates at 1m/s2. When does the police car catch up with the car?

Write an essay on one of the following topics (1.5 pages maximum):

(i) The importance of symmetries in Physics.
(ii) The contributions of Isaac Newton to Physics (or mathematics).
(iii) The importance of friction in everyday life.
(iv) Is the concept of relativity important for an accurate GPS?
(v) How could a pendulum measure the local acceleration due to gravity and why would that be useful?
(vi) Discuss the major contribution of Augustin de Coulomb to understanding electricity.
(vii) Describe how thunderclouds become electrically charged.