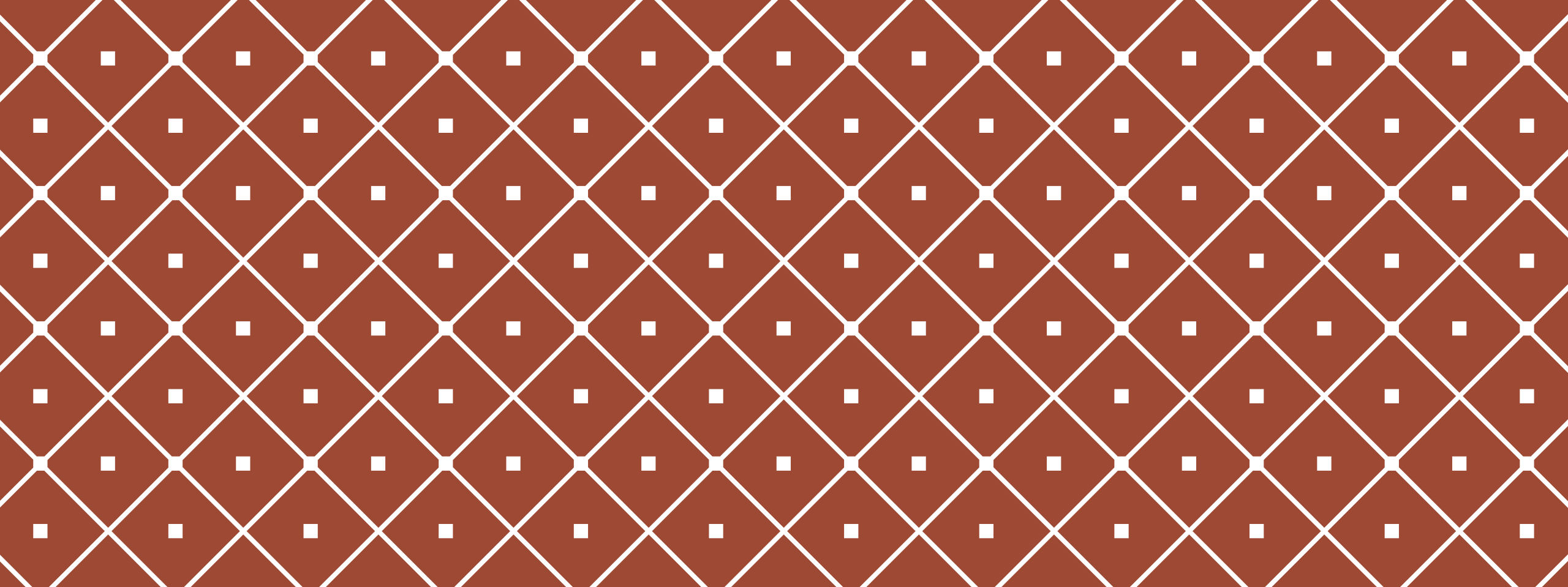




CHAPTER 4

Relative Equilibrium of Liquids

PART 1 Rectilinear Translation
(Moving Vessel)

I. Moving Vessel

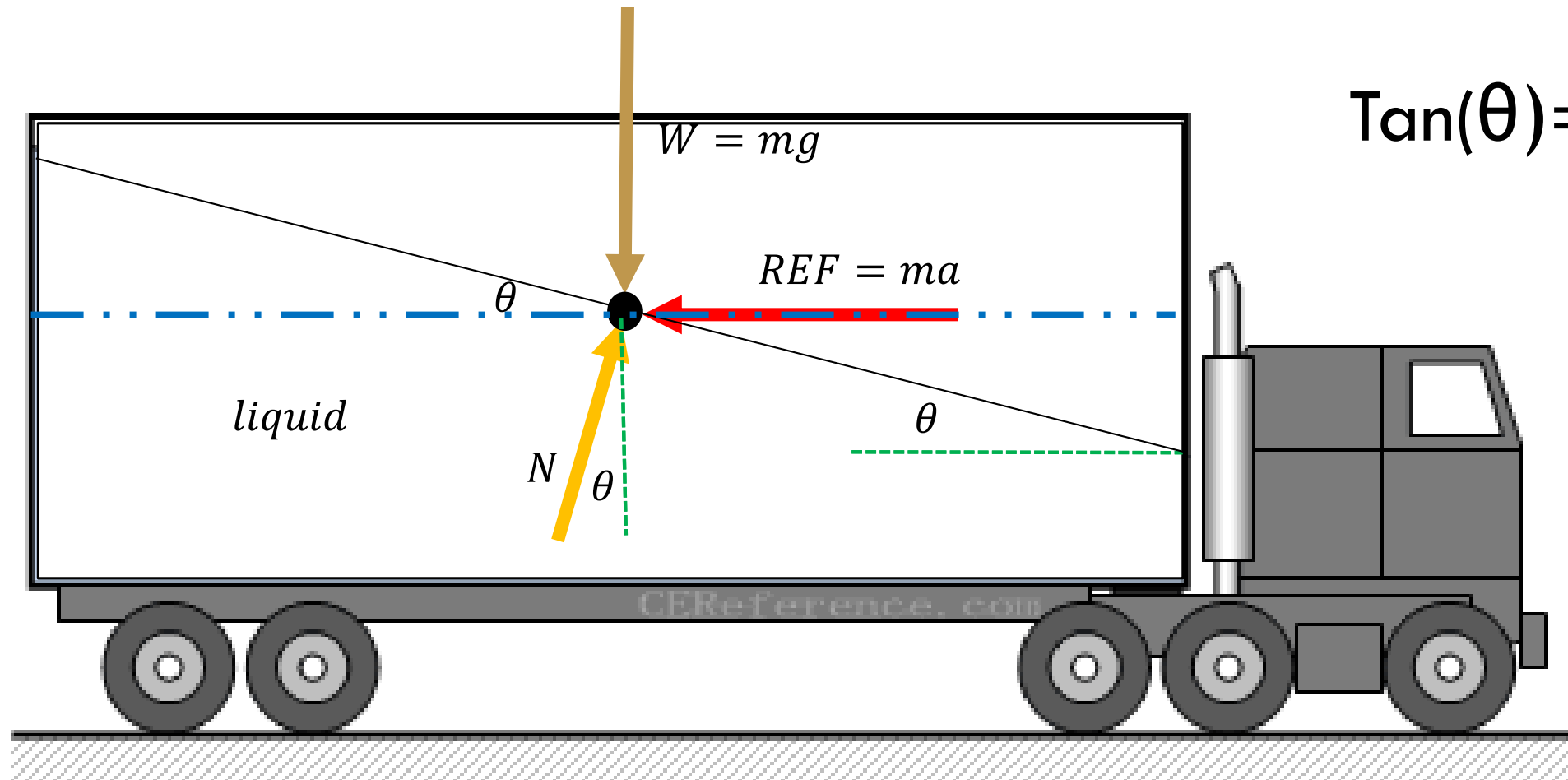
A. HORIZONTAL MOTION

B. INCLINED MOTION

C. VERTICAL MOTION

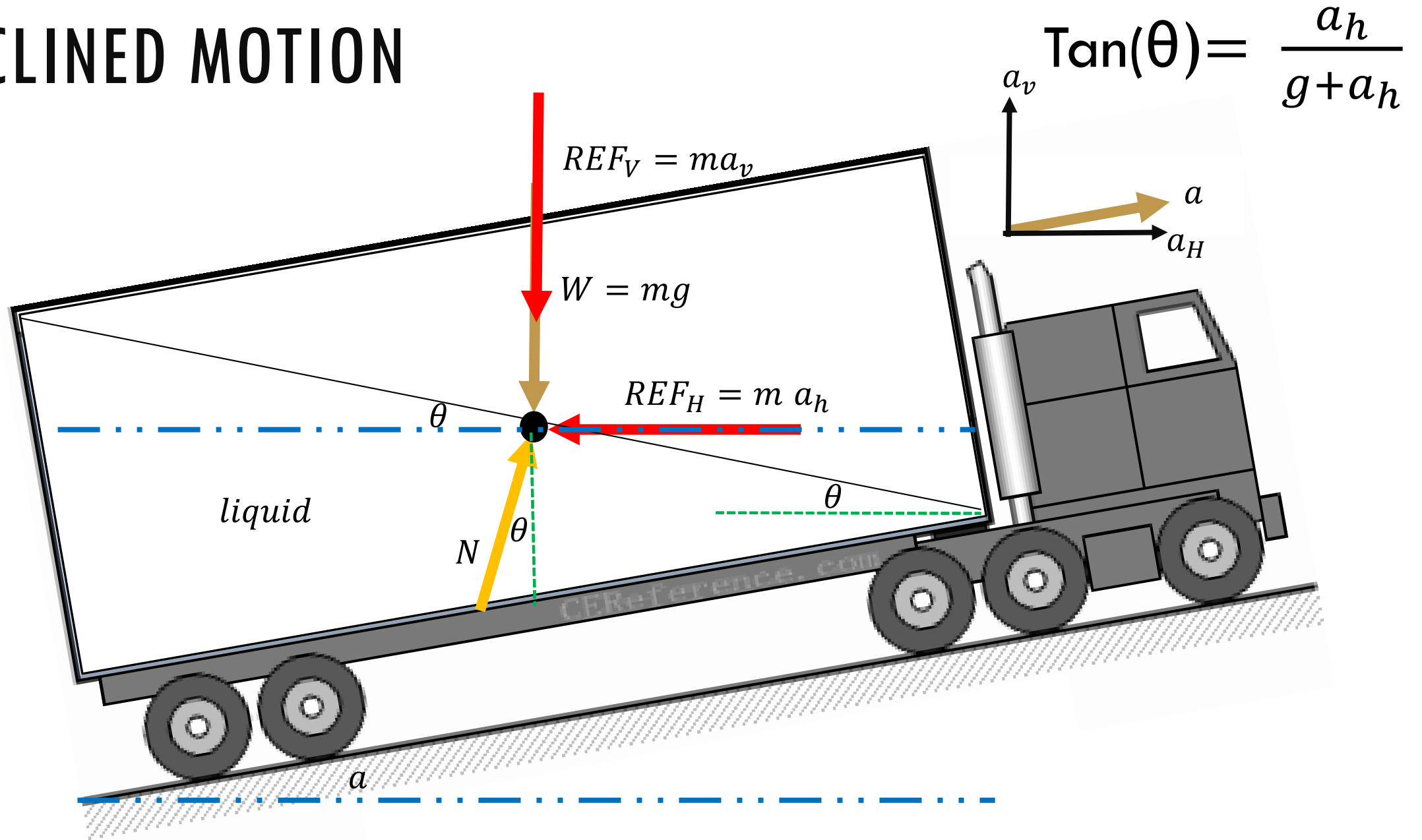
II. ROTATING VESSELS

A. HORIZONTAL MOTION

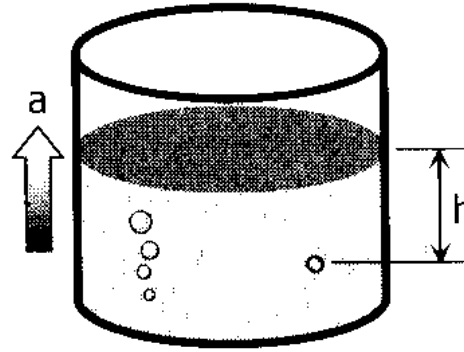


Fluid mass in horizontal accelerated motion

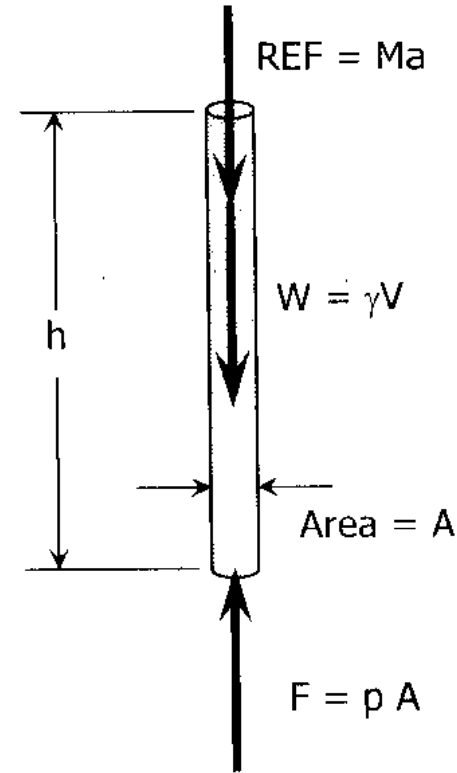
B. INCLINED MOTION



C. VERTICAL MOTION

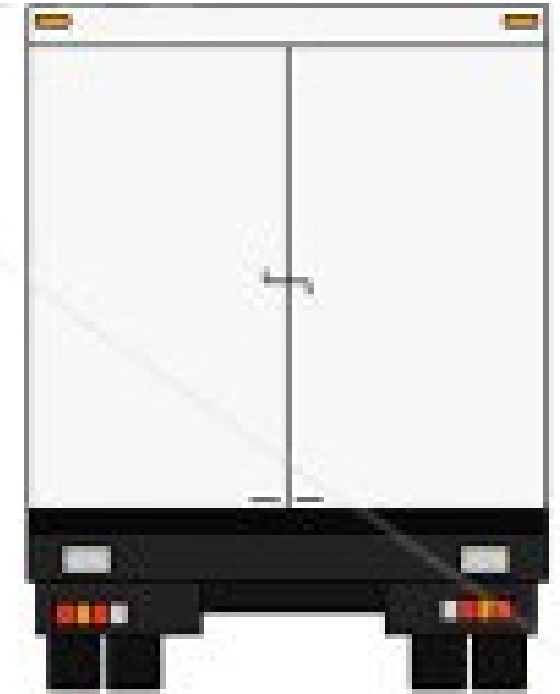
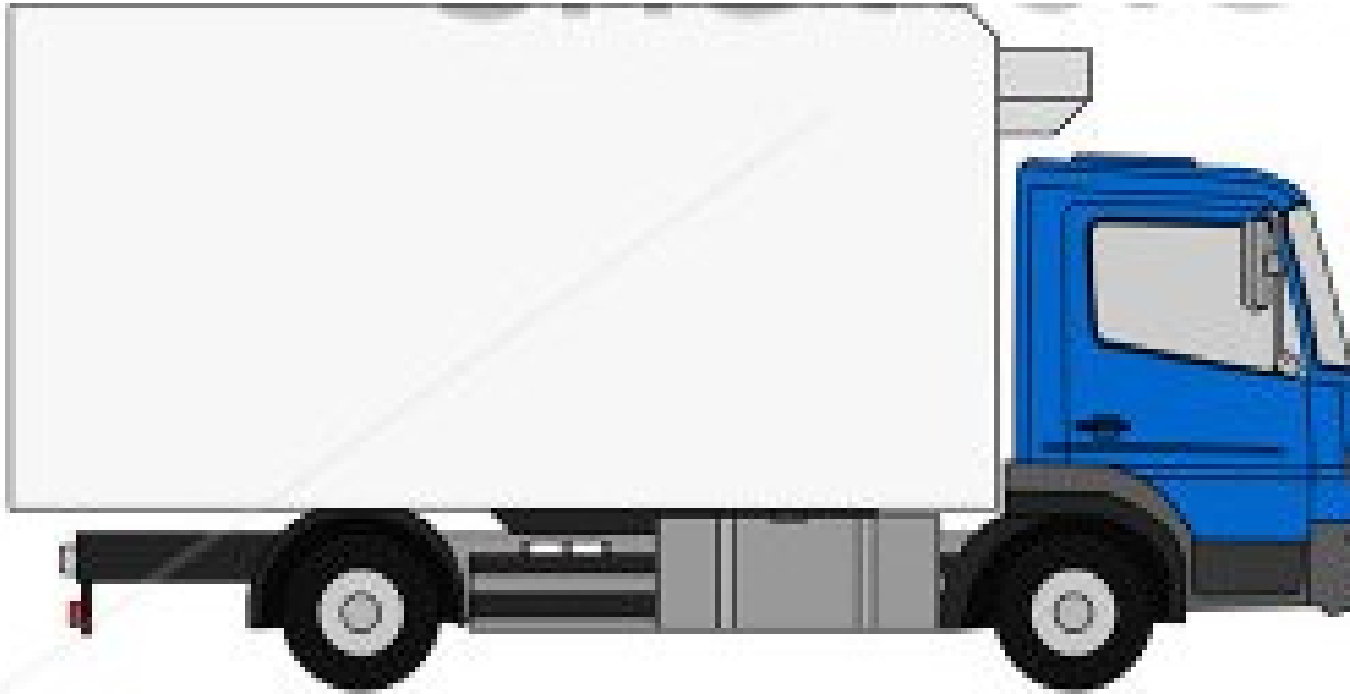


$$p = \gamma h \left(1 \pm \frac{a}{g} \right)$$

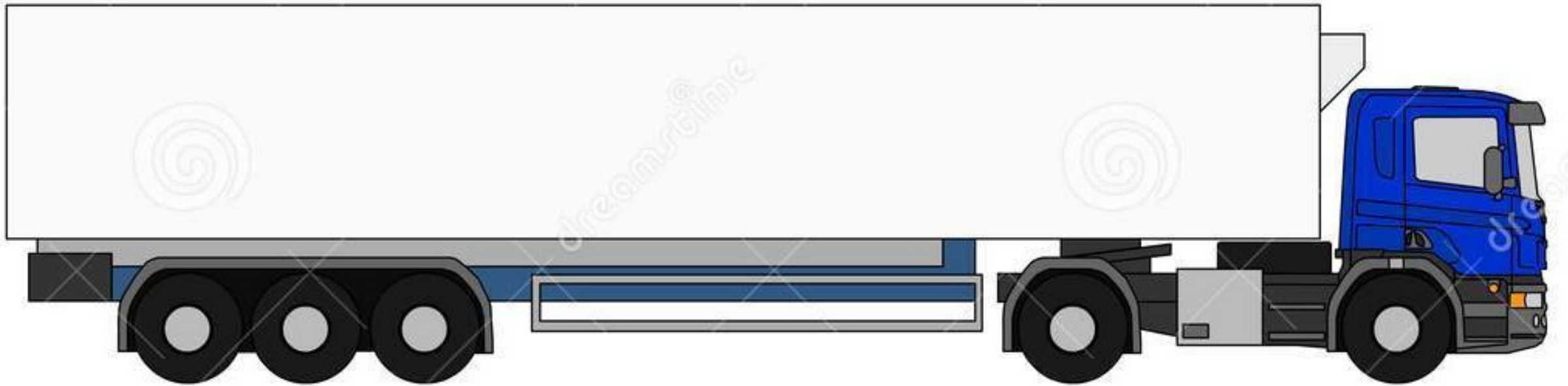


1. An open rectangular tank mounted on a truck is 5m long, 2 m wide and 3.5 m high is filled with water to a depth of 2 m.

- a. What maximum horizontal acceleration can be imposed on the tank without spilling any water (m/s^2)
- b. Determine the accelerating force on the liquid mass (kN)
- c. If the acceleration is increased to 6 m/s^2 , how much water is spilled out? (m^3)



2. A closed horizontal cylindrical tank 1.5 m in diameter and 4 m long is completely filled with gasoline ($SG=0.82$) and accelerated horizontally at 3 m/s^2 . Find the total force acting at the rear wall and at the front wall of the tank. Find also the accelerating force on the fluid mass.



3. A closed rectangular tank 4m long, 2 m wide, and 2 m high is filled with water to a depth of 1.8 m. if the allowable force at the rear wall of the tank is 200 kN, how fast can it be accelerated horizontally?



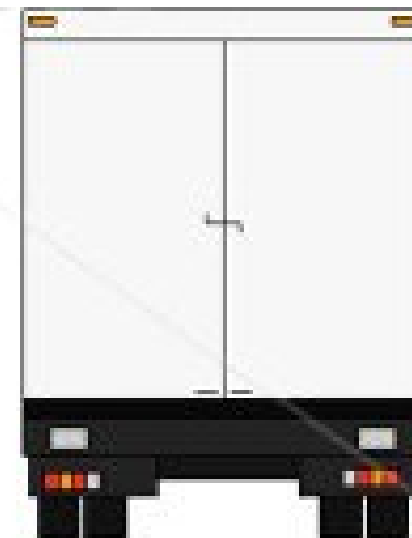
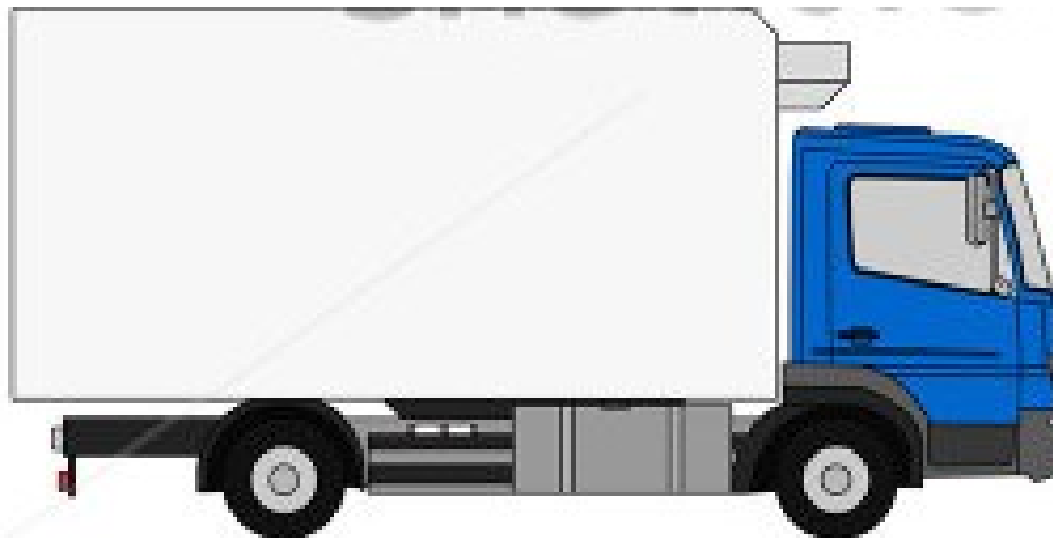
4.

A rectangular Car tank 20 m. long, 4 m. wide and 3 m. deep is completely open at the top. If it is initially filled to the top.

① How much liquid will be spilled if it is given a horizontal acceleration of 0.3 g , in the direction of its length.

② What is the max. force acting on the side opposite to the direction of the acceleration.

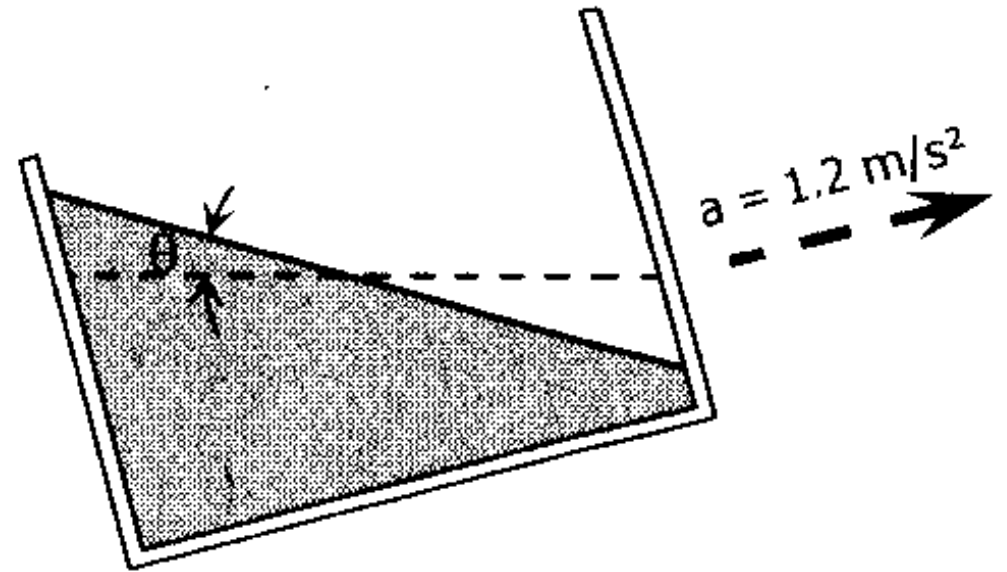
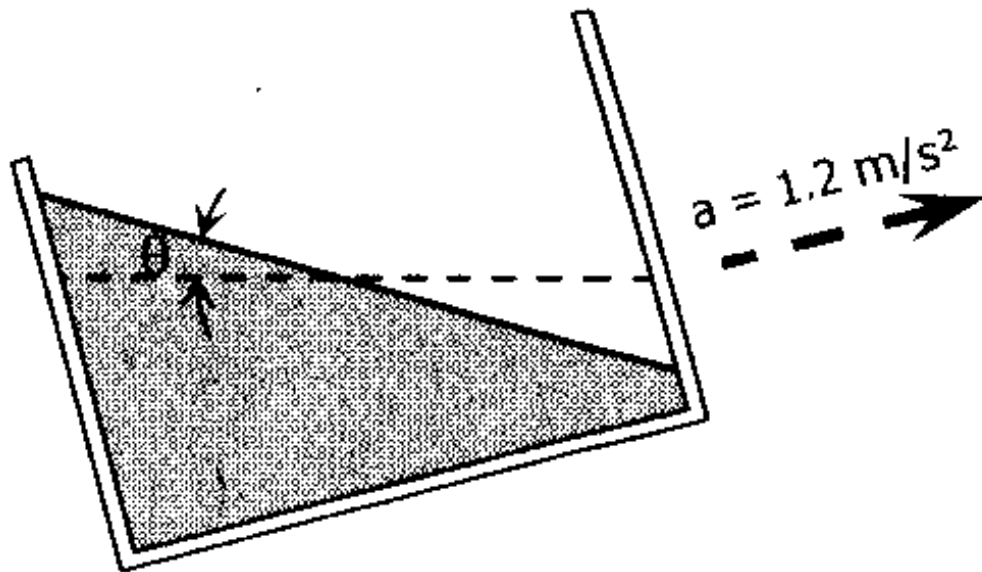
③ Determine the volume of the remaining water of the tank.



5. A vessel containing oil is accelerated on a plane inclined 15 degrees with the horizontal at 1.2 m/s^2 . Determine the inclination of the oil surface when the motion is

A. upwards (degrees)

B. downwards (degrees)



6. An open tank containing oil ($SG = 0.8$) is accelerated vertically at 8 m/s^2 . Determine the pressure 3 m below the surface if the motion is

- A. upward with positive acceleration
- B. upward with a negative acceleration
- C. downward with a positive acceleration
- D. downward with a negative acceleration.