# Physics 113 - Fall 2006 - workshop module 1
1-d kinematics

1. Appended to this workshop module, you will find two bread recipes.

a) Which of these recipes would be easier to make? Why do you think so?
b) If you were an inexperienced cook, what might make cooking difficult for you to learn?
c) Suppose you made bread from one of these recipes and it didn't rise as much as you would like.
d) What might you change in the recipe? What do you need to know in order to modify the recipe?
e) How might making bread be similar to doing physics problems?

2. The position of your car during a recent road trip on the interstate highway (essentially a straight line) is described by the position-time graph below, where North is assigned to be positive. You should begin this problem by redrawing the graph on a whiteboard or blank sheet of paper. Draw it large!

(a) When is the car's *speed* zero?
(b) Determine the car's approximate *average velocity* for the intervals
    (i)   from 0 to 6 hrs
    (ii)   from 2 to 4 hrs
    (iii)   from 4 to 11 hrs
(c) Determine the car's *average speed* for its entire 11-hour motion.
(d) Sketch the velocity versus time graph corresponding to this motion.
(e) From the graph below, estimate the average acceleration in the interval from 1 to 3 hours.
(f) At what times is the magnitude of the acceleration large. When is it positive? When is it negative?
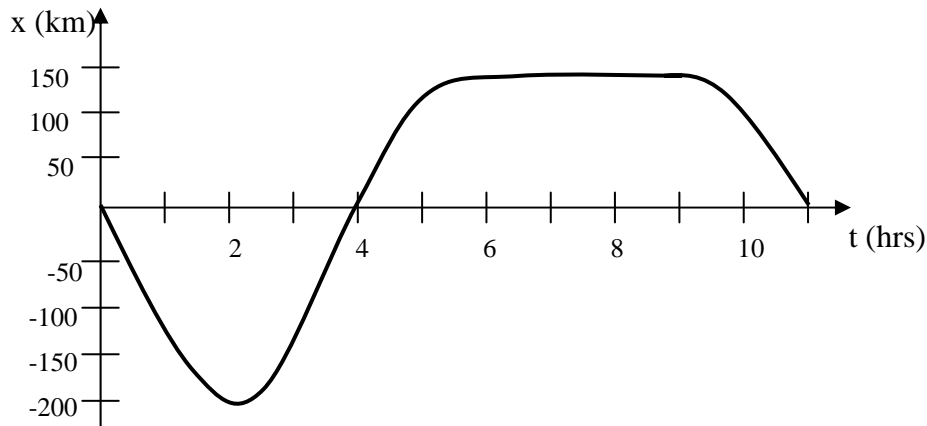
3. Smoky the cat is relaxing on the arm of a couch, one meter above the ground, when he is startled by something and jumps straight up in the air with initial speed 4 m/s. Coming down, he misses the couch because someone moves it while he is in the air so that Smokey lands on the ground. You can neglect air resistance in your answers below.

(a) What is Smoky's *acceleration*…
   (i)   …just after his paws leave the couch and he is on his way up?
   (ii)   …at the exact instant when he is at his maximum height?
   (iii)   …just before he hits the ground on his way back down?

(b) What is Smoky's maximum height above the ground during his motion?
(c) What is Smoky's velocity just before he hits the ground?
(d) How long is Smoky in the air?

4. You are on the roof of the lecture hall, 50 m above the ground. As your physics professor, who is 1.8 m tall, walks toward the hall at a constant speed of 1.20 m/s. If you wish to drop an egg on your professor's head (and commit P113 suicide), where should the professor be when you release the egg? Assume the egg is in free fall (i.e., you can ignore air resistance). (*Actual experimentation is discouraged.*)

5. A cat hears a member of the house staff opening a can of tuna and takes off at a run from its favorite sleeping spot on the couch. The magnitude of the velocity of the cat is given by Ct^2, where $C = 2$ m/s³. Assuming the cat runs in a straight line, how far does the cat run in two seconds?

6. A particle travels in one dimension. The graph below shows the velocity of a particle as a function of time. In the 12 seconds shown, the particle travels a distance of

a) 0 m
b) 1200 m
c) 640 m
d) 440 m
e) 200 m

Velocity, in m/s

Time, in seconds
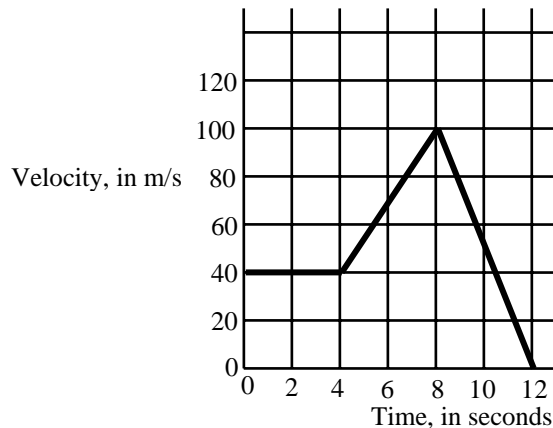
Nine-Grain Bread

¾ cup (6 fl oz/180 ml) water, boiling
½ cup (3 oz/90 g) 9-grain cereal
1¾ cups (8 oz/250 g) whole-wheat
  (wholemeal) flour
½ cup (2 oz/60 g) cake (soft-wheat)
  flour
2 teaspoons baking powder
1 teaspoon baking soda (bicarbonate
  of soda)
1 teaspoon salt
1½ cups (12 fl oz/375 ml) buttermilk
⅓ cup (4 oz/125 g) honey
⅓ cup (3 fl oz/80 ml) vegetable oil
1 egg

Nine-grain cereal usually contains cracked rye, barley, rice, corn, oats, millet, flax, soy and triticale. It is coarse and earthy and often valued for its fiber and nutrients. Look for it in health-food stores, and enjoy the crunchy texture and the taste of grain it imparts to this simple bread.

✖

In a small bowl pour the boiling water over the cereal and stir well. Let stand for 20 minutes, then drain off any remaining water.

Meanwhile, preheat an oven to 350°F (180°C). Grease and flour a large (9-inch/23-cm) loaf pan.

In a large bowl stir and toss together the whole-wheat flour, cake flour, baking powder, baking soda and salt. Set aside. In another bowl whisk together the buttermilk, honey, oil and egg until smooth. Stir in the cereal. Add to the combined dry ingredients and stir just until blended.

Spread in the prepared pan. Bake until a thin wooden skewer inserted in the center of the loaf comes out clean, 55–60 minutes. Cool in the pan for 10 minutes, then turn out onto a wire rack to cool completely.

Makes 1 large loaf

SOURDOUGH RYE BREAD

2 Round or 2 Long Loaves

The best-flavored rye breads call for sourdoughs, 514. We love this recipe which comes from Merna Lazier, who has run, among many other successful projects, a bakery of her own. She says: "You may object to the number of stages in this process, but I must say that old-time bakers who were proud of their rye bread really nursed it along—so there must be a reason." For this recipe, on one day you make a sourdough, using ½ cake of yeast. The following day, you make two sponges, using the other ½ cake of yeast.

The first day, prepare the sourdough. Mix in a bowl and work together lightly:

½ cup rye flour
½ cup water
½ cake compressed yeast

Cover this sourdough lightly so it will not dry out, and keep it in a warm place at about 85° for 24 hours. Then work into it:

¾ cup water
1 cup rye flour

The sourdough should be ready to use after it has fermented, covered, 4 hours longer.

Sponge I. Mix into the above sourdough:

1¼ cups rye flour
⅔ of ½ cake compressed yeast
¼ cup water

Allow this sponge to rise, covered with a damp cloth, at 85° until it doubles in bulk.

Sponge II. Add to Sponge I:

1¼ cups rye flour
1¼ cups all-purpose flour
Remaining ⅓ of ½ cake compressed yeast
1 cup water

Mix until smooth. Cover with a damp cloth and let rise until doubled in bulk. Then add:

1 cup water
1 tablespoon salt
1¾ cups all-purpose flour
1 tablespoon caraway seed

Mix until smooth, then let the mixture rest, covered, 20 minutes. Turn the dough out onto a floured board and mix and knead into it:

1½ to 2 cups all-purpose flour

depending on the flour, until you have a rather firm dough—one that will not flatten or spread. Divide and shape it into 2 long or 2 round loaves. Place them on a greased pan and allow to rise, but not double in bulk. Too much rising will result in a flat loaf.

Preheat oven to 425°.

Place a flat pan containing about one-fourth inch water in the oven. Bake the loaves 50 to 60 minutes. You may have to replenish the water, but ▶ remove the pan after 20 minutes. As soon as the bread is done, spread it with:

Melted butter

or, if you wish a glazed crust, spread with:

Salted water—1 teaspoon salt
to ½ cup water

Cool loaves on a rack, away from drafts.