Fri: Test 1 in class (50 min)
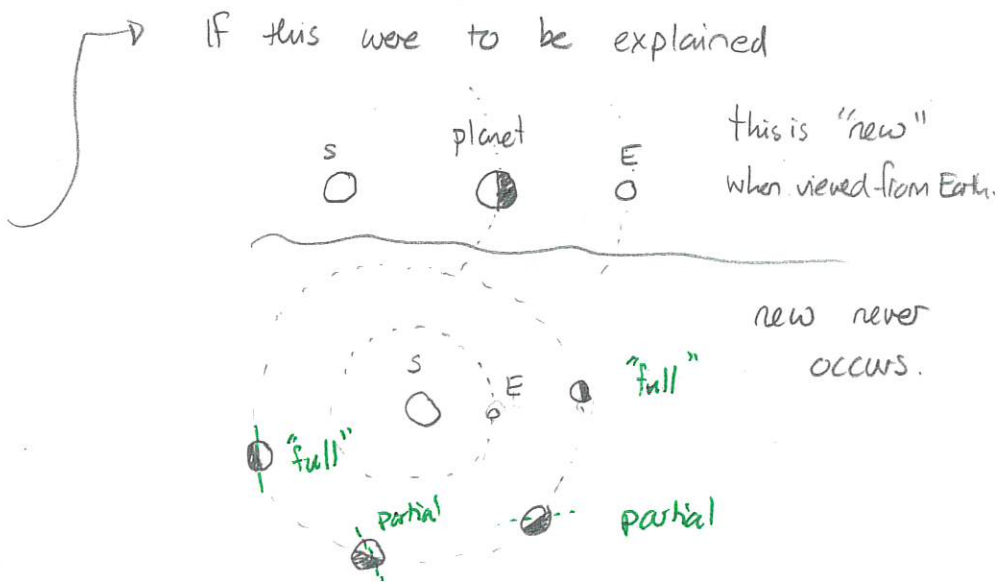
* Duration: 50 min

* Covers: Ch 1 → Ch 5.2

  Lectures 1 → 16

  HW 1 → 4

* Bring: Calculator – no communicating devices

* Given: Equations on front of exam

* Study: 2023 Test 1 All except Q3

  2022 Test 1 All except Q 3,4.

Ch 1.1 → 1.4

.Know – what the simple geocentric model means
– what the heliocentric model means
– how to use the models to predict what you can observe from Earth for

    * planetary motion

    * apparent size

    * phases.

Quiz 1 70%

Quiz 2 70%

If this were to be explained

this is "new" when viewed from Earth.

new never occurs.

new

Ch 2.4   Powers of 10

    Know: - how to use powers of 10
           - how to estimate.

Quiz3 20% ~ 60%

1 Quantity of money

A bag contains many US nickel coins. To determine the total value and to avoid counting them, you weigh the bag and find that is has mass 1.645 kg. You know that the mass of one nickel is 5.0 g.

a) Determine the number coins in the bag.

b) Determine the value of the money in the bag.

Answer: a)   total mass = (number of coins) × (mass one coin)

$$\Rightarrow \text{(number of coins)} = \frac{\text{total mass}}{\text{mass one coin}}$$

Now $1.645 \text{ kg} = 1.645 \times 10^3 \text{ g} = 1645 \text{ g}$

$$\Rightarrow \text{(number of coins)} = \frac{1645 \text{ g}}{5 \text{ g}} = 329 \text{ coins.}$$

b)   Each nickel is worth $0.05. Thus the value is

total value = number of coins × value one coin

$$= 329 \times \$0.05$$

$$= \$16.45$$

Ch 3.1 → 3.6

Know — meaning of speed, velocity, acceleration
— free fall motion

Quiz 4   90%

Quiz 5   30% - 50%

Exercise 2 (next page)

Quiz 6   90%

Exercise 3

2 Balls on slopes

Two balls roll down ramps inclined at different angles. Their speeds at moments 3 s apart are illustrated. Which ball has the larger acceleration? Explain your answer.

2 m/s

8 m/s

Ball A

9 m/s

12 m/s

Ball B

Answer: accel = $\dfrac{\text{change in speed}}{\text{time elapsed}}$] show this

A   change in speed = 8 m/s − 2 m/s] show this

= 6 m/s

accel = $\dfrac{6 \text{ m/s}}{3 \text{ s}}$ = 2 m/s²

B   change in speed = 12 m/s − 9 m/s = 3 m/s

accel = $\dfrac{3 \text{ m/s}}{3 \text{ s}}$ = 1 m/s²

Ball A has larger acceleration
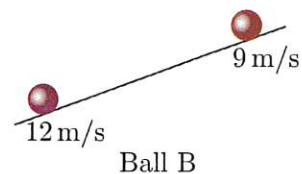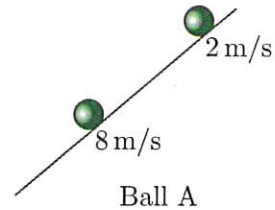
3 Accelerating cheetah

At one moment a cheetah is at rest. After that it has a constant acceleration of 3.0 m/s². Determine its speed 5 s after it starts to move.

speed later = speed earlier + acceleration × time

= 0 m/s + 3.0 m/s² × 5 s

= 15 m/s

## Ch 4.1 → 4.5

Know - forces tend to produce acceleration

- Newton's Laws and how to use them

Quiz 7 60%

Quiz 8

4 Trains

Two locomotives are connected to train cars as illustrated. The mass of the train is 200,000 kg. Locomotive 1 pushes right with force 6000 N. Locomotive 2 pulls right with force 10000 N. Air resistance pushes left with force 4000 N on the locomotive in the front.

Loc 1	Train cars	Loc 2
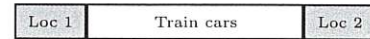
a) Determine the acceleration of the train.

b) Suppose that the train was initially at rest. Determine the speed of the train one minute after the locomotives start to push/pull.

c) Determine the speed of the train another two minutes later.

Answer
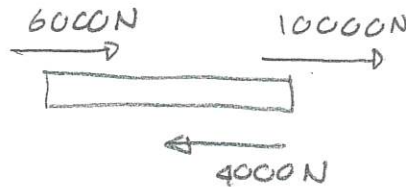
6000 N   10000 N

4000 N

a) Acceleration = net force / mass.

net force = 10000 N + 6000 N - 4000 N = 12000 N

Acceleration = 12000 N / 200000 kg = 0.06 m/s²

b) speed later = speed earlier + accel × time
   (1 min)   (0 min)   ↳ 60 s

   = 0 m/s + 0.06 m/s² × 60 s = 3.6 m/s

c) speed later = speed earlier + accel × time
   (3 min)   (1 min)

   = 3.6 m/s + 0.06 m/s² × 120 s = 10.8 m/s
   (2 min)

Ch 5,1 → 5.2

know: Newton's Law of Gravitation

Quiz 9