

Thurs: Seminar WS 160 at 12:30

Friday: Test 1 in class meeting time

- * Duration: 50 minutes
- * Covers Ch 1 → Ch 5.2
 - ↳ Lectures 1 → 16
 - HW 1 → 4
- * Bring: Calculator (no phones allowed)
- * Given: Formulas/Equations on front of exam. 2022
- * Review: 2021 Test 1 All except Q2
2022 Test 1 All except Q3

Chapter 1.1 → 1.4

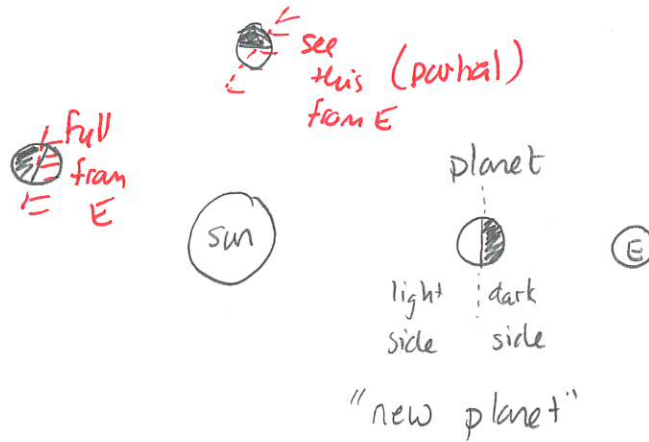
Know - meaning of geocentric and heliocentric models of solar system; evidence for these

- how to use diagrams to reason about models of solar system and make predictions.

Quiz 1 80%

Quiz 2 50% -

We can explain the latter using diagrams. The new phase can only occur when the planet is between Earth and Sun



Ch 2.1 → 2.5

- Know - meaning + basic properties of atoms, elements
- evidence for atoms: Brownian motion
 - explanatory power of atoms: gas properties
 - powers of 10, scientific notation.
 - units,

Quiz 3 80% - 100%

1 Molecules of water

A molecule of water consists of a single oxygen atom and a two hydrogen atoms and has mass approximately 3.0×10^{-26} kg. One liter of water has mass 1.0 kg.

- Determine the number of water molecules in one liter of water.
- Determine the total number of atoms in one liter of water.

Answer: a) number of molecules = $\frac{\text{total mass water}}{\text{mass one molecule}}$

$$= \frac{1.0 \text{ kg}}{3.0 \times 10^{-26} \text{ kg}}$$
$$= \frac{1.0 \times 10^0}{3.0 \times 10^{-26}} = \frac{1.0}{3.0} \times 10^{26}$$
$$= 0.33 \times 10^{26}$$
$$= 3.3 \times 10^{25}$$

b) Each molecule has three atoms

$$\text{number of atoms} = 3 \times \text{number of molecules}$$

$$= 3 \times 3.3 \times 10^{25} = 10 \times 10^{25} = 10^{26} \quad \square$$

Ch 3.1 → 3, 6

Know - meaning of speed, velocity, acceleration
- properties of free fall

Quiz 4 100%

Quiz 5 50% - 80%

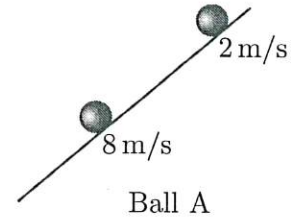
Exercise (next page) then

Quiz 6 90%

2 Balls on slopes

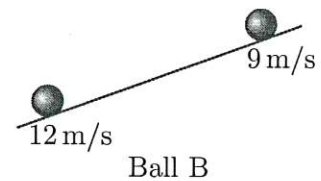
Two balls roll down ramps inclined at different angles. Their speeds at moments 3 s apart are illustrated. Which ball has the larger acceleration? Explain your answer.

$$\text{Acceleration} = \frac{\text{change in speed}}{\text{time elapsed}}$$



Ball A

$$\begin{aligned} \text{Accel} &= \frac{8 \text{ m/s} - 2 \text{ m/s}}{3 \text{ s}} \\ &= \frac{6 \text{ m/s}}{3 \text{ s}} = 2 \text{ m/s}^2 \end{aligned}$$



Ball B

$$\text{Accel} = \frac{12 \text{ m/s} - 9 \text{ m/s}}{3 \text{ s}} = \frac{3 \text{ m/s}}{3 \text{ s}} = 1 \text{ m/s}^2$$

The numbers show A has the greater acceleration.

3 Accelerating cheetah

At one moment a cheetah is at rest. After that it has a constant acceleration of 3.0 m/s^2 . Determine its speed 5 s after it starts to move.

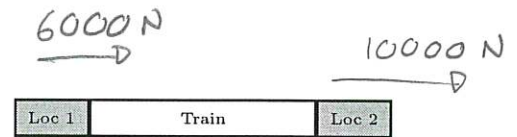
$$\begin{aligned} \text{change in speed} &= \text{acceleration} \times \text{time} \\ &= 3.0 \text{ m/s}^2 \times 5 \text{ s} \\ &= 15 \text{ m/s} \end{aligned}$$

Ch 4.1 → 4.5

Know - how to use Newton's Laws.

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.



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

Answers: a) $accel = \frac{\text{net force}}{\text{mass}}$

$$\begin{aligned}\text{net force} &= 10000 \text{ N} + 6000 \text{ N} \\ &= 16000 \text{ N}\end{aligned}$$

$$accel = \frac{16000 \text{ N}}{200000 \text{ kg}} = 0.08 \text{ m/s}^2$$

$$\begin{aligned}\text{b) change in speed} &= accel \times \text{time} \\ &= 0.08 \text{ m/s}^2 \times 60 \text{ s} \\ &= 4.8 \text{ m/s}\end{aligned}$$

Quiz 7

Ch 5.1 → 5.2

Know: Newtons Law of Gravitation

Quiz 8 80%