

2 The Seven International Units

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Question box 2.1

F1 In 1999, the Mars Climate Orbiter satellite burned up in our neighboring planet's atmosphere. What was the main reason for this accident?

a) solar panel got stuck, b) it ran out of fuel, c) collision with a meteor or d) calculation mistake by the engineers.

F2 ►L The following units are still used today for measurement: inch, yard and foot. Do you know how long each is in cm or m?

F3 ►L Resolution for printers is given in the unit "dpi"; one of the most common being 600 dpi. Do you know what dpi stands for and what it means?

F4 ►L Can you remember from your history classes which units of measurement were used in the past in Austria?

F5 ►L A dozen means "12" of something. Do you know what 144 used to be called?

F6 There are two metal bars mounted next to the main entrance at Saint Steven's Cathedral in Vienna. Do you know what these bars were used for in the past?

F7 Review again what Galileo was supposed to have said about measuring. Why is this principle so important in physics?

key words excerpt

International System of Units – das Internationale Einheitensystem

atmosphere – die Atmosphäre

inch(es) – das Zoll

yard(s) – das Yard, die Yards

resolution – die Auflösung

dozen – ein Dutzend

purpose – der Zweck

to serve a purpose – einen Zweck erfüllen

conversion – Konvertierung, Umformung

measuring – die Messung

Question box 2.2

F8 What is the earth's mass? What is the diameter of an atom? Try guessing.

F9 ►L Is earth's mass always constant, or does it change as time passes?

F10 ►L With personal computers you are familiar with the terms kilobyte, megabyte, and gigabyte, but do you know what each term means? And what is a teraflop?

F11 What do you mean when you talk about an astronomical amount of money?

F12 What is meant by the term "light year"? Is this unit for measuring time or distance?

key words excerpt

mass – die Masse

diameter – der Durchmesser

personal computer – der Computer (PC)

light year – das Lichtjahr

unit – die Einheit

exponent – der Exponent

exponential – exponential

Question box 2.3

F14 Measure the width of your thumb. Next measure the distance from the tip of your nose to your thumb while stretching out your arm to your side like in figure 2.4. How far is it?

F15 Imagine there is no standard unit for measuring distance. Is there anything found in nature that is always the same and universally available which could be used to define a unit of measure for distance?

F16 ►L What happens to metal objects when they get warmer or colder? Why does this create problems when measuring distances?

F17 ►L Are there such things as smallest and largest distances?

key words excerpt

width – die Breite

standard unit – die einheitliche Messeinheit

circumference – der Umfang

to measure – messen

available – verfügbar

natural measurement – das Naturmaß

Question box 2.4**F19** What does time mean to you? Talk with your neighbour about time and how you can describe it.**F20 ►L** It has been impossible to measure the speed of light since 1983. This sounds strange, but it is true all the same. But why? Hint: the answer has to do with the definition of a meter.**F21** Imagine you are alive 10,000 years ago and want to construct a clock. What would best lend itself to measuring time.**F22 ►L** How many degrees does the sun move across the sky in one hour? Try to work out the answer in your head.**F23** Exactly how many seconds does a day have? Is this number constant, or can days have varying numbers of seconds?**F24 ►L** Are there such things as longest and shortest time?**key words excerpt**

speed of light – die Lichtgeschwindigkeit

time measuring – die Zeitmessung

measurements – die Messwerte

degree – das Grad (Winkelmaß)

sun diameter – der Sonnendurchmesser

time zones – die Zeitzonen

local time – die lokale Zeit

mechanical clocks – die mechanischen Uhren

pendulum clocks – die Pendeluhr

quartz clocks – die Quarzuhr

atomic clocks – die Atomuhren

Question box 2.5**F27** You have seen pictures of astronauts jumping on the moon. This happens because: a) they weigh less on the moon, b) they have less mass on the moon, c) both, d) none of the above.**F28** What is the difference between mass and weight? What is mass?**key words excerpt**

mass – die Masse

weigh – das Gewicht

prototype kilogram – das Urkilogramm

scale – der Maßstab

glass lid – der Glasdeckel

Question box 2.6**F29** What mass does a cork ball have if its radius measures one meter? Guess first, then make an estimate.**F30** Try to explain why you sink in water in very simple terms. Why doesn't an iceberg sink? And why doesn't a steam ship sink although it's made of steel.**F31 ►L** Estimate the mass of the air in the physic lab. Use table 2.3.**key words excerpt**

cork ball – die Korkkugel

radius – der Radius

iceberg – der Eisberg

density – die Dichte

volume – das Volumen

