Faculty of Exact Sciences

Department of Physics

First Material Sciences

Unit 2   Matter and measurement

READING PASSAGE :

Matter and measurement

Matter, in science, is the general term applied to anything that has the property of occupying space and the attributes of gravity and inertia. In classical physics, matter and energy were considered two separate concepts that lay at the root of all physical phenomena. Modern physicists, however, have shown that it is possible to transform matter into energy and energy into matter and have thus broken down the classical distinction between the two concepts. When dealing with a large number of phenomena, however, such as motion, the behavior of liquids and gases, and heat, scientists find it simpler and more convenient to continue treating matter and energy as separate entities.

Certain elementary particles of matter combine to form atoms; in turn, atoms combine to form molecules. The properties of individual molecules and their distribution and arrangement give to matter in all its forms various qualities such as mass, hardness, viscosity, fluidity, color, taste, electrical resistivity, and heat conductivity, among others. In philosophy, matter has been generally regarded as the raw material of the physical world, although certain philosophers of the school of idealism, such as the Irish philosopher George Berkeley, denied that matter exists independent of the mind.

Matter exists in three states: solid, liquid and gas. A solid, for example a stone, has a definite shape and a definite volume; a liquid, for example oil, has definite volume but no definite shape; a gas, for example hydrogen (H), has neither definite shape nor volume. Water can exist in all three states; below $0\ ^{o}C$ as a solid (ice); between $0\ ^{o}C$ and $100\ ^{o}C$ as a liquid (water); and above $100\ ^{o}C$ as a gas (vapor). All matter consists of elements, or of compounds .

When we measure quantities of matter, we may use the fundamental units of time (e.g. the second), mass (e.g. the kilogram) and length (e.g. the meter). Or we may use the units such as area (e.g. m^2) or volume (e.g. cm^3) or density (e.g. g/cm^3).

__Grammar__

__Types of measurements with examples__

1- Adjectives:	It is to come up with the word and its opposite and synonyms	deep ≠ shallow, far ≠ near, fast ≠ slow , heavy ≠ light, high ≠ low, long ≠ short, odd ≠ even, thick ≠ thin, (wide = broad) ≠ narrow, accurate ≠ inaccurate, average = mean, standard ≠ sub-standard.
2- Nouns and Rules for noun formation – suffixes:	Nouns:	amount, extent, measurement, range, size, span, speed, accuracy, average, level, mean, rate, scale, stage, step, check, study, survey, area, circumference, cross-section, diameter, radius.
	Adjective/verb + th/t (+ vowel change):	Deep → depth , high → height, long → length, weigh → weight, wide → width.
	Adjective + ness:	Hard → hardness, heavy → heaviness, near → nearness, thick → thickness.
	Verb + ment:	To develop → development, to measure → measurement, to move → movement.
3- Verbs: Rules for forming verbs:	Noun/Adj : (No change)	Narrow / thin → to narrow / to thin, range/ span/ extent → to range/ to span/ to extend, reach → to reach, rate/ check/ monitor → to rate/ to check/ to monitor, record/ plot → to record/ to plot.
	Noun/Adjctive + en:	deep → to deepen, length → to lengthen, short → to shorten, thick → to thicken, wide → to widen.
	Noun/ Adjective + adverb particle:	(Slow, speed) → to slow down ≠ to speed up, step → to step up, check → to check up, Level → to level off, work → to work out.

Structures :	Dimensions can be expressed by four structures.	It is 78 m high, or it is 78 m in height, or its height is 78 m, or it has a height of 78 m.
Area:.	To obtain the area, you multiply the length by the width	100 cm^2 (a hundred square cm). πr^2 (pi r squared). $\sqrt{X}$ (the square root of x).
Volume:	To obtain the volume, you multiply the length by the width by the height	The volume is 1000 cm^3 (a thousand cubic centimeters). x^3 (x cubed). $\sqrt[3]{y}$ (the cube root of y).
Power:	It is a mathematical term for the exponent	X^7 (x to the power seven or x to the seventh). x^{-7} (x to the power minus seven or x to the minus seventh).

Approximate measurements:	These can be expressed by means of adverbial modifiers.	-It is approximately 8 cm long. -It is about (roughly / more or less) 8 cm long. -It is almost (nearly) 8 cm long. -It is a little over (slightly under) 8 cm long.
Questions:	is the question using the How: much, many, long, often, far, old or what	-It weighs 27 kg → How heavy is it? Or How much does it weigh? Or What does it weigh? -It is 7 km away → How far (away) is it? Or How many kilometers away is it? Or What is the distance?

Teacher : farouk ladjailia