

科学技術英語2C

第6回

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先週までは力学

- 今週からは、物質の物理(material physics)。その後、電磁気(electromagnetism)、電磁波(electromagnetic wave, 光(light)、現代物理学(modern physics)へと進む。

1.7 微分, 積分, 總和 (derivative, differential, integral, sum)

Δf delta f / finite difference of f

dx differential of x

$\frac{df}{dx}$ $d f$ $d x$

$\frac{df(x)}{dx}$ $d f$ of x $d x$

$\frac{\partial f}{\partial x}$ dif f to dif x / the partial derivative of f with respect to x / round f round x

$D_x f$ D sub x of f / the derivative of f with respect to x

$\delta f(x)$ small difference in the function f of x

$\int_a^b f(x) dx$ the integral from a to b of f of x with respect to x

\iint double integral

\iiint triple integral

\oint circuital integral / integral round a closed circuit

$\sum_{i=1}^n a_i$ the sum from i equals one to n of a sub i /
the sum of all terms of a sub i from i equals one to i equals n

$\prod_{i=1}^n a_i$ the product from i equals one to n of a sub i /
the product of all terms of a sub i from i equals one to i equals n

1.8 等式, 不等式 (equation, inequality)

$31 \div 7 = 4 \text{ r } 3$ Thirty-one divided by seven is four with a remainder of three.

$4.1 - 8.3 = -4.2$ Four point one minus eight point three equals minus [negative] four point two.

$2^2 = 4$ Two squared is four.

$2^3 = 8$ Two cubed is eight.

$2 : 3 = 4 : 6$ Two is to three as four is to six.

$a = b$ a equals b . / a is equal to b .

$a \parallel b$ a is parallel to b .

$\therefore a = b$ Therefore a equals b .

$\because a = b$..., since a equals b .

$a : b = c : d$ a is to b as c is to d .

$3x + 2x = 5x$ Three x plus two x equals five x .

$y = -5x^2 + 2x + 4$ y equals minus five x squared plus two x plus four.

$$(x + y)^2 = x^2 + 2xy + y^2$$

The quantity x plus y squared is x squared plus two xy plus y squared. ^{4/}

Open parenthesis x plus y close parenthesis squared is x squared plus two xy plus y squared. ²

$$(x + y)(x - y) = x^2 - y^2$$

The quantity x plus y times the quantity x minus y equals x squared minus y squared. ⁵

Open parenthesis x plus y close parenthesis, open parenthesis x minus y close parenthesis, is equal to x squared minus y squared. ²

$$x^2 + y^2 = z^2$$

x squared plus y squared equals z squared. ⁶

hierarchical structure of matter

- atom, molecule
- electron, nucleus (pl. nuclei)
- proton, neutron, quark
- neutrino

element

- periodic table of the elements
- Isotope
 - dating (age determination), such as radio carbon dating (ration between ^{12}C and ^{14}C)
- atomic mass unit (amu)
- compound, mixture

atomic hypothesis

- Feynman: If some cataclysm were to destroy all scientific knowledge and only one sentence could be passed on to the next generation of creatures, the statement with the most information in the least words would be, “All things are made of atoms - little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another.”

PERIODIC TABLE OF THE ELEMENTS

<http://www.ktf-split.hr/periodni/en/>

GROUP	PERIODIC TABLE OF THE ELEMENTS																18	
1	IIA										IIIA						18	
1	1.0079											4.0026						
PERIOD	H											He						
1	HYDROGEN											HELIUM						
2	3 6.941	4 9.0122											10 20.180					
2	Li	Be											Ne					
	LITHIUM	BERYLLIUM											NEON					
3	11 22.990	12 24.305											18 39.948					
3	Na	Mg											Ar					
	SODIUM	MAGNESIUM											ARGON					
4	19 39.098	20 40.078	21 44.956	22 47.867	23 50.942	24 51.996	25 54.938	26 55.845	27 58.933	28 58.693	29 63.546	30 65.39	31 69.723	32 72.64	33 74.922	34 78.96	35 79.904	36 83.80
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	POTASSIUM	CALCIUM	SCANDIUM	TITANIUM	VANADIUM	CHROMIUM	MANGANESE	IRON	COBALT	NICKEL	COPPER	ZINC	GALLIUM	GERMANIUM	ARSENIC	SELENIUM	BROMINE	KRYPTON
5	37 85.468	38 87.62	39 88.906	40 91.224	41 92.906	42 95.94	43 (98)	44 101.07	45 102.91	46 106.42	47 107.87	48 112.41	49 114.82	50 118.71	51 121.76	52 127.60	53 126.90	54 131.29
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
	RUBIDIUM	STRONTIUM	YTTORIUM	ZIRCONIUM	NIOBIUM	MOLYBDENUM	TECHNETIUM	RUTHENIUM	RHODIUM	PALLADIUM	SILVER	CADMIUM	INDIUM	TIN	ANTIMONY	TELLURIUM	IODINE	XENON
6	55 132.91	56 137.33	57-71	72 178.49	73 180.95	74 183.84	75 186.21	76 190.23	77 192.22	78 195.08	79 196.97	80 200.59	81 204.38	82 207.2	83 208.98	84 (209)	85 (210)	86 (222)
6	Cs	Ba	La-Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
	CAESIUM	BARIUM	Lanthanide	HAFNIUM	TANTALUM	TUNGSTEN	RHENIUM	OSMIUM	IRIDIUM	PLATINUM	GOLD	MERCURY	THALLIUM	LEAD	BISMUTH	POLONIUM	ASTATINE	RADON
7	87 (223)	88 (226)	89-103	104 (261)	105 (262)	106 (266)	107 (264)	108 (277)	109 (268)	110 (281)	111 (272)	112 (285)		114 (289)				
7	Fr	Ra	Ac-Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq				
	FRANCIUM	RADIUM	Actinide	RUTHERFORDIUM	DUBNIUM	SEABORGIUM	BOHRIUM	HASSIUM	MEITNERIUM	UNUNNIUM	UNUNUNIUM	UNUNBIUM		UNUNQUADIUM				

Legend for element classification:

- Metal
- Semimetal
- Nonmetal
- 1 Alkali metal
- 2 Alkaline earth metal
- 3-10 Transition metals
- L Lanthanide
- A Actinide
- 16 Chalcogens element
- 17 Halogens element
- 18 Noble gas

STANDARD STATE (25 °C; 101 kPa)

Ne - gas Fe - solid
Ga - liquid Tc - synthetic

LANTHANIDE

57 138.91	58 140.12	59 140.91	60 144.24	61 (145)	62 150.36	63 151.96	64 157.25	65 158.93	66 162.50	67 164.93	68 167.26	69 168.93	70 173.04	71 174.97
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
LANTHANUM	CERIUM	PRASEODYMIUM	NEODYMIUM	PROMETHIUM	SAMARIUM	EUROPIUM	GADOLINIUM	TERBIUM	DYSPROSIUM	HOLMIUM	ERBIUM	THULIUM	YTTERIUM	LUTETIUM

ACTINIDE

89 (227)	90 232.04	91 231.04	92 238.03	93 (237)	94 (244)	95 (243)	96 (247)	97 (247)	98 (251)	99 (252)	100 (257)	101 (258)	102 (259)	103 (262)
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
ACTINIUM	THORIUM	PROTACTINIUM	URANIUM	NEPTUNIUM	PLUTONIUM	AMERICIUM	CURIUM	BERKELIUM	CALIFORNIUM	EINSTEINIUM	FERMIUM	MENDELEVIUM	NOBELIUM	LAWRENCIUM

(1) Pure Appl. Chem., 73, No. 4, 667-683 (2001)
 Relative atomic mass is shown with five significant figures. For elements have no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.
 However three such elements (Th, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.

H: HYdrogen
He: HELium
Li: LIthium
Be: beRYlium
B: BOron
C: CARbon
N: NITrogen
O: OXYgen
Oxide (CO₂; CARbon diOxide)
F: FLUorine
Ne: NEon
Na: SOdium
Mg: magNESium
Al: aLUminum/aluMINium
aLUmina
Si: SILicon
P: PHOSphorus
S: SULfur
Cl: chLORine
chLORide (NaCl, SOdium
chLORide)
Ar: ARgon

K: poTAssium
Ca: CALcium
Sc: SCANdium
Ti: tiTAnium
V: vaNAdium
vaNAdate (NaVO₃, SOdium
vaNAdate)
Cr: chROMium
Mn: MANganese/mangaNESE
MANganite (LaMnO₃ LAN-
thanum MANganite)
Fe: Iron
Co: CObalt
Ni: NICKel
Cu: COPper
Zn: zinc
Ga: GAllium

Ge: gerMANium
As: ARsenic
ARsenide
Se: seLEnium
Br: BROmine
BROmide
Kr: KRYPTon
Rb: ruBIDIum
Sr: STRONtium
Y: YTtrium
Zr: zirCONium
Nb: niObium
Mo: moLYBdenum
Tc: techNETium
Ru: ruTHEnium
Rh: RHODium
Pd: palLAdium
Ag: SILver
Cd: CADmium
In: INdium
Sn: tin
Sb: ANtimony
ANtimonide
Te: telLURIum
I: IODine
IODide, NaI (SOdium IO-
dide)
Xe: XENon

three forms of matter

- solid, liquid, gas
- solid: crystal structure, lattice
- liquid
 - Archimedes' principle: An immersed object is buoyed up by a force equal to the weight of the fluid it displaces.
 - buoyant force
 - Pascal's principle: A change in pressure at any point in an enclosed fluid at rest is transmitted undiminished to all points in the fluid.

gas

- gas
 - atmosphere, atmospheric pressure, barometer, ozone layer
 - Bernoulli's principle: When the speed of a fluid increases, internal pressure in the fluid decreases.
 - Boyle's law: The product of pressure and volume for a given mass of gas is a constant as long as the temperature doesn't change.

学籍番号

氏名

quiz

- What are the three forms of matter?
- Read the following equations.

– Ex) $z^2 = x^2 + y^2$

- z squared equals x squared plus y square. (ピリオド忘れない)

$$5:2=10:4$$

$$102/51=2$$

$$y = ax^2 + bx + c$$

$$y = ax^3$$