TAP 525- 4: A binding energy calculator

This model removes the drudgery from the calculation of binding energies. There are three sheets. Sheet 1 does the calculations.

4
4 The calculator

	numbers	masses / amu	energy / J
electrons	5	0.0025	
protons	5	5.0365	
neutrons	7	7.0609	
constitutents total		12.0999	
quoted mass of isotope		11.00931	
difference in mass		-1.09059	
energy released			-1.63E-10

Sheet 2 holds the common data – masses for neutrons, protons, electrons, the value of one atomic mass unit in kilograms and the speed of light

Masses of particles

name	symbol	mass / unified atomic
electron	$^{0}_{-1}e$	0.0005
proton	$^{1}_{1}p$	1.0073
neutron	$^{1}_{0}n$	1.0087

Constants			
Speed of light	c	3.00E+08	m/s
1 amu		1.67E-27	kg

Sheet 3 holds a sample of isotope data.

Element	Z	A	Mass / amu
H	1	1	1.00783
He	2	4	4.00260
Li	3	7	7.01600
Be	4	9	9.01218
Be	5	11	11.00931
C	6	12	12.00000
N	7	14	14.00307
O	8	16	15.99491
F	9	19	18.99840
Ne	10	20	19.99244
Na	11	23	22.98980
Mg	12	24	23.98504
Al	13	27	26.98153
Si	14	28	27.97693
P	15	31	30.97376
Si	16	32	31.97207
Cl	17	35	34.96885
Ar	18	38	37.96272
K	19	39	38.96371
Ca	20	40	39.96259
Sc	21	45	44.95592
Ti	22	47	46.95180
V	23	51	50.94400
Cr	24	52	51.94050
Mn	25	55	54.93810
Fe	26	56	55.93490
Ni	28	58	57.93530
Co	27	59	58.93320
Cu	29	63	62.92980
Zn	30	64	63.92910
Ga	31	69	68.92570
Ge	32	74	73.92190
As	33	75	74.92160
Br	35	79	78.91830
Se	34	80	79.91650
Kr	36	82	81.91350
Rb	37	85	84.91170
Sr	38	88	87.90560
Y	39	89	88.90540
Zr	40	90	89.90430
Nb	41	93	92.90600
Mo	42	98	97.90550
Ru	44	102	101.90370
Rh	45	103	102.90480
Pd	46	106	105.90320
Ag	47	107	106.90509
Cd	48	114	113.90360
In	49	115	114.90410
Sn	50	118	117.90180
Sb	51	121	120.90380
In	53	127	126.90040
Te	52	130	129.90670
Xe	54	132	131.90420
Cs	55	133	132.90510
Ba	56	138	137.90500
La	57	139	138.90610
Ce	58	140	139.90530
Pr	59	141	140.90740
Nd	60	142	141.90750
Sm	62	152	151.91950

What to do:

Enter the values for the chosen isotope into the pale yellow boxes in sheet 1, following the tips in the comment boxes, and the binding energy is calculated and displayed in the pale blue box.

You will need to double click on the boxes and have a computer running Excel

Practical advice

This is provided as a constructed calculator, together with some useful data.

External reference

This activity is taken from Advancing Physics chapter 18, File 30T