**Instructions**

1) This exam requires the Respondus Lockdown Browser with Monitoring; you will not be able to take the exam with any other browser nor if you don’t have a webcam.

2) You are allowed to use this coversheet, a calculator, paper and pen/pencil during this exam.

3) Other references or aids are not allowed. Headphones are not allowed.

4) You are responsible for locating an appropriate testing environment where you can work alone while having reliable internet access.

5) Your “Environmental Check” must include the entire room and items on the desk.

6) You should remain in view of the webcam throughout the entire exam.

**PERIODIC** **TABLE** **OF** **THE** **ELEMENTS**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 IA | 2 IIA | 3 IIIB | 4 IVB | 5 VB | 6 VIB | 7 VIIB | 8 ------ | 9 VIIIB | 10 ------ | 11 IB | 12 IIB | 13 IIIA | 14 IVA | 15 VA | 16 VIA | 17 VIIA | 18 VIIIA |
| 1  **H**  1.008 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2  **He**  4.003 |
| 3  **Li**  6.941 | 4  **Be**  9.012 |  |  |  |  |  |  |  |  |  |  | 5  **B**  10.81 | 6  **C**  12.01 | 7  **N**  14.01 | 8  **O**  16.00 | 9  **F**  19.00 | 10  **Ne**  20.18 |
| 11  **Na**  22.99 | 12  **Mg**  24.31 |  |  |  |  |  |  |  |  |  |  | 13  **Al**  26.98 | 14  **Si**  28.09 | 15  **P**  30.97 | 16  **S**  32.07 | 17  **Cl**  35.45 | 18  **Ar**  39.95 |
| 19  **K**  39.10 | 20  **Ca**  40.08 | 21  **Sc**  44.96 | 22  **Ti**  47.88 | 23  **V**  50.94 | 24  **Cr**  52.00 | 25  **Mn**  54.94 | 26  **Fe**  55.85 | 27  **Co**  58.93 | 28  **Ni**  58.69 | 29  **Cu**  63.55 | 30  **Zn**  65.39 | 31  **Ga**  69.72 | 32  **Ge**  72.61 | 33  **As**  74.92 | 34  **Se**  78.96 | 35  **Br**  79.90 | 36  **Kr**  83.80 |
| 37  **Rb**  85.47 | 38  **Sr**  87.62 | 39  **Y**  88.91 | 40  **Zr**  91.22 | 41  **Nb**  92.91 | 42  **Mo**  95.94 | 43  **Tc**  (98) | 44  **Ru**  101.1 | 45  **Rh**  102.9 | 46  **Pd**  106.4 | 47  **Ag**  107.9 | 48  **Cd**  112.4 | 49  **In**  114.8 | 50  **Sn**  118.7 | 51  **Sb**  121.8 | 52  **Te**  127.6 | 53  **I**  126.9 | 54  **Xe**  131.3 |
| 55  **Cs**  132.9 | 56  **Ba**  137.3 | 57  **La**  138.9 | 72  **Hf**  178.5 | 73  **Ta**  181.0 | 74  **W**  183.8 | 75  **Re**  186.2 | 76  **Os**  190.2 | 77  **Ir**  192.2 | 78  **Pt**  195.1 | 79  **Au**  197.0 | 80  **Hg**  200.6 | 81  **Tl**  204.4 | 82  **Pb**  207.2 | 83  **Bi**  209.0 | 84  **Po**  (209) | 85  **At**  (210) | 86  **Rn**  (222) |
| 87  **Fr**  (223) | 88  **Ra**  226.0 | 89  **Ac**  227.0 | 104  **Rf**  (267) | 105  **Db**  (268) | 106  **Sg**  (269) | 107  **Bh**  (270) | 108  **Hs**  (277) | 109  **Mt**  (278) | 110  **Ds**  (281) | 111  **Rg**  (282) | 112  **Cn**  (285) | 113  **Nh**  (286) | 114  **Fl**  (289) | 115  **Mc**  (289) | 116  **Lv**  (293) | 117  **Ts**  (294) | 118  **Og**  (294) |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 58  **Ce**  140.1 | 59  **Pr**  140.9 | 60  **Nd**  144.2 | 61  **Pm**  (145) | 62  **Sm**  150.4 | 63  **Eu**  152.0 | 64  **Gd**  157.3 | 65  **Tb**  158.9 | 66  **Dy**  162.5 | 67  **Ho**  164.9 | 68  **Er**  167.3 | 69  **Tm**  168.9 | 70  **Yb**  173.0 | 71  **Lu**  175.0 |
| 90  **Th**  232.0 | 91  **Pa**  231.0 | 92  **U**  238.0 | 93  **Np**  (237) | 94  **Pu**  (244) | 95  **Am**  (243) | 96  **Cm**  (247) | 97  **Bk**  (247) | 98  **Cf**  (251) | 99  **Es**  (252) | 100  **Fm**  (257) | 101  **Md**  (258) | 102  **No**  (259) | 103  **Lr**  (262) |

**Some constants and conversion factors:**

R = 8.314 J mole-1 K-1 = 0.08206 L atm mole-1 K-1 1 atm = 760 torr = 101.325 kPa

NA = 6.022 X 1023 mol-1 h = 6.63 × 10-34 J-s c = 3.00 × 108 m s-1

Rh = 1.097 × 107 m-1 B = -2.18 × 10-18 J me = 9.11 × 10-31 kg

TK = TC + 273.15

**A Few Useful Equations from all of CHEM111**

  q = m Cs T

  PV = nRT

KE = h – h0

 density = =  

c =  p = m v = h/p E = Z2 B/n2 E = h = hc/λ

 

b.o. = (#e - #e\*)/2 

