

L3-CHEMR



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New Zealand Qualifications Authority

## Level 3 Chemistry 2023

### RESOURCE BOOKLET

Refer to this booklet to answer the questions in your Question and Answer Booklets.

Check that this booklet has pages 2–3 in the correct order and that none of these pages is blank.

**YOU MAY KEEP THIS SHEET AT THE END OF THE EXAMINATION.**

**Formulae for 91390: Demonstrate understanding of thermochemical principles and the properties of particles and substances**

$$n = cV$$

$$n = \frac{m}{M}$$

$$q = mc\Delta T$$

$$\Delta_r H^\circ = \frac{-q}{n}$$

$$\Delta_r H^\circ = \sum \Delta_f H^\circ(\text{products}) - \sum \Delta_f H^\circ(\text{reactants})$$

**Formulae for 91392: Demonstrate understanding of equilibrium principles in aqueous systems**

$$\text{pH} = -\log[\text{H}_3\text{O}^+]$$

$$[\text{H}_3\text{O}^+] = 10^{-\text{pH}}$$

$$K_w = [\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

$$\text{p}K_a = -\log K_a$$

$$K_a = 10^{-\text{p}K_a}$$

$$K_a = \frac{[\text{H}_3\text{O}^+][\text{A}^-]}{[\text{HA}]}$$

$$K_s = s^2$$

$$K_s = 4s^3$$

$$n = cV$$

$$n = \frac{m}{M}$$

**Complex ions for 91392: Demonstrate understanding of equilibrium principles in aqueous systems**



# PERIODIC TABLE OF THE ELEMENTS

18

| Atomic number |            | Relative atomic mass |            |            |            |            |            |            |            |            |            |           |           |            |            |           |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |
|---------------|------------|----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------|-----------|------------|------------|-----------|------------|------------|------------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 1             | 2          |                      |            |            |            |            |            |            |            |            |            |           |           |            |            |           |            | 17         | 18         |           |            |            |            |            |            |            |            |            |            |            |            |            |            |
| 1             |            |                      |            |            |            |            |            |            |            |            |            |           |           |            |            |           |            | 2          |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |
| H<br>1.0      |            |                      |            |            |            |            |            |            |            |            |            |           |           |            |            |           |            | He<br>4.0  |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |
| 3             | 4          | 5                    | 6          | 7          | 8          | 9          | 10         | 11         | 12         | 13         | 14         | 15        | 16        | 17         | 18         | 19        | 20         | 21         | 22         | 23        | 24         | 25         | 26         | 27         | 28         | 29         | 30         | 31         | 32         | 33         | 34         | 35         | 36         |
| Li<br>6.9     | Be<br>9.0  | B<br>10.8            | C<br>12.0  | N<br>14.0  | O<br>16.0  | F<br>19.0  | Ne<br>20.2 | Na<br>23.0 | Mg<br>24.3 | Al<br>27.0 | Si<br>28.1 | P<br>31.0 | S<br>32.1 | Cl<br>35.5 | Ar<br>40.0 | K<br>39.1 | Ca<br>40.1 | Sc<br>45.0 | Ti<br>47.9 | V<br>50.9 | Cr<br>52.0 | Mn<br>54.9 | Fe<br>55.9 | Co<br>58.9 | Ni<br>58.7 | Cu<br>63.6 | Zn<br>65.4 | Ga<br>69.7 | Ge<br>72.6 | As<br>74.9 | Se<br>79.0 | Br<br>79.9 | Kr<br>83.8 |
| 37            | 38         | 39                   | 40         | 41         | 42         | 43         | 44         | 45         | 46         | 47         | 48         | 49        | 50        | 51         | 52         | 53        | 54         | 55         | 56         | 57        | 58         | 59         | 60         | 61         | 62         | 63         | 64         | 65         | 66         | 67         | 68         | 69         | 70         |
| Rb<br>85.5    | Sr<br>87.6 | Y<br>88.9            | Zr<br>91.2 | Nb<br>92.9 | Mo<br>95.9 | Tc<br>98.9 | Ru<br>101  | Rh<br>103  | Pd<br>106  | Ag<br>108  | Cd<br>112  | In<br>115 | Sn<br>119 | Sb<br>122  | Te<br>128  | I<br>127  | Xe<br>131  | Cs<br>133  | Ba<br>137  | La<br>139 | Ce<br>140  | Pr<br>141  | Nd<br>144  | Pm<br>147  | Sm<br>150  | Eu<br>152  | Gd<br>157  | Tb<br>159  | Dy<br>163  | Ho<br>165  | Er<br>167  | Tm<br>169  | Yb<br>173  |
| 87            | 88         | 89                   | 90         | 91         | 92         | 93         | 94         | 95         | 96         | 97         | 98         | 99        | 100       | 101        | 102        | 103       | 104        | 105        | 106        | 107       | 108        | 109        | 110        | 111        | 112        | 113        | 114        | 115        | 116        | 117        | 118        | 119        | 120        |
| Fr<br>223     | Ra<br>226  | Ac<br>227            | Th<br>232  | Pa<br>231  | U<br>238   | Np<br>237  | Pu<br>239  | Am<br>241  | Cm<br>244  | Bk<br>249  | Cf<br>251  | Es<br>252 | Fm<br>257 | Md<br>258  | No<br>259  | Lr<br>262 | Rf<br>261  | Db<br>262  | Sg<br>263  | Bh<br>264 | Hs<br>265  | Mt<br>268  | Ds<br>271  | Rg<br>272  | Cn<br>277  | Nh<br>285  | Fl<br>289  | Mc<br>288  | Lv<br>293  | Ts<br>294  | Og<br>294  |            |            |

|                   |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                  |                  |                  |
|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Lanthanide Series | 57<br>La<br>139 | 58<br>Ce<br>140 | 59<br>Pr<br>141 | 60<br>Nd<br>144 | 61<br>Pm<br>147 | 62<br>Sm<br>150 | 63<br>Eu<br>152 | 64<br>Gd<br>157 | 65<br>Tb<br>159 | 66<br>Dy<br>163 | 67<br>Ho<br>165 | 68<br>Er<br>167  | 69<br>Tm<br>169  | 70<br>Yb<br>173  |
| Actinide Series   | 89<br>Ac<br>227 | 90<br>Th<br>232 | 91<br>Pa<br>231 | 92<br>U<br>238  | 93<br>Np<br>237 | 94<br>Pu<br>239 | 95<br>Am<br>241 | 96<br>Cm<br>244 | 97<br>Bk<br>249 | 98<br>Cf<br>251 | 99<br>Es<br>252 | 100<br>Fm<br>257 | 101<br>Md<br>258 | 102<br>No<br>259 |

