Chemical Institute of Canada | *For Our Future*
Institut de chimie du Canada | *Pour notre avenir*

Data Sheet
Fiche de données

CHEMISTRY Olympiads
CANADA
Olympiades CHIMIE

1																	18
1 H 1.008	2											13	14	15	16	17	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	3	4	5	6	7	8	9	10	11	12	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 47.87	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 65.38	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 95.96	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 180.9	74 W 183.9	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)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (269)	111 Rg (272)	112 Cn (285)	113 Nh (284)	114 Fl (289)	115 Mc (288)	116 Lv (292)	117 Ts (294)	118 Og (294)

Relative Atomic Masses (2012, IUPAC)
***For the radioactive elements the atomic mass of an important isotope is given**

Masses Atomiques Relatives (UICPA, 2012)
***Dans le cas des éléments radioactifs, la masse atomique fournie est celle d'un isotope important**

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)

	Symbol **Symbole**	**Value** **Quantité numérique**	
Atomic mass unit	*amu*	1.66054×10^{-27} kg	Unité de masse atomique
Avogadro's number	N_A	6.022×10^{23}	Nombre d'Avogadro
Charge of an electron	*e*	1.60218×10^{-19} C	Charge d'un électron
Dissociation constant (H_2O)	K_w	1.00×10^{-14} (25°C)	Constante de dissociation de l'eau (H_2O)
Faraday's constant	*F*	96 485 C mol^{-1}	Constante de Faraday
Gas constant	*R*	8.31451 J K^{-1} mol^{-1} 0.08206 L atm K^{-1} mol^{-1}	Constante des gaz
Mass of an electron	m_e	9.10939×10^{-31} kg	Masse d'un électron
Mass of a neutron	m_n	1.67493×10^{-27} kg	Masse d'un neutron
Mass of a proton	m_p	1.67262×10^{-27} kg	Masse d'un proton
Planck's constant	*h*	6.62608×10^{-34} J s	Constante de Planck
Speed of light	*c*	2.997925×10^{8} m s^{-1}	Vitesse de la lumière
Rydberg constant	R_H	1.096×10^{7} m^{-1}	Constante de Rydberg

1 Å	$= 1 \times 10^{-10}$ m
1 atm	= 101.325 kPa
1 bar	$= 1 \times 10^{5}$ Pa

STP/TPN	**SATP/TPAN**
273.15 K	298 K
100 kPa	100 kPa

2022 CCO Answer Sheet

Name_____**Account Number**_____

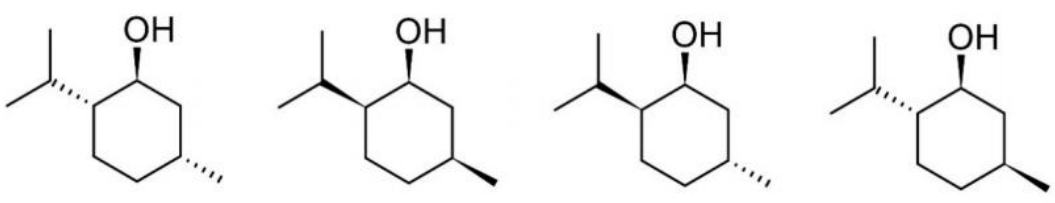
School _____

1. ORGANIC CHEMISTRY

a) ***6 marks***

b) ***4 marks***

c) ***2 marks***



2. ANALYTICAL CHEMISTRY

a) ***4 marks***

A: **B:** **C:**

D: **E:** **F:**

G: **H:**

b) ***4 marks***

Reaction to produce B & C

Reaction for heating B to increase the volume by 50%

Reaction to produce D & E

Reaction to produce F

Reaction of F to produce the colorless solution

Reaction of E to produce G and H

Reaction of H to produce the brown color gas

c) ***2.5 marks***

d) ***0.5 mark***

e) ***0.5 mark***

f) ***0.5 mark***

3. INORGANIC CHEMISTRY

a) ***1 mark***

b) ***1 mark***

c) ***2 marks***

d) ***1 mark***

e) ***1 mark***

f) **0***.5 mark*

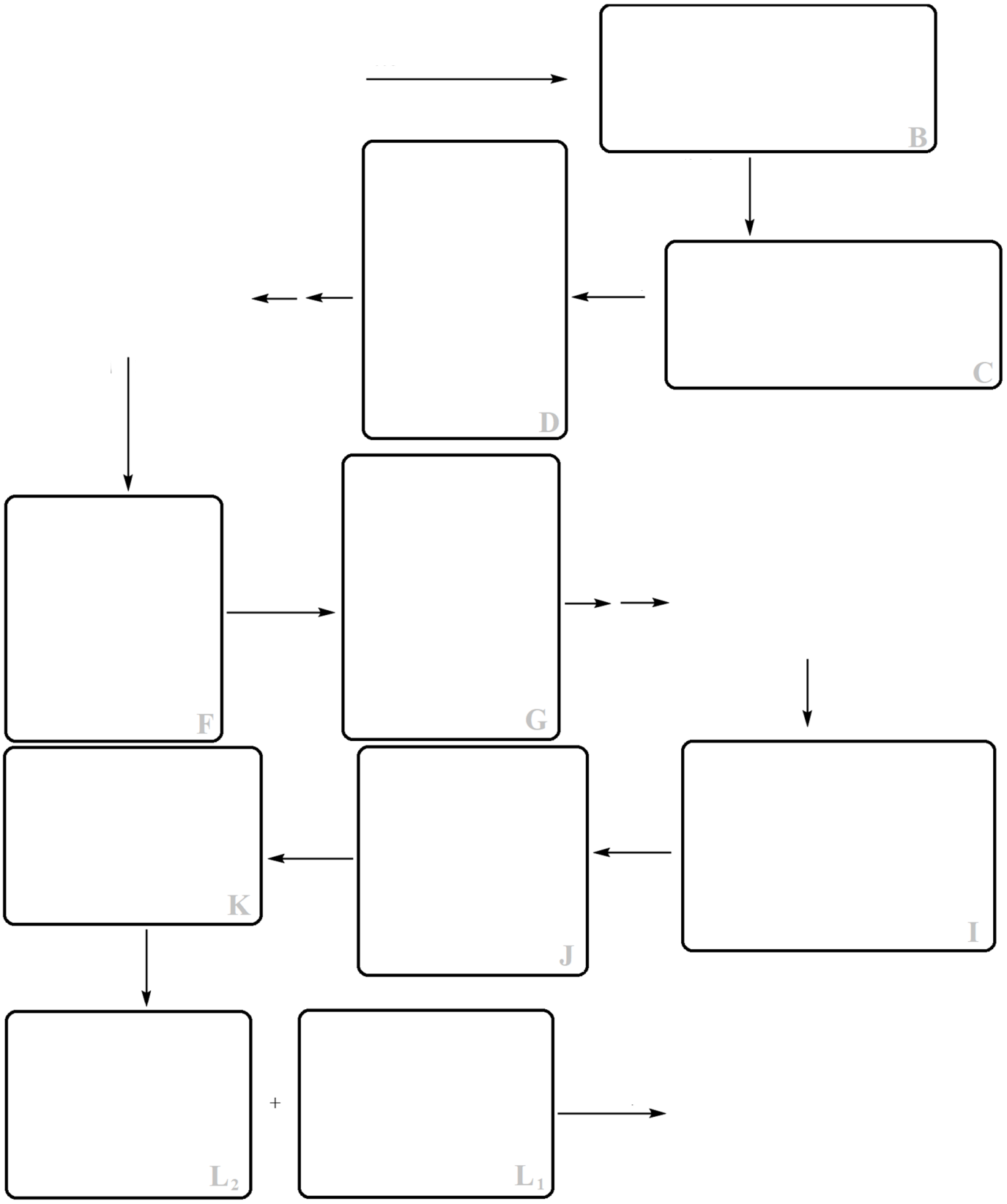
g) ***0.5 mark***

h) **2** ***marks***

i) ***3 marks***

4. ORGANIC CHEMISTRY and NMR spectroscopy

a*) *9 marks



b) ***1 mark***

c) ***2 marks***

Hydrogen atom	Chemical shift of peak (ppm)
a.	
b.	
c.	
d.	

5. PHYSICAL CHEMISTRY

a) ***3 marks***

b) ***1 mark***

c) ***1 mark***

d) ***1 mark***

e) ***2 marks***

f) ***1 mark***

g) ***1 mark***

h) ***2 marks***