2021 CCO Answer Sheet

Name_____School_____Account Number_____

1. PHYSICAL CHEMISTRY

a) ***3 marks***

$K_{p,\ 298K}$ = $K_{p,\ 398K}$ =

Favorable at 298K? (Yes / No)

b) ***1 mark***

c) ***3 marks***

d) ***2 marks***

e) ***1 mark***

f)

i) ***1 mark***

ii) ***1 mark***

2. ANALYTICAL CHEMISTRY

a) ***7 marks***

A: B: C:

D: E: F:

Reactions *(0.8 mark each for a total of 4.0 marks)*:

1.

2.

3.

4.

5.

b) ***2.5 marks***

c) ***1 mark***

d) ***1 mark***

e) ***0.5 mark***

3. INORGANIC CHEMISTRY

Part 1: Hemoglobin and Iron Coordination

a) 0.5 mark

b) ***1 mark***

c) ***1 mark***

d) ***3 marks***

e) ***2 marks***

Part 2: Fenton Catalysis

f) ***1.5 marks***

g) ***0.5 mark***

Part 3: The Deferiprone Controversy - Putting it Together

h) ***0.5 mark***

i) ***2 marks***

4. ORGANIC CHEMISTRY

a) ***0.5 mark***

b) ***0.5 mark***

The reaction is: SN1 SN2 E1 E2
(circle the right answer)

c) ***1 mark***

d) ***4 marks***

Draw the charged, aromatic intermediate that occurs in the formation of both products.

Draw the two products (R_1 and R_2). Circle which product is favored at lower temperatures and explain.

Draw the mechanism for the formation of the kinetically favored product.

e) ***0.5 mark***

CH_2CL_2 NAH Radical initiator heat
(circle the right answer)

f) ***2 marks***

g) ***1 mark***

h) ***1 mark***

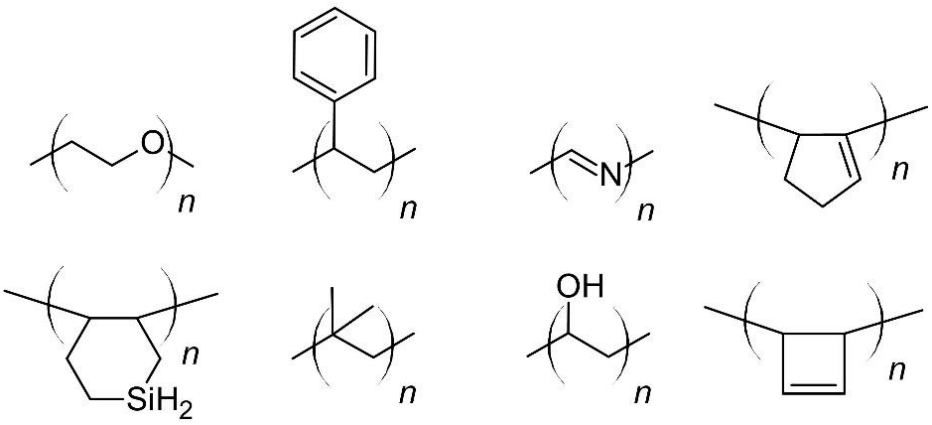
i) ***1.5 marks***

5. POLYMER CHEMISTRY

a) ***0.5 mark***

b) ***0.5 mark***

c) ***1 mark***



d) ***0.5 mark***

e) ***2 marks***

f) ***1.5 marks***

g) ***2 marks***

h) ***0.5 mark***

Yes No

(circle your answer)

i) ***1 mark***

j) ***0.5 mark***

k)

i) ***0.5 mark***

ii) ***0.5 mark***

iii) ***1 mark***

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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