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1. (3) Arrange the following elements in the order of increasing electron affinity: Cl, He, K, S, Li

2. (3) Knowing the atomic radii of C (0.77 Å), Si (1.18 Å), Cl (0.99 Å) and Al (1.43 Å), arrange the following single bonds in the order of increasing bond length: C-Si, C-Al, C-Cl, Si-Cl, Al-Cl.



3. (3) Circle all dative bonds in the following species:

4. (4) Determine the formal oxidation states for all atoms in the following molecules and ions:

CaH₂ OS: Ca _____ H _____

SOCl₂ OS: S _____ O _____ Cl _____

[H₂SiO₂]²⁻ OS: H _____ Si _____ O _____

F₂B-NH₂ OS: F _____ B _____ N _____ H _____

Li[AlCl₂H₂] OS: Li _____ Al _____ Cl _____ H _____

5. (6) Use VSEPR rules to predict the structure and shape of the following molecules. Prepare clear structural drawings showing all atoms, bonds, as well as lone pairs on the central atom (if present). Do NOT show any other electrons. Name the shapes.

[BeCl₂F]²⁺ [ClO₂] BrF₃

Molecular shape:

UNIT 16 ELECTROCHEMISTRY REVISION (MCQ)

OXIDATION NUMBERS, OXIDATION AND REDUCTION

1. Assign oxidation numbers to each element in the following:

a. MeO ₂ Mn + 2(0) = 0 Mn = 2(0) = 0 Mn = 0 Δ Mn = +4 and O = -2	b. NO ₂ N + 2(0) = 0 N = 2(0) = 0 N = 0 Δ N = +4 and O = -2	c. Cl ₂ 2Cl = 0 Δ Cl = 0
d. ClO ₂ Cl + 2(0) = 0 Cl = 2(0) = 0 Cl = 0 Δ Cl = +4 and O = -2	e. SO ₂ S + 2(0) = 0 S = 2(0) = 0 S = 0 Δ S = +4 and O = -2	f. Fe ₂ O ₃ Reverse cross over Fe = 3 and O = -2 or 2Fe + 3(0) = 0 2Fe = 3(0) = 0 2Fe = 0 Δ Fe = +3 and O = -2
g. H ₃ PO ₄ 3H + P + 4(0) = 0 3(+1) + P + 4(0) = 0 +3 + P + 0 = 0 Δ P = +5, H = +1 and O = -2	h. HPO ₃ H + P + 3(0) = 0 +1 + P + 3(0) = 0 P = 0 Δ P = +5, H = +1 and O = -2	i. CH ₄ C + 4H = 0 C + 4(+1) = 0 C + 4 = 0 Δ C = -4 and O = -2
j. CO ₂ C + 2(0) = 0 C = 2(0) = 0 C = 0 Δ C = +4 and O = -2	k. H ₂ O ₂ 2H + 2(0) = 0 2(+1) + 2(0) = 0 +2 + 2(0) = 0 Δ O = -1 and H = +1 (An exception to O = -2)	l. Cu ²⁺ Cu = +2
m. Ag Ag = 0	n. Cr ₂ O ₇ ²⁻ 2Cr + 7(0) = -2 2Cr + 7(0) = -2 2Cr + 0 = -2 Δ 2Cr = +6 and O = -2	o. IO ₃ I + 3(0) = -1 I + 3(0) = -1 I + 0 = -1 Δ I = +5 and O = -2
p. Mn ²⁺ Mn = +2	q. NO ₂ N + 2(0) = 0 N = 2(0) = 0 N = 0 Δ N = +4 and O = -2	r. SO ₂ S + 2(0) = 0 S = 2(0) = 0 S = 0 Δ S = +4 and O = -2
s. SO ₂ S + 2(0) = 0 S = 2(0) = 0 S = 0 Δ S = +4 and O = -2	t. NO ₂ N + 2(0) = 0 N = 2(0) = 0 N = 0 Δ N = +4 and O = -2	u. NO N + 0 = 0 N = 0 Δ N = +2 and O = -2
v. F F = -1	w. Al ³⁺ Al = +3	x. H ₂ S 2H + S = 0 2(+1) + S = 0 +2 + S = 0 Δ S = -2 and H = +1

1. The following table lists the standard electrode potentials for various half-cells (all concentrations are 1.0 mol dm⁻³ and all pressures are 1.0 bar).

1. Zn ²⁺ /Zn	-0.76 V	11. Fe ³⁺ /Fe ²⁺	+0.77 V
2. Cu ²⁺ /Cu	+0.34 V	12. Ag ⁺ /Ag	+0.80 V
3. Fe ²⁺ /Fe	-0.44 V	13. Pb ²⁺ /Pb	-0.13 V
4. Ni ²⁺ /Ni	-0.25 V	14. Sn ²⁺ /Sn	-0.14 V
5. Cr ³⁺ /Cr	-0.74 V	15. Sn ⁴⁺ /Sn ²⁺	+0.15 V
6. Mn ²⁺ /Mn	-1.18 V	16. Br ₂ /Br ⁻	+1.07 V
7. Al ³⁺ /Al	-1.66 V	17. I ₂ /I ⁻	+0.54 V
8. Mg ²⁺ /Mg	-2.37 V	18. Cl ₂ /Cl ⁻	+1.36 V
9. Cd ²⁺ /Cd	-0.40 V	19. H ₂ O ₂ /H ₂ O	+1.78 V
10. Co ²⁺ /Co	-0.28 V	20. O ₂ /H ₂ O	+1.23 V
11. NiO ₂ /Ni(OH) ₂	+0.49 V	21. H ₂ /H ⁺	0.00 V
12. PbO ₂ /Pb(OH) ₂	+1.46 V	22. H ₂ O ₂ /H ₂ O	+1.78 V
13. PbO ₂ /Pb	+0.99 V	23. O ₂ /H ₂ O	+1.23 V
14. Pb ²⁺ /Pb	-0.13 V	24. H ₂ /H ⁺	0.00 V
15. Sn ²⁺ /Sn	-0.14 V	25. H ₂ O ₂ /H ₂ O	+1.78 V
16. Sn ⁴⁺ /Sn ²⁺	+0.15 V	26. O ₂ /H ₂ O	+1.23 V
17. Br ₂ /Br ⁻	+1.07 V	27. H ₂ /H ⁺	0.00 V
18. I ₂ /I ⁻	+0.54 V	28. H ₂ O ₂ /H ₂ O	+1.78 V
19. Cl ₂ /Cl ⁻	+1.36 V	29. O ₂ /H ₂ O	+1.23 V
20. H ₂ O ₂ /H ₂ O	+1.78 V	30. H ₂ /H ⁺	0.00 V
21. O ₂ /H ₂ O	+1.23 V	31. H ₂ O ₂ /H ₂ O	+1.78 V
22. H ₂ /H ⁺	0.00 V	32. O ₂ /H ₂ O	+1.23 V
23. H ₂ O ₂ /H ₂ O	+1.78 V	33. H ₂ /H ⁺	0.00 V
24. O ₂ /H ₂ O	+1.23 V	34. H ₂ O ₂ /H ₂ O	+1.78 V
25. H ₂ /H ⁺	0.00 V	35. O ₂ /H ₂ O	+1.23 V
26. H ₂ O ₂ /H ₂ O	+1.78 V	36. H ₂ /H ⁺	0.00 V
27. O ₂ /H ₂ O	+1.23 V	37. H ₂ O ₂ /H ₂ O	+1.78 V
28. H ₂ /H ⁺	0.00 V	38. O ₂ /H ₂ O	+1.23 V
29. H ₂ O ₂ /H ₂ O	+1.78 V	39. H ₂ /H ⁺	0.00 V
30. O ₂ /H ₂ O	+1.23 V	40. H ₂ O ₂ /H ₂ O	+1.78 V

2. The following table lists the standard electrode potentials for various half-cells (all concentrations are 1.0 mol dm⁻³ and all pressures are 1.0 bar).

1. Zn ²⁺ /Zn	-0.76 V	11. Fe ³⁺ /Fe ²⁺	+0.77 V
2. Cu ²⁺ /Cu	+0.34 V	12. Ag ⁺ /Ag	+0.80 V
3. Fe ²⁺ /Fe	-0.44 V	13. Pb ²⁺ /Pb	-0.13 V
4. Ni ²⁺ /Ni	-0.25 V	14. Sn ²⁺ /Sn	-0.14 V
5. Cr ³⁺ /Cr	-0.74 V	15. Sn ⁴⁺ /Sn ²⁺	+0.15 V
6. Mn ²⁺ /Mn	-1.18 V	16. Br ₂ /Br ⁻	+1.07 V
7. Al ³⁺ /Al	-1.66 V	17. I ₂ /I ⁻	+0.54 V
8. Mg ²⁺ /Mg	-2.37 V	18. Cl ₂ /Cl ⁻	+1.36 V
9. Cd ²⁺ /Cd	-0.40 V	19. H ₂ O ₂ /H ₂ O	+1.78 V
10. Co ²⁺ /Co	-0.28 V	20. O ₂ /H ₂ O	+1.23 V
11. NiO ₂ /Ni(OH) ₂	+0.49 V	21. H ₂ /H ⁺	0.00 V
12. PbO ₂ /Pb(OH) ₂	+1.46 V	22. H ₂ O ₂ /H ₂ O	+1.78 V
13. PbO ₂ /Pb	+0.99 V	23. O ₂ /H ₂ O	+1.23 V
14. Pb ²⁺ /Pb	-0.13 V	24. H ₂ /H ⁺	0.00 V
15. Sn ²⁺ /Sn	-0.14 V	25. H ₂ O ₂ /H ₂ O	+1.78 V
16. Sn ⁴⁺ /Sn ²⁺	+0.15 V	26. O ₂ /H ₂ O	+1.23 V
17. Br ₂ /Br ⁻	+1.07 V	27. H ₂ /H ⁺	0.00 V
18. I ₂ /I ⁻	+0.54 V	28. H ₂ O ₂ /H ₂ O	+1.78 V
19. Cl ₂ /Cl ⁻	+1.36 V	29. O ₂ /H ₂ O	+1.23 V
20. H ₂ O ₂ /H ₂ O	+1.78 V	30. H ₂ /H ⁺	0.00 V
21. O ₂ /H ₂ O	+1.23 V	31. H ₂ O ₂ /H ₂ O	+1.78 V
22. H ₂ /H ⁺	0.00 V	32. O ₂ /H ₂ O	+1.23 V
23. H ₂ O ₂ /H ₂ O	+1.78 V	33. H ₂ /H ⁺	0.00 V
24. O ₂ /H ₂ O	+1.23 V	34. H ₂ O ₂ /H ₂ O	+1.78 V
25. H ₂ /H ⁺	0.00 V	35. O ₂ /H ₂ O	+1.23 V
26. H ₂ O ₂ /H ₂ O	+1.78 V	36. H ₂ /H ⁺	0.00 V
27. O ₂ /H ₂ O	+1.23 V	37. H ₂ O ₂ /H ₂ O	+1.78 V
28. H ₂ /H ⁺	0.00 V	38. O ₂ /H ₂ O	+1.23 V
29. H ₂ O ₂ /H ₂ O	+1.78 V	39. H ₂ /H ⁺	0.00 V
30. O ₂ /H ₂ O	+1.23 V	40. H ₂ O ₂ /H ₂ O	+1.78 V

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