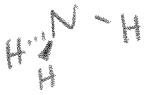
AP Chem Practice MC Exam B

1. A Noble gases are unreactive, thus least likely to oxidize.
2. E Actinides are radioactive (uranium!)
3. C Halogens gain e^- forming anions
4. C mol WA = mol SB ⇒ equivalence pt. = ½ up vertical line on titration curve
5. E strong base = high pH
6. B WA = CB ⇒ ½ equiv. pt (perfect buffer) = ½ volume of equiv. pt.
7. A 
8. E electrolyte = ions in soln ⇒ HBr completely ionizes making H^+ + Br^- ions
9. E Slow effusion = heaviest ⇒ HBr has greatest molecular weight
10. C 3rd Law thermodynamics - entropy of pure crystalline solid at 0 K = 0
11. A activation E determines rate
12. C $\Delta G = \Delta H - T\Delta S$ spontaneous at all Temps - ΔH must be ⊖, ΔS must be ⊕
13. A Evaporation is endothermic (ΔH ⊕) and increase mol gas, thus ΔS ⊕
14. C combustion of pentane is EXOTHERMIC, thus ΔH ⊖. Make more moles of gas, thus ΔS ⊕
15. B precipitation rxn = make solid from aqueous solns.
16. E $[Ag(NH_3)_2]^+$ = coordination complex
17. A $2\overset{0}{Mg}_{(s)} + \overset{0}{O_2}_{(g)} \rightarrow 2\overset{+2}{Mg}\overset{-2}{O}_{(s)}$ synthesis rxn = form product from simpler reactants
18. C $2KClO_3 \rightarrow 2KCl + 3O_2$ (? mol; 1.0 L) STP = 1 mol gas = 22.4 L

$$\frac{1.0\text{ L } O_2}{} \left| \frac{1\text{ mol } O_2}{22.4\text{ L}} \right| \frac{2\text{ mol } KClO_3}{3\text{ mol } O_2} = \frac{2}{3}\left(\frac{1}{22.4}\right)\text{ mol}$$

19. C Br^- has 36 e^- (Kr e- configuration) Sr^{2+} also has Kr e- config, thus 36 e^-

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20. E CH_4 is nonpolar, thus London forces only

21. B excited state = e^- jumps up to higher E level

$1s^2 2s^2 2p^5 3s^2$ ← e^- from 2p jumped up to 3s

22. C $^{\delta-}O=C=O^{\delta-}$ Dipole moments created from polar bonds cancel each other b/c molecule is symmetrical, thus molecule is nonpolar

23. B Zn is always +2

24. B Cesium-134, Cs has atomic # of 55, thus 55 protons
It is neutral, thus $\#p^+ = \#e^- = 55\ e^-$
Mass # = $\#p^+ + \#n^0$
$134 - 55 = 79$ neutrons

25. A $PV = nRT$

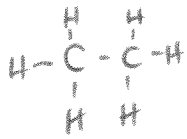
$$P = \frac{nRT}{V} = \frac{(1.85\ mol)(.0821)(308\ K)}{3.00\ L}$$

$$\begin{array}{r} 35 \\ +273 \\ \hline 308 \end{array}$$

26. D rate $= k[X][Y]^2 = R$

$\left(\frac{1}{2}\right)(2)^2 = 2R$

27. D sum of top #'s on left must equal sum of top #'s on right
sum of bottom #'s on left must equal sum of bottom #'s on right.

28. C 
Ethane All alkanes have single bonds only

29. B $\frac{24.5\text{ g } H_3PO_4 \mid 1\text{ mol } H_3PO_4}{\mid 98.8\text{ g}} \approx \frac{1}{4} = 0.25\text{ mol } H_3PO_4$

$m = \frac{\text{mol } H_3PO_4}{\text{kg } H_2O} = \frac{0.25\text{ mol } H_3PO_4}{.100\text{ kg } H_2O} = 2.5\text{ m}$

30. B mass $= 39.493\text{ g} - 18.990\text{ g} = 20.503\text{ g}$ (keep 3 decimal places)

density $= \frac{m}{V} = \frac{20.503\text{ g}}{25.00\text{ mL}}$ = value w/ 4 sig figs

31. C $\frac{30\text{ g S} \mid 1\text{ mol S}}{\mid 32\text{ g S}} \approx 1\text{ mol S}$

$\frac{70\text{ g F} \mid 1\text{ mol F}}{\mid 19\text{ g}} \approx 4\text{ mol F}$

$\boxed{EF = SF_4}$

32. C $1 \xrightarrow{t_{1/2}} \frac{1}{2} \rightarrow \frac{1}{4} \rightarrow \frac{1}{8}$ undergoes 3 Half Lives in 124 s

$t_{1/2} = \frac{124\text{ s}}{3} = 41\text{ s}$

33. A $2H_2 + O_2 \rightarrow 2H_2O$

0.40 mol 0.15 mol

Don't have enough ∴ O_2 = LR

$\frac{0.40\text{ mol } H_2 \mid 1\text{ mol } O_2}{\mid 2\text{ mol } H_2} = 0.20\text{ mol } O_2$ needed

$\frac{0.15\text{ mol } O_2 \mid 2\text{ mol } H_2}{\mid 1\text{ mol } O_2} = 0.30\text{ mol } H_2$ needed/used

0.40 mol H_2 available − 0.30 mol H_2 used = 0.10 mol H_2 left over
= 0.2 g H_2

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34. D $Ca_3(PO_4)_2 + 4H_3PO_4 \rightarrow 3Ca(H_2PO_4)_2$

35. C $H_{2(g)} + I_{2(g)} \rightleftarrows 2HI_{(g)}$ $\Delta H > 0$ ENDO
+ Heat

want to incr [HI] = shift →
I. Add H_2 = shift →
II. Incr T = shift →
III. decr P (incr V) = favor side w/ more mol gas
But mol R = mol P = no shift

36. A

2.8 g C_2H_4	1 mol C_2H_4 / ~~28~~ 10 g	2 mol C / 1 mol C_2H_4	6.02×10^{23} atoms C / 1 mol C

$= \frac{12.04 \times 10^{23}}{10}$

$= \boxed{1.2 \times 10^{23}}$ atoms C

37. A Si forms SiO_2 (quartz) = network covalent solid (Diamond, C, is also a network covalent solid)

38. D $M_1V_1 = M_2V_2$
$(10\,M)\,V_1 = (2\,M)(500\,mL)$
$V_1 = \frac{1000}{10} = \boxed{100\ mL}$

39. E $SnCl_2 + CuSO_4 \rightarrow$ No RXN (No ppt) ($SnSO_4$ + $CuCl_2$ both soluble)
$ZnSO_4 + SnF_2 \rightarrow ZnF_{2(s)} + SnSO_{4(aq)}$
ppt

40. A Highest MP = strongest IMF. All nonpolar, thus all have London forces. More e^- = stronger London forces

41. E $N_2 + 3H_2 \rightarrow 2NH_3$

N_2	$3H_2$	$2NH_3$
3	3	0
−1	−3	+2
2	0	2

42. E Equal masses He + Ne
mol He = $\frac{1}{4}$ OR 5 mol He
mol Ne = $\frac{1}{20}$ OR 1 mol Ne

$\frac{P_{He}}{P_T} = \frac{n_{He}}{n_T}$

$\frac{P_{He}}{6\,atm} = \frac{5\ mol\ He}{6\ mol}$ ⇒ $P_{He} = 5\,atm$

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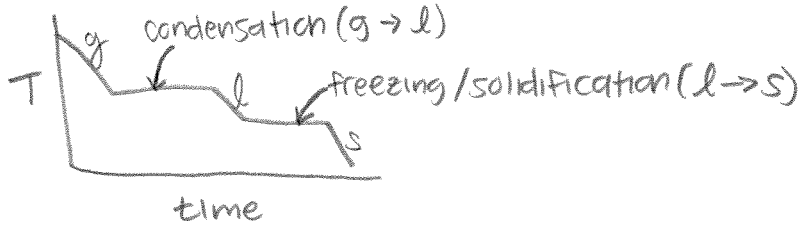
43. C liquids boil when vapor pressure = atmospheric pressure

44. B galvanic = spontaneous redox, thus Cl_2 is reduced to Cl^- and I^- oxidized to I_2
Cl_2 is reduced, thus Cl_2 is the oxidizing agent

45. D



* T constant during phase change

46. A

$\frac{16\text{ g } CH_3OH}{} \Big| \frac{1 \text{ mol } CH_3OH}{32 \text{ g}} = \frac{1}{2}$ mol CH_3OH

$\frac{90 \text{ g } H_2O}{} \Big| \frac{1 \text{ mol } H_2O}{18 \text{ g}} = 5$ mol H_2O

5.5 mol total $= \frac{11}{2}$

Mole Fraction CH_3OH

$\frac{\frac{1}{2}}{\frac{11}{2}} = \frac{1}{2}\left(\frac{2}{11}\right) = \frac{1}{11}$

$\sim \frac{1}{10} = .1$

47. B $H_2SO_4 + H_2O$ = HEAT

48. B conjugate acid has one more H

49. E Acetate, Ammonium, Potassium, Nitrate = Always Soluble

50. E $10\overset{-1}{Br^-} \rightarrow 5\overset{0}{Br_2}$ 10 e^- transferred

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51. C Ideal gas = No Attractions = ↑T and ↓P

52. C Molarity = $\frac{mol}{L}$ since volume changes w/ T, M also changes. All other choices involve mass, which does not change w/ T.

53. D $M = \frac{mol}{L}$ ← already have # mol, need liters.

54. D $\frac{1 \text{ mol } C_2H_6O_2}{10 \text{ mol total}} = \frac{1}{10}$ $C_2H_6O_2$ will lower vapor pressure by 1/10 ⇒ 25 (.1) = 2.5 mmHg

25 - 2.5 = **22.5 mmHg**

55. E $2X + Y \rightleftarrows 3Z$

$$K = \frac{[Z]^3}{[X]^2[Y]} = \frac{(4)^3}{(2)^2(0.5)} = \frac{64}{2} = 32$$

56. A Weakest London forces = least # of e⁻

57. A H⊖C≡C-H 2 e⁻ concentrations = 2 orbitals = sp

58. D $360 \text{ mg} = \frac{\cancel{.360}\ .002 \text{ g}}{} \cdot \frac{1 \text{ mol}}{\cancel{180}} = .002 \text{ mol aspirin}$

$M = \frac{.002 \text{ mol}}{.2 \text{ L}} = .01 \text{ M}$ 50 mL of the soln would have the <u>same</u> molarity

59. B $K = \frac{N_2O_4}{NO_2} = \frac{3}{6^2} = \frac{3}{36} < 1$

60. B NH_3 forms complex ion w/ Ni^{2+}, solubility of the complex ion increases as more NH_3 is added.

61. D $R-O-\overset{O}{\overset{\|}{C}}-R$ = ester

62. B

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63. B F^- and O^{2-} have same # of e^-, but F^- has more protons, thus stronger nuclear charge, thus e^- have stronger attraction for nucleus in F^- than in O^{2-}

64. D pH > 7 = BASE

$\overset{N}{K}\overset{N}{Br}$ = Neutral $HC_2H_3O_2$ = weak acid HI = strong acid

$\overset{A}{NH_4}\overset{N}{Cl}$ = Acidic $\overset{N}{Na}\overset{B}{F}$ = Basic

65. C

66. E

67. B

$$8H^+ + 3\overset{+3}{N}\overset{-2}{O_2}^- + \overset{+6}{Cr_2}\overset{-2}{O_7}^{2-} \rightarrow 2Cr^{3+} + 3\overset{+5}{N}\overset{-2}{O_3}^- + 4H_2O$$

1 N × 2e⁻ = 2e⁻ (3) = 6e⁻

2 Cr × 3e⁻ = 6e⁻

68. B (.01 L)(0.002) = .00002 mol OH^- $[OH^-] = \frac{.00002 \text{ mol}}{.02 \text{ L}} = .001 \text{ M} = 1.0 \times 10^{-3}$ M

pOH = $-\log(1 \times 10^{-3}) = 3$

pH = 14 − 3 = 11

69. A same T = same average KE

70. B

71. C O and F next to each other on periodic table so similar electronegativity values

72. E produce two aqueous solns from two aqueous solns, all ions cancel, thus No RXN.

73. E Vapor pressure depends only on T, same T = same VP

74. B $Ni^{+2} + 2e^- \rightarrow Ni_{(s)}$

1 mol Ni	2 mole⁻	96500 C	= 193000 C
	1 mol Ni	1 mole⁻	

$1.00 \text{ A} = \frac{193000 \text{ C}}{\text{s}}$

$= 193000 \text{ s}$

75. B