

Chemistry 20: Practice Final # 1

Name _____

Score _____/100

1. An element with 6 valence electrons would be found in group ____ of the periodic table.

a	1
b	2
c	16
d	17

2. An example of an **element** is _____

a	Water
b	Iron powder
c	Copper (II) sulfate penta hydrate
d	lead (IV) fluoride

3. A valence electron is _____

a	The electron closest to the nucleus of an atom
b	Any electron in the highest energy level of an atom
c	The electron that is gained when an anion is formed
d	Any electron in the lowest energy level of an atom

4. The electron dot diagram for an oxygen atom is

a	<pre> . . :O:</pre>	b	<pre> . :O: .</pre>	c	<pre> .. . O: .</pre>	d	<pre> .. :O: ..</pre>
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5. The element chlorine forms the ion chloride ($\text{Cl}^-(\text{aq})$) by _____

a	Gaining one electron
b	Losing one electron
c	Gaining one proton
d	Losing one proton

6. The element, fluorine, has an atomic number of 9. An atom of fluorine has _____ lone pair(s) of electrons and _____ bonding electron(s).

a	1	6
b	6	1
c	1	3
d	3	1

7. Which of the following combined atoms would include a polar covalent bond?

a	Hydrogen - hydrogen
b	Carbon – hydrogen
c	Nitrogen – nitrogen
d	Chlorine - chlorine

8. Which formula represents a non-polar molecule

a	$\text{NH}_3(\text{g})$
b	$\text{HF}(\text{g})$
c	$\text{CCl}_4(\text{l})$
d	$\text{H}_2\text{O}(\text{l})$

9. The compound that contains a trigonal planar shape about one of its central atoms is _____

a	$\text{C}_4\text{H}_{10}(\text{g})$
b	$\text{C}_2\text{H}_4(\text{g})$
c	$\text{C}_6\text{H}_6(\text{l})$
d	$\text{C}_2\text{H}_5\text{OH}(\text{l})$

10. The number of electrons that are shared in a hydrogen – carbon bond is _____

a	One
b	Two
c	Three
d	four

11. The number of bonds between nitrogen atoms in a nitrogen molecule is _____

a	1
b	2
c	3
d	4

12. Of the molecules listed below, the one exhibiting pyramidal shape around its central atom is _____

a	SO ₂ (g)
b	CH ₄ (g)
c	NH ₃ (g)
d	C ₂ H ₄ (g)

13. The shape around each C atom in C₂H₂(g) is _____

a	Linear
b	V-shaped
c	Pyramidal
d	tetrahedral

14. The transfer of electrons from sodium atoms to chlorine atoms results in the formation of a/an _____ bond.

a	Polar covalent
b	Coordinate covalent
c	Non polar covalent
d	Ionic

15. Which is the formula of a non-polar molecule containing non-polar bonds?

a	CO ₂ (g)
b	H ₂ (g)
c	NH ₃ (g)
d	H ₂ O(l)

16. Which statement best explains why CCl₄(l) is a non-polar molecule?

a	C and Cl are non metals
b	The C-Cl bonds are polar
c	CCl ₄ (l) is a liquid at room temperature
d	The CCl ₄ (l) molecule is symmetrical in shape

17. Hydrogen bonds are the strongest between molecules of _____

a	HF
b	HCl
c	HBr
d	HI

18. Dipole-dipole attraction forces are the strongest between molecules of _____

a	H ₂ (g)
b	CH ₄ (g)
c	H ₂ O(l)
d	CO ₂ (g)

19. Which molecule is the MOST polar?

a	H ₂ O(l)
b	H ₂ S(g)
c	H ₂ Te(s)
d	H ₂ Se(s)

20. Liquid ammonia reacts with oxygen to product nitric acid and water. The balanced equation for this process is _____

a	$\text{NH}_4(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{NO}_2(\text{g}) + \text{H}_2(\text{g})$ heat
b	$\text{NH}_3(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{HNO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$
c	$2\text{O}_2(\text{g}) + 2\text{NH}_4(\text{l}) \rightarrow \text{H}_2\text{O}(\text{l}) + 2\text{HNO}_3(\text{aq})$
d	$2\text{O}_2(\text{g}) + \text{NH}_3(\text{l}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{HNO}_3(\text{aq})$

21. Which one of the following represents a double replacement reaction?

a	Sulfuric acid and potassium hydroxide → water + potassium sulfate
b	Calcium + water → hydrogen + calcium hydroxide
c	Methane + oxygen → carbon dioxide + water
d	Hydrogen + oxygen → hydrogen peroxide

22. Calcium sulfate and cesium dichromate → _____

a	$\text{CeSO}_4(\text{s}) + \text{CaCr}_2\text{O}(\text{s})$
b	$\text{CaS} + \text{Cs}(\text{CrO}_4)_2(\text{s})$
c	$\text{Ce}_2\text{S}(\text{s}) + \text{Ca}(\text{Cr}_2\text{O}_7)_2(\text{s})$
d	$\text{Cs}_2\text{SO}_4(\text{s}) + \text{CaCr}_2\text{O}_7(\text{s})$

23. The correct formula for ammonium phosphate is _____

a	$\text{NH}_4\text{PO}_4(\text{s})$
b	$(\text{NH}_4)_3\text{PO}_4(\text{s})$
c	$\text{NH}_4(\text{PO}_4)_3(\text{s})$
d	$(\text{NH}_3)_4\text{PO}_4(\text{s})$

24. The correct name for $\text{Pb}_3(\text{PO}_4)_2(\text{s})$ would be _____

a	Trilead diphosphate
b	Plumbic phosphate
c	Lead (II) phosphate
d	Lead (III) phosphate

25. The formula for calcium chloride at SATP is best written as _____

a	$\text{CaCl}_2(\text{l})$
b	$\text{CaCl}_2(\text{s})$
c	$\text{CaCl}_2(\text{g})$
d	$\text{CaCl}_2(\text{aq})$

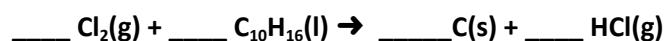
26. Which of the following observations is **not** evidence for a chemical reaction?

a	$\text{Zn}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$
b	Color is changed
c	Precipitate is formed
d	$\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{g})$

27. A concentrated solution is one in which there is _____

a	Large amount of solute in a large amount of solvent
b	Large amount of solute in a small amount of solvent
c	Small amount of solute in a large amount of solvent
d	Small amount of solute in a small amount of solvent

28. Consider the following unbalanced reaction



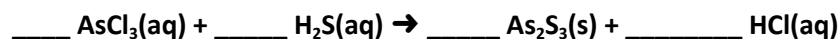
When the above reaction is balanced with the smallest whole numbers possible, the coefficient for $\text{Cl}_2(\text{g})$ is

a	1
b	4
c	8
d	16

29. A mole is correctly defined as

a	22.4 L of a gas
b	One gram of a substance
c	One molecule of a substance
d	One molar mass of a substance

30. Consider the following unbalanced reaction



Which of the following statements is TRUE when the equation above is correctly balanced?

a	The sum of the moles of reactants must equal the sum of the moles of the products
b	9 mol of $\text{H}_2\text{S}(\text{aq})$ will combine with 4 mol of $\text{AsCl}_3(\text{aq})$
c	4 mole of $\text{AsCl}_3(\text{aq})$ will produce 12 mol of $\text{HCl}(\text{aq})$
d	There is no relationship between the number of moles of reactants and the number of moles of products.

31. How many moles of $\text{CO}_2(\text{g})$ are there in 176 g of carbon dioxide?

a	21.1×10^{23}
b	6.02×10^{23}
c	44.0
d	4.00

32. The molar mass of $\text{Al}_2(\text{CO}_3)_3(\text{s})$ is _____ g

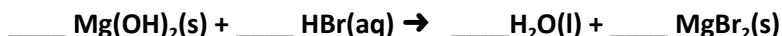
a	86.99
b	207.01
c	209.97
d	233.99

33. The mass of 0.250 mol of a compound with the molecular formula $LZ_3(s)$ is 17.0 g. If the molar mass of the element L is 11.00 g/mol, then the molar mass of Z is _____ g/mol

a	19.0
b	28.5
c	33.0
d	6.00

Use the following information to answer questions 34 & 35.

137 g of $Mg(OH)_2(s)$ is reacted according to the following equation



34. The number of moles of $Mg(OH)_2(s)$ that is reacted is _____ mol

a	1.54
b	2.35
c	3.32
d	4.57

35. The mass of water produced when 473 g of $MgBr_2(s)$ is produced will be _____ g

a	55.4
b	92.6
c	85.4
d	169

-
36. The quantity of $NaOH(s)$ that is equal in mass to 2.00 mol of $CaCO_3(s)$ is _____ mol

a	2.00
b	2.50
c	5.00
d	33.3

37. Consider the following unbalanced equation



The TRUE statement about the reaction

a	0.20 mol of $Na_3PO_4(s)$ reacts with 0.30 mol $CaO(s)$
b	1.5 mol of $CaO(s)$ produces 4.5 mol $Ca_3(PO_4)_2(s)$
c	1.0 mol $Na_3PO_4(s)$ produces 2.5 mol $Na_2O(s)$
d	2.0 mol of $Na_3PO_4(s)$ produces 2.0 mol $Ca_3(PO_4)_2(s)$

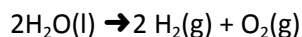
38. Substances that dissolve each other in any proportion are said to be _____.

a	Saturated
b	Diluted
c	Miscible
d	Aqueous

39. The number of moles of sodium nitrate in a 40.0 mL sample of 0.150 mol/L solution is _____ mol

a	6.00
b	2.67×10^{-1}
c	3.75×10^{-3}
d	6.00×10^{-3}

40. Consider the equation for the electrolysis of water



The number of moles of $\text{O}_2(\text{g})$ produced by the reaction using 90 g of $\text{H}_2\text{O}(\text{l})$ is _____ mol

a	1.0
b	2.0
c	2.5
d	5.0

41. The concentration of a salt solution that contains 77.4 g of $\text{KBr}(\text{s})$ in 500 mL of water is _____ mol/L

a	0.00130
b	0.130
c	1.30
d	5.00

42. What mass of sodium hydroxide is contained in 200 mL of a saturated 19.1 mol/L solution?

a	19.6 g
b	138 g
c	153 g
d	76.4 g

43. The molar concentration of a solution made by diluting 10.0 mL of a 0.740 mol/L $\text{KCl}(\text{aq})$ solution to a volume of 250 mL is _____ mol/L

a	0.0338
b	0.0296
c	0.0200
d	0.0185

44. In order to dilute 50.0 mL of a 6.00 mol/L HCl(aq) to a concentration of 0.150 mol/L, water should be added until the final volume is _____ L

a	2.00
b	2.50
c	3.00
d	4.00

45. Which of the following combinations are immiscible?

a	Hydrochloric acid and water
b	Ethanol and water
c	Gasoline and oil
d	Gasoline and water

46. A technician took 50.0 mL of distilled water and gradually added it to a solution of HCl(aq). The effect on moles of solute, volume of solution and concentration of solution respectively are _____, _____, and _____.

a	Increased	Increased	Increased
b	Decreased	Decreased	Decreased
c	Unchanged	Increased	Decreased
d	Unchanged	Decreased	increased

47. An adjustment was made to the concentration of a solution as shown in the table

	Moles of solute (mol)	Concentration mol/L	Volume (L)
Initial	0.50	0.25	X
Final	0.50	0.15	Y

How does volume X compare to volume Y?

A	X is greater than or equal to volume Y
B	X is greater than volume Y
C	X is less than volume Y
D	X is equal to volume Y

48. The molar concentration of a solution is expressed in units of _____

a	Moles per litre
b	Percent by mass
c	Parts per million
d	Percent by volume

49. An acidic solution does **NOT** _____

a	Conduct an electric current
b	Turn red litmus blue
c	React with an active metal to produce hydrogen gas
d	Neutralize a base

50. According to the Arrhenius definition, a base is a substance that when dissolved in water _____

a	Turns blue litmus paper red
b	Turns red litmus paper blue
c	Increases the hydrogen ion concentration
d	Increases the hydroxide concentration

51. The products of neutralization are _____ and _____.

a	Salt	Water
b	Salt	Base
c	Salt	Acid
d	Acid	Base

52. When the pH of a solution changes from 10 to 8, the $[\text{OH}^-(\text{aq})]$ _____

a	Increases and the solution becomes more acidic
b	Decrease and the solution becomes less acidic
c	Increases and the solution becomes more basic
d	Decreases and the solution becomes less basic

53. Acids are substances which have _____

a	High $[\text{OH}^-(\text{aq})]$ and low pH
b	High $[\text{OH}^-(\text{aq})]$ and high pH
c	Low $[\text{H}_3\text{O}^+(\text{aq})]$ and high pH
d	High $[\text{H}_3\text{O}^+(\text{aq})]$ and low pH

54. If $[\text{H}_3\text{O}^+(\text{aq})]$ of a solution is $7.5 \times 10^{-4} \text{ mol/L}$, then the $[\text{OH}^-(\text{aq})]$ is _____ mol/L

a	1.3×10^{-11}
b	2.5×10^{-11}
c	7.5×10^{-4}
d	2.5×10^{-4}

55. If the $[\text{OH}^-(\text{aq})]$ of a solution is $3.2 \times 10^{-6} \text{ mol/L}$, then the $[\text{H}_3\text{O}^+(\text{aq})]$ is _____ mol/L

a	3.2×10^{-6}
b	6.8×10^{-8}
c	3.1×10^{-9}
d	3.4×10^{-10}

56. The $[\text{H}_3\text{O}^+(\text{aq})]$ of grapefruit juice is about $6.3 \times 10^{-4} \text{ mol/L}$. The pH of this juice is _____

a	0.80
b	3.20
c	3.40
d	10.80

57. The $[\text{OH}^-(\text{aq})]$ of a cracker is $2.3 \times 10^{-6} \text{ mol/L}$. The pH of the cracker is _____

a	5.64
b	6.36
c	8.36
d	9.63

58. If 2.5 mol of barium hydroxide ($\text{Ba}(\text{OH})_2(\text{s})$) is dissolved in 60 L of water, the pH of the solution would be _____

a	12.92
b	1.08
c	1.38
d	12.62

59. The sauerkraut in a Reuben sandwich has a pH of 3.58. The $[\text{H}_3\text{O}^+(\text{aq})]$ of the sauerkraut is _____

a	$2.6 \times 10^{-11} \text{ mol/L}$
b	$3.8 \times 10^{-11} \text{ mol/L}$
c	$2.6 \times 10^{-4} \text{ mol/L}$
d	$3.8 \times 10^{-4} \text{ mol/L}$

60. Limburger cheese has a pH of 4.80 The $[\text{OH}^-(\text{aq})]$ of the cheese is _____ mol/L

a	6.3×10^{-4}
b	2.0×10^{-5}
c	1.6×10^{-5}
d	6.3×10^{-10}

61. The $[\text{OH}^-(\text{aq})]$ of an egg white is 3.4×10^{-7} mol/L. The egg is _____

a	Slightly basic
b	Highly basic
c	Highly acidic
d	Slightly acidic

62. The pH of a solution is 5.80. The TRUE statement about this solution is _____

a	The solution is acidic with a $[\text{H}_3\text{O}^+(\text{aq})]$ of less than 10^{-7} mol/L
b	The solution is acidic with a $[\text{H}_3\text{O}^+(\text{aq})]$ of greater than 10^{-7} mol/L
c	The solution is basic with a $[\text{OH}^-(\text{aq})]$ of less than 10^{-7} mol/L
d	The solution is basic with a $[\text{OH}^-(\text{aq})]$ of greater than 10^{-7} mol/L

63. A lime pie has a pH of 1.2 The pie filling is _____

a	Highly acidic
b	Slightly acidic
c	Highly basic
d	Slightly basic

64. A solution with a pH of 9.00 is _____ and has _____

a	Acidic	$[\text{H}_3\text{O}^+(\text{aq})] = 10^{-9}$ mol/L
b	Basic	$[\text{OH}^-(\text{aq})] = 10^{-9}$ mol/L
c	Acidic	$[\text{OH}^-(\text{aq})] = 10^{-9}$ mol/L
d	Basic	$[\text{H}_3\text{O}^+(\text{aq})] = 10^{-9}$ mol/L

65. A solution was made with 2.00 g of $\text{Na}_2\text{CO}_3(\text{s})$ dissolved in 100 mL of water. A 25.0 mL sample was then reacted with 15.5 mL of $\text{HCl}(\text{aq})$. What is the concentration of the acid?

a	0.258 mol/L
b	0.304 mol/L
c	0.609 mol/L
d	1.22 mol/L

66. What was the concentration of $\text{Na}_2\text{CO}_3(\text{aq})$ in question #65.

a	0.0189 mol/L
b	0.0200 mol/L
c	0.189 mol/L
d	1.89 mol/L

67. What volume of 0.24 mol/L sodium hydroxide solution is needed to neutralize 0.50 L of sulfuric acid with a pH of 1.83?

a	30.8 m
b	61.6 mL
c	92.4 mL
d	123 mL

68. Which statement is TRUE about decreasing the volume of a given amount of gas at a constant temperature in a container?

a	There are fewer molecules
b	The molecules are moving more slowly
c	The molecules are striking the container with increased force
d	There are more molecules

69. A gas mixture contains $\text{O}_2(\text{g})$, $\text{N}_2(\text{g})$, and $\text{CO}(\text{g})$. The total pressure of the three gases is 280 kPa. If the partial pressure of the $\text{O}_2(\text{g})$ is 74 kPa and the partial pressure of the $\text{CO}(\text{g})$ is 88 kPa, then the partial pressure of the $\text{N}_2(\text{g})$ is _____ kPa.

a	118
b	128
c	152
d	162

70. If 28 L of air at 30°C is warmed to 100°C , the new volume will be ____ L. Assume the pressure is held constant.

a	8.4
b	22.7
c	34.5
d	93.3

71. The boiling point of liquid nitrogen is -196°C . An equivalent temperature on the Kelvin scale will be _____ K

a	-196
b	77
c	153
d	273

72. A balloon filled with helium increases in volume as it ascends to a higher altitude. The expansion of the balloon is primarily due to _____

a	A decrease in the number of molecules inside the balloon.
b	An increase in the average kinetic energy of the helium atoms inside the balloon
c	An increase in the rate of collisions of the atmosphere molecules on the outside walls of the balloon
d	A decrease in the rate of collisions of the atmosphere molecules on the outside walls of the balloon

73. An empty 2 L plastic milk container is rinsed out with hot water and then sealed. What will happen to the container if it is placed in a cool storage room for ten minutes

a	It will swell
b	The sides will collapse inwards
c	It will remain the same size
d	Its temperature will increase

74. At a constant pressure, what will happen to the temperature of a gas when the volume is increased?

a	It will increase
b	It will decrease
c	It will remain unchanged
d	The gas will solidify

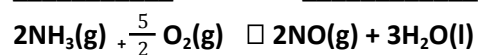
75. Which change below will cause an increase in the pressure of a gaseous system?

a	Increase the size of the container and reduce temperature
b	Increase the temperature
c	Release some gas from the container
d	Reduce the temperature

76. If the temperature of a gas is held constant, but the volume is reduced to one half, the pressure of the gas will _____

a	Be reduced by $\frac{1}{2}$
b	Remain the same
c	Double
d	Quadruple

77. In the reaction below 10 moles of ammonia reacted with 8 moles of oxygen at STP. The excess reagent is _____ and it has _____ moles left over

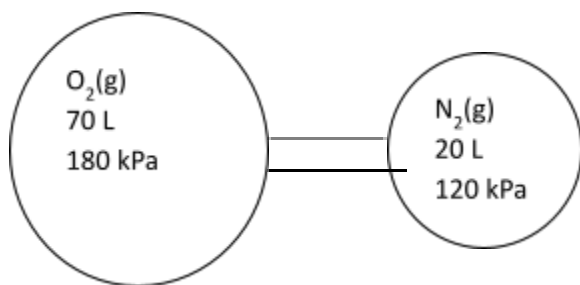


a	Oxygen	6.4
b	Oxygen	3.6
c	Ammonia	4.5
d	Ammonia	2.5

78. If the pressure of a gas in a rigid container at 200°C is 240 kPa, what will be the temperature of the gas when the pressure is reduced to 100 kPa? Express as _____ °C

a	-76.0
b	83.3
c	197
d	480

79. If the valve between the two containers below is opened, what would be the total pressure of the mixed gases? Assume the temperature holds constant.



a	5.25 kPa
b	33.3 kPa
c	150 kPa
d	167 kPa

80. The gaseous product of a reaction was collected in a 4.0 L container at 27°C and 77.9 kPa. If the gas is diatomic and has a mass of 4.0 g, then the gas is _____

a	Chlorine
b	Fluorine
c	Nitrogen
d	oxygen

81. **Numerical response question:**

Left justify the answer in the boxes provided

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A 72 mg sample of a toxic compound is dissolved in 2.5 L of water. The concentration of this compound is _____ ppm.

82. **Numerical response question**

Left justify the answer in the boxes provided

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A cation with a charge of 3+ is reduced to its metal by adding sufficient electrons. The number of electrons needed per mole of the cation will be _____

83. **Numerical response question**

Left justify the answer in the boxes provided

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The pressure of 2.40 atm is equivalent to _____ kPa.

84. **Numerical response question**

Left justify the answer in the boxes provided

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The mass of 0.50 mole of copper (II) sulfate pentahydrate is _____ kg.

85. Numerical response question

Left justify the answer in the boxes provided

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If 16 mol of oxygen gas at STP is reacted with 24 mol of hydrogen gas at STP to form water vapour, give the moles of excess reagent that is left over. Round the answer to the nearest tenth.

86. Numerical response question

Left justify the answer in the boxes provided

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Consider the following oxidation reduction reaction



The chemicals reagents from this reaction are assigned numbers as follows:

1	Al(s)
2	Fe(s)
3	Al ³⁺ (aq)
4	Fe ²⁺ (aq)

In the first box, give the chemical reagent that undergoes reduction

In the second box, give the chemical reagent that undergoes oxidation

87. Numerical response question

Left justify the answer in the boxes provided

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Samantha and Erin have a 500 mL sample of 0.0123 mol/L HCl(aq)

Express the concentration of [OH⁻(aq)] found in this solution in the form a.b x 10^{-cd}

88. Numerical response question

Left justify the answer in the boxes provided

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In the a molecule of HCN(g) , there is/ are ____ triple bonds, ____ double bonds and ____ single bond

89. Numerical response question

Left justify the answer in the boxes provided

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The number of moles of lithium nitrate found in 400 mL of 3.75 mol/L solution is ____ mol.

90. Numerical response question

Left justify the answer in the boxes provided

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A 2.00 mL sample of nitrogen gas as STP is changed to 290 K and 120 kPa. The new volume of this gas will be ____ mL

91. Long answer:

A 25.0 mL sample of 1.50 mol/L solution of barium nitrate and a 30 mL sample of 2.50 mol/L solution of aluminium sulfate undergo a double replacement reaction

i. Write the NON, total and Net ionic equations (3 marks)

ii. Identify the limiting reagent _____ and the excess reagent _____. (2 marks)

92. A 100 mL sample of 0.0340 mol/L **HCl** has 840 mL of water added to it.

- What is the pH of the undiluted acid? (1 mark) _____
- What is the pH of the diluted acid? (2 marks) _____
- Fill in the expected colors for the indicators given below (3 marks)

Indicator	Color in Undiluted acid	Color in Diluted acid
H ₂ Cr		
HMv		
HOr		

Answers:

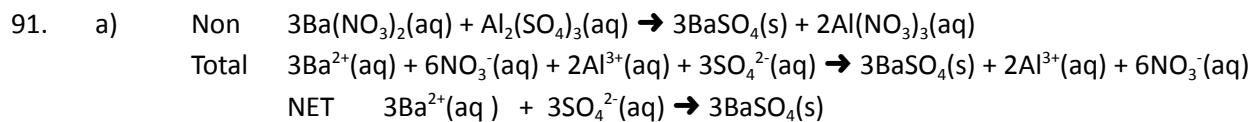
Multiple choice questions (1 mark each = 80)

1	C	16	D	31	D	46	C	61	A	76	C
2	B	17	A	32	D	47	C	62	B	77	B
3	B	18	C	33	A	48	A	63	A	78	A
4	C	19	A	34	B	49	B	64	D	79	D
5	A	20	D	35	B	50	D	65	c	80	D
6	D	21	A	36	C	51	A	66	C		
7	B	22	D	37	A	52	D	67	B		
8	C	23	B	38	C	53	D	68	C		
9	B	24	C	39	D	54	A	69	A		
10	B	25	B	40	C	55	C	70	C		
11	C	26	D	41	C	56	B	71	B		
12	C	27	B	42	C	57	C	72	D		
13	A	28	C	43	B	58	A	73	B		
14	D	29	D	44	A	59	C	74	A		
15	B	30	C	45	D	60	D	75	B		

Numerical response questions (1 mark x 10 = 10)

81	29	86	32
82	3	87	8113
83	243	88	101
84	0.12	89	1.50
85	4.0	90	1.79

Long answer:



b) Moles of $\text{Ba}(\text{NO}_3)_2(\text{aq}) = 0.0375$

moles of $\text{Al}_2(\text{SO}_4)_3(\text{aq}) = 0.075 \text{ mol}$

Limiting reagent = $\text{Ba}(\text{NO}_3)_2(\text{aq})$

Excess reagent = $\text{Al}_2(\text{SO}_4)_3(\text{aq})$

92. **pH of undiluted acid = 1.469** **pH of diluted acid 2.442**

Indicator	Color in Undiluted acid	color in Diluted acid
H ₂ Cr	Yellow	yellow
HMv	Green	blue
HOr	orange	orange