Exam Review 2021

Name: _____

Part A

Directions: Each set of lettered choices below refers to the numbered statements immediately following it. Select the one lettered choice that best fits each statement and them fill in the corresponding oval on the answer sheet. A choice may be used once, more than once, or not at all in each set.

Questions 1-3 refer to the following gases at 0 ^{o}C and 1 atm.

a) Ne
b) Xe
c) O_2
d) CO
e) NO

1) Has an average atomic or molecular speed closest to that of N_2 molecules at 0 ^{o}C and 1 atm

2) Has the greatest density

3) Has the greatest rate of effusion through a pinhole

Questions 4 -6 refer to the reactions represented below.

a) H_2SeO_4 (aq) + 2 Cl^- (aq) + 2 H^+ (aq) --> H_2SeO_3 (aq) + Cl_2 (g) + H_2O (l)
b) S_8 (s) + 8 O_2 (g) --> 8 SO_2 (g)
c) 3 Br_2 (aq) + 6 OH^- (aq) --> 5 Br^- (aq) + BrO_3^- (aq) + 3 H_2O (l)
d) Ca^{2+} (aq) + SO_4^{2-} (aq) --> $CaSO_4$ (s)
e) $PtCl_4$ (s) + 2 Cl^- (aq) --> $PtCl_6^{2-}$ (aq)

4) A precipitation reaction

5) A reaction in which the same reactant undergoes both oxidation and reduction

6) A combustion reaction

Part B

Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case and then fill in the corresponding oval on the answer sheet.

7) In which of the following species does sulfur have the same oxidation number as it does in H_2SO_4?
a) H_2SO_3 b) $S_2O_3^{2-}$ c) S^{2-} d) S_8 e) SO_2Cl_2

8) A flask contains 0.25 mole of SO_2 (g), 0.50 mole of CH_4 (g) and 0.50 mol of O_2 (g). The total pressure of the gases in the flask is 800 mm Hg. What is the partial pressure of the SO_2 (g) in the flask?
a) 800 mm Hg
b) 600 mm Hg
c) 250 mm Hg
d) 200 mm Hg
e) 160 mm Hg

9) In the laboratory, H_2 (g) can be produced by adding which of the following to 1 M HCl (aq)?
I. 1 M NH_3 (aq)
II. Zn (s)
III. $NaHCO_3$ (s)

a) I only b) II only c) III only d) 1 and II only e) I, II, and III

$$2\ NH_3 \leftrightarrows NH_4^+ + NH_2^-$$

10) In liquid ammonia, the reaction represented above occurs. In the reaction NH_4^+ acts as
a) a catalyst
b) both an acid and a base
c) the conjugate acid of NH_3
d) the reducing agent
e) the oxidizing agent

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{141}_{55}Cs + 3\,{}^{1}_{0}n + X$$

11) Neutron bombardment of uranium can induce the reaction represented above. Nuclide X is which of the following?
a) $^{92}_{35}Br$ b) $^{94}_{35}Br$ c) $^{91}_{37}Rb$ d) $^{92}_{37}Rb$ e) $^{94}_{37}Rb$

12) A compound contains 1.10 mol of K, 0.55 mol of Te, and 1.65 mol of O. What is the simplest formula of this compound?
a) KTeO b) KTe_2O c) K_2TeO_3 d) K_2TeO_6 e) K_4TeO_6

13) Approximately what mass of $CuSO_4 \cdot 5H_2O$ (250 g mol^{-1}) is required to prepare 250 mL of 0.10 M copper (II) sulfate solution?
a) 4.0 g b) 6.2 g c) 34 g d) 84 g e) 140 g

14) Of the following compounds, which is the most ionic?
a) $SiCl_4$ b) BrCl c) PCl_3 d) Cl_2O e) $CaCl_2$

15) At 25 ^{O}C, aqueous solutions with a pH of 8 have a hydroxide ion concentration, $[OH^-]$, of
a) 1×10^{-14} M b) 1×10^{-8} M c) 1×10^{-6} M d) 1 M e) 8 M

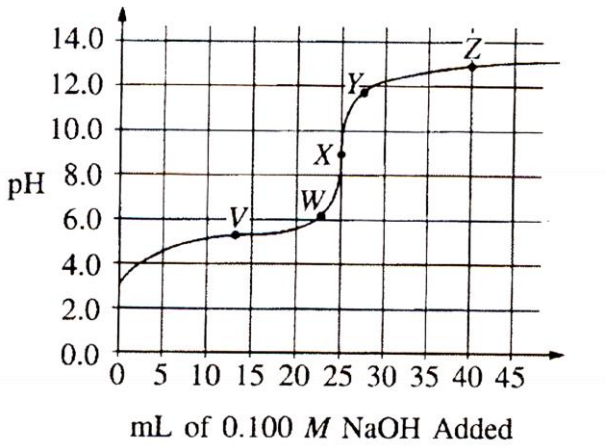
$$CS_2\ (l) + 3\ O_2\ (g) \text{ --> } CO_2\ (g) + 2\ SO_2\ (g)$$

16) What volume of O_2 (g) is required to react with excess CS_2 (l) to produce 4.0 L of CO_2 (g)? (Assume all gases are measured at 0 ^{O}C and 1 atm.)
a) 12 L
b) 22.4 L
c) 1/3 x 22.4 L
d) 2 x 22.4 L
e) 3 x 22.4 L

17) A 0.10 M aqueous solution of sodium sulfate, Na_2SO_4, is a better conductor of electricity than a 0.10 M aqueous solution of sodium chloride, NaCl. Which of the following best explains this observation?
a) Na_2SO_4 is more soluble in water than NaCl is.
b) Na_2SO_4 has a higher molar mass than NaCl has.
c) To prepare a given volume of 0.10 M solution, the mass of Na_2SO_4 needed is more than twice the mass of NaCl needed.
d) More moles of ions are present in a given volume of 0.10 M Na_2SO_4 than in the same volume of 0.10 M NaCl.
e) The degree of dissociation of Na_2SO_4 in solution is significantly greater than that of NaCl.

Questions 18 - 19

The graph below shows the titration curve that results when 100. mL of 0.0250 M acetic acid is titrated with 0.100 M NaOH.



18) Which of the following indicators is the best choice for this titration?

	Indicator	pH Range of Color Change
a)	Methyl orange	3.2 - 4.4
b)	Methyl red	4.8 - 6.0
c)	Bromothymol Blue	6.1 - 7.6
d)	Phenolphthalien	8.2 - 10.0
e)	Alizarin	11.0 - 12.4

19) What part of the curve corresponds to the optimum buffer action for the acetic acid/acetate ion pair?

a) Point V
b) Point X
c) Point Z
d) Along all of section WY
e) Along all of section YZ

20) An excess of Mg (s) is added to 100. mL of 0.400 M HCl. At O ^{o}C and 1 atm pressure, what volume of H_2 gas can be obtained?

a) 22.4 mL b) 44.8 mL c) 224 mL d) 448 mL e) 896 mL

21) At a certain temperature, the value of the equilibrium constant, K, for the reaction represented above is 2.0×10^{5}. What is the value of K for the reverse reaction at the same temperature?

a) -2.0×10^{-5} b) 5.0×10^{-6} c) 2.0×10^{-5} d) 5.0×10^{-5} e) 5.0×10^{-4}

22) The atomic mass of copper is 63.55. Given that there are only two naturally occurring isotopes of copper, ^{63}Cu and ^{65}Cu, the natural abundance of the ^{65}Cu isotope must be approximately

a) 90% b) 70% c) 50% d) 25% e) 10%

23) Which of the following represents acceptable laboratory practice?

a) Placing a hot object on a balance pan.
b) Using distilled water for the final rinse of a buret before filling with a standardized solution.
c) Adding a weighed quantity of solid acid to a titration flask wet with distilled water.
d) Using 10 mL of standard strength phenolphthalein indicator solution for titration of 25 mL of acid solution
e) Diluting a solution in a volumetric flask to its final concentration with hot water.

24) Propane gas, C_3H_8, burns in excess oxygen gas. When the equation for this reaction is correctly balanced and all coefficients are reduced to their lowest whole number terms, the coefficient for O_2 is
a) 4 b) 5 c) 7 d) 10 e) 22

$$2\ N_2H_4\ (g) + N_2O_4\ (g) \rightarrow 3\ N_2\ (g) + 4\ H_2O\ (g)$$

25) When 8.0 g of N_2H_4 (32 g mol^{-1}) and 92 g of N_2O_4 (92 g mol^{-1}) are mixed together and react according to the equation above, what is the maximum mass of H_2O that can be produced?
a) 9.0 g b) 18 g c) 36 g d) 72 g e) 144 g

26) All of the halogens in their elemental form at 25 ^oC and 1 atom are
a) conductors of electricity
b) diatomic molecules
c) odorless
d) colorless
e) gases

$$2\ H_2O\ (l) + 4\ MnO_4^-\ (aq) + 3\ ClO_2^-\ (aq) \rightarrow 4\ MnO_2\ (s) + 3\ ClO_4^-\ (aq) + 4\ OH^-\ (aq)$$

27) According to the balanced equation above, how many moles of ClO_2^- (aq) are needed to react completely with 20 mL of 0.20 M $KMnO_4$ solution?
a) 0.0030 mol b) 0.0053 mol c) 0.0075 mol d) 0.013 mol e) 0.030 mol

28) How can 100. mL of sodium hydroxide solution with a pH of 13.00 be converted to a sodium hydroxide solution with a pH of 12.00?
a) By diluting the solution with distilled water to a total volume of 108 mL.
b) By diluting the solution with distilled water to a total volume of 200 mL.
c) By diluting the solution with distilled water to a total volume of 1.0 L.
d) By adding 100. mL of 0.10 M HCl
e) By adding 100. mL of 0.10 M NaOH

29) Mixtures that would be considered buffers include which of the following?

I. 0.10 M HCl + 0.10 M NaCl
II. 0.10 M HF + 0.10 M NaF
III. 0.10 M HBr + 0.10 M NaBr

a) I only b) II only c) III only d) I and II e) II and III

30) Ascorbic acid, $H_2C_6H_6O_6$ (s), is a diprotic acid with $K_1 = 7.9 \times 10^{-5}$ and $K_2 = 1.6 \times 10^{-12}$. In a 0.005 M aqueous solution of ascorbic acid, which of the following species is present in the lowest concentration?
a) H_2O (l) b) H_3O^+ (aq) c) $H_2C_6H_6O_6$ (aq) d) $HC_6H_6O_6^-$ (aq) e) $C_6H_6O_6^{-2}$ (aq)

31) Which of the following substances is LEAST soluble in water?
a) $(NH_4)_2SO_4$ b) $KMnO_4$ c) $BaCO_3$ d) $Zn(NO_3)_2$ e) Na_3PO_4

32) A 2 L container will hold about 4 g of which of the following gases at 0 ^oC and 1 atm?
a) SO_2 b) N_2 c) CO_2 d) C_4H_8 e) NH_3

33) If 200. mL of 0.60 M $MgCl_2$ (aq) is added to 400 mL of distilled water, what is the concentration of Mg^{+2} (aq) in the resulting solution? (Assume volumes are additive.)
a) 0.20 M b) 0.30 M c) 0.40 M d) 0.60 M e) 1.2 M

Review Answers:

1) D
2) B
3) A
4) D
5) C
6) B
7) E
8) E
9) E
10) C
11) E
12) C
13) B
14) E
15) C
16) A
17) D
18) D
19) A
20) D
21) E
22) D
23) C
24) B
25) A
26) B
27) A
28) C
29) B
30) E
31) C
32) C
33) A