

AP Chemistry: Miscellaneous Multiple Choice

24. The formula for potassium hexacyanoferrate(II) is...

- (A) $\text{K}_4[\text{Fe}(\text{CN})_6]$ (B) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (C) $\text{K}_2[\text{Pt}(\text{CN})_4]$ (D) $\text{K}_2[\text{Pt}(\text{CN})_6]$ (E) KCN

4. Use the following answers for questions 4 - 7.

- (A) Hydrofluoric acid
(B) Carbon dioxide
(C) Aluminum hydroxide
(D) Ammonia
(E) Hydrogen peroxide

4. Is a good oxidizing agent

5. Is used to etch glass chemically

6. Is used extensively for the production of fertilizers

7. Has amphoteric properties

63. Which of the following characteristics is common to elemental sulfur, chlorine, nitrogen, and carbon?

- (A) They are gaseous elements at room temperature.
(B) They have oxides that are acid anhydrides.
(C) They have perceptible color at room temperature.
(D) They form ionic oxides.
(E) They react readily with hydrogen at room temperature.

64. A solution is known to contain an inorganic salt of one of the following elements. The solution is colorless. The solution contains a salt of...

- (A) Cu (B) Mn (C) Fe (D) Ni (E) Zn

11. Use the following answers for Questions 11-13

- (A) Pb (B) Ca (C) Zn (D) As (E) Na

11. Utilized as a coating to protect Fe from corrosion

12. Is added to silicon to enhance its properties as a semiconductor

13. Utilized as a shield from sources of radiation

1. Questions 1-4 refer to the following types of energy:

- (A) Activation energy (B) Free energy (C) Ionization energy (D) Kinetic energy (E) Lattice energy

1. The energy required to convert a ground-state atom in the gas phase to a gaseous positive ion

2. The energy change that occurs in the conversion of an ionic solid to widely separated gaseous ions

3. The energy in a chemical or physical change that is available to do useful work

4. The energy required to form the transition state in a chemical reaction

45. A measured mass of an unreactive metal was dropped into a small graduated cylinder half filled with water. The following measurements were made.

Mass of metal = 19.611 grams

Volume of water before addition of metal = 12.4 milliliters

Volume of water after addition of metal = 14.9 milliliters

The density of the metal, when correctly rounding using sig. figs, should be reported as...

- (A) 7.8444 grams per mL (B) 7.844 grams per mL (C) 7.84 grams per mL
(D) 7.8 grams per mL (E) 8 grams per mL

42.

Mass of an empty container = 3.0 grams

Mass of the container plus the solid sample = 25.0 grams

Volume of the solid sample = 11.0 cubic centimeters

The data above were gathered in order to determine the density of an unknown solid. The density of the sample, when correctly rounding using sig. figs, should be reported as...

- (A) 0.5 g/cm³ (B) 0.50 g/cm³ (C) 2.0 g/cm³ (D) 2.00 g/cm³ (E) 2.27 g/cm³

49. Which of the following techniques is most appropriate for the recovery of solid KNO₃ from an aqueous solution of KNO₃?

- (A) Paper chromatography (B) Filtration (C) Titration (D) Electrolysis (E) Evaporation to dryness

81. What is the net ionic equation for the reaction that occurs when aqueous copper (II) sulfate is added to excess 6-molar ammonia?

- (A) $\text{Cu}^{2+} + \text{SO}_4^{2-} + 2 \text{NH}_4^+ + 2 \text{OH}^- \rightarrow (\text{NH}_4)_2\text{SO}_4 + \text{Cu}(\text{OH})_2$
(B) $\text{Cu}^{2+} + 4 \text{NH}_3 + 4 \text{H}_2\text{O} \rightarrow \text{Cu}(\text{OH})_4^{2-} + 4 \text{NH}_4^+$
(C) $\text{Cu}^{2+} + 2 \text{NH}_3 + 2 \text{H}_2\text{O} \rightarrow \text{Cu}(\text{OH})_2 + 2 \text{NH}_4^+$
(D) $\text{Cu}^{2+} + 4 \text{NH}_3 \rightarrow \text{Cu}(\text{NH}_3)_4^{2+}$
(E) $\text{Cu}^{2+} + 2 \text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{CuO} + 2 \text{NH}_4^+$

69. A white solid is observed to be insoluble in water, insoluble in excess ammonia solution, and soluble in dilute HCl. Which of the following compounds could the solid be?

- (A) CaCO₃ (B) BaSO₄ (C) Pb(NO₃)₂ (D) AgCl (E) Zn(OH)₂

31. A 0.1-molar solution of which of the following ions is orange?

- (A) Fe(H₂O)₄²⁺ (B) Cu(NH₃)₄²⁺ (C) Zn(OH)₄²⁻ (D) Zn(NH₃)₄²⁺ (E) Cr₂O₇²⁻

35. The addition of an oxidizing agent such as chlorine water to a clear solution of an unknown compound results in the appearance of a brown color. When this solution is shaken with the organic solvent, methylene dichloride, the organic solvent layer turns purple. The unknown compound probably contains...

- (A) K⁺ (B) Br⁻ (C) NO₃⁻ (D) I⁻ (E) Co²⁺

62. A student pipetted five 25.00-milliliter samples of hydrochloric acid and transferred each sample to an Erlenmeyer flask, diluted it with distilled water, and added a few drops of phenolphthalein to each. Each sample was then titrated with a sodium hydroxide solution to the appearance of the first permanent faint pink color. The following results were obtained:

Volumes of NaOH Solution

First Sample.....35.22 mL

Second Sample.....36.14 mL

Third Sample.....36.13 mL

Fourth Sample.....36.15 mL

Fifth Sample.....36.12 mL

Which of the following is the most probable explanation for the variation in the student's results?

- (A) The burette was not rinsed with NaOH solution.
- (B) The student misread a 5 for a 6 on the burette when the first sample was titrated.
- (C) A different amount of water was added to the first sample.
- (D) The pipette was not rinsed with the HCl solution.
- (E) The student added too little indicator to the first sample.

36. Appropriate laboratory procedures include which of the following?

- I. Rinsing a buret with distilled water just before filling it with the titrant for the first titration
 - II. Lubricating glass tubing before inserting it into a stopper
 - III. For accurate results, waiting until warm or hot objects have reached room temperature before weighing them
- (A) II only (B) I and II only (C) I and III only (D) II and III only (E) I, II, and III

73. Adding water to some chemicals can be dangerous because large amounts of heat are liberated. Which of the following does NOT liberate heat when water is added to it?

- (A) KNO_3 (B) NaOH (C) CaO (D) H_2SO_4 (E) Na

38. Concentrations of colored substances are commonly measured by means of a spectrophotometer. Which of the following would ensure that correct values are obtained for the measured absorbance?

- I. There must be enough sample in the tube to cover the entire light path.
 - II. The instrument must be periodically reset using a standard.
 - III. The solution must be saturated.
- (A) I only (B) II only (C) I and II only (D) II and III only (E) I, II, and III

41. A strip of metallic scandium, Sc, is placed in a beaker containing concentrated nitric acid. A brown gas rapidly forms, the scandium disappears, and the resulting liquid is brown-yellow but becomes colorless when warmed. These observations best support which of the following statements?

- (A) Nitric acid is a strong acid.
- (B) In solution scandium nitrate is yellow and scandium chloride is colorless.
- (C) Nitric acid reacts with metals to form hydrogen.
- (D) Scandium reacts with nitric acid to form a brown gas.
- (E) Scandium and nitric acid react in mole proportions of 1 to 3.

46. Which of the following solids dissolves in water to form a colorless solution?

- (A) CrCl_3 (B) FeCl_3 (C) CoCl_2 (D) CuCl_2 (E) ZnCl_2

21. When a solution of sodium chloride is vaporized in a flame, the color of the flame is...

- (A) blue (B) yellow (C) green (D) violet (E) white

46. Which of the following occurs when excess concentrated $\text{NH}_{3(\text{aq})}$ is mixed thoroughly with 0.1 M $\text{Cu}(\text{NO}_3)_2$?

- (A) A dark red precipitate forms and settles out.
(B) Separate layers of immiscible liquids form with a blue layer on top.
(C) The color of the solution turns from light blue to dark blue.
(D) Bubbles of ammonia gas form.
(E) The pH of the solution decreases.

42. Metallic copper is heated strongly with concentrated sulfuric acid. The products of this reaction are...

- (A) $\text{CuSO}_{4(\text{s})}$ and $\text{H}_{2(\text{g})}$ only (B) Cu^{2+} , $\text{SO}_{2(\text{g})}$, and H_2O (C) Cu^{2+} , $\text{H}_{2(\text{g})}$, and H_2O
(D) $\text{CuSO}_{4(\text{s})}$, $\text{H}_{2(\text{g})}$, and $\text{SO}_{2(\text{g})}$ (E) Cu^{2+} , $\text{SO}_{3(\text{g})}$, and H_2O

44. The metal calcium reacts with molecular hydrogen to form a compound. All of the following statements concerning this compound are true EXCEPT:

- (A) Its formula is CaH_2 . (B) It is ionic. (C) It is solid at room temperature.
(D) When added to water, it reacts to produce H_2 gas.
(E) When added to water, it forms an acidic solution.

Questions 17-18 refer to the following elements:

- (A) Lithium (B) Nickel (C) Bromine (D) Uranium (E) Fluorine

17. Is a gas in its standard state at 298 K

18. Reacts with water to form a strong base

Questions 6-7 refer to the following solid compounds:

- (A) PbSO_4
(B) CuO
(C) KMnO_4
(D) KCl
(E) FeCl_3

6. Is purple in aqueous solution.

7. Is white and very soluble in water.

59. All of the halogens in their elemental form at 25 °C and 1 atm are...

- (A) conductors of electricity
- (B) diatomic molecules
- (C) odorless
- (D) colorless
- (E) gases

72. A colorless solution is divided into three samples. The following tests were performed on samples of the solution.

<u>Sample</u>	<u>Test</u>	<u>Observation</u>
1	Add $\text{H}^+_{(\text{aq})}$	No change
2	Add $\text{NH}_{3(\text{aq})}$	No change
3	Add $\text{SO}_4^{2-}_{(\text{aq})}$	No change

Which of the following ions could be present in the solution at a concentration of 0.10 M?

- (A) $\text{Ni}^{2+}_{(\text{aq})}$
- (B) $\text{Al}^{3+}_{(\text{aq})}$
- (C) $\text{Ba}^{2+}_{(\text{aq})}$
- (D) $\text{Na}^+_{(\text{aq})}$
- (E) $\text{CO}_3^{2-}_{(\text{aq})}$

50. 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 it with 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

21. In the laboratory, $\text{H}_{2(\text{g})}$ can be produced by adding which of the following to 1M $\text{HCl}_{(\text{aq})}$?

- I. 1 M $\text{NH}_{3(\text{aq})}$
- II. $\text{Zn}_{(\text{s})}$
- III. $\text{NaHCO}_{3(\text{s})}$

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I, II, and III

36. A sample of a solution of an unknown was treated with dilute hydrochloric acid. The white precipitate formed was filtered and washed with hot water. A few drops of potassium iodide solution were added to the hot water filtrate and a bright yellow precipitate was produced. The white precipitate remaining on the filter paper was readily soluble in ammonia solution. What two ions could have been present in the unknown?

- (A) $\text{Ag}^+(\text{aq})$ and $\text{Hg}_2^{2+}(\text{aq})$
- (B) $\text{Ag}^+(\text{aq})$ and $\text{Pb}^{2+}(\text{aq})$
- (C) $\text{Ba}^{2+}(\text{aq})$ and $\text{Ag}^+(\text{aq})$
- (D) $\text{Ba}^{2+}(\text{aq})$ and $\text{Hg}_2^{2+}(\text{aq})$
- (E) $\text{Ba}^{2+}(\text{aq})$ and $\text{Pb}^{2+}(\text{aq})$

65. Which of the following substances is LEAST soluble in water?

- (A) $(\text{NH}_4)_2\text{SO}_4$
- (B) KMnO_4
- (C) BaCO_3
- (D) $\text{Zn}(\text{NO}_3)_2$
- (E) Na_3PO_4