

八十六學年度 輻射生物研究所 (所) _____ 組碩士班研究生入學考試

科目 普通化學 科號 4107 共 五 頁第 1 頁 *請在試卷【答案卷】內作答

選擇題 (每題二分, 共五十題)

1. A homogeneous mixture is a
(a) colloid (b) solution (c) suspension (d) pure substance.
2. Which of the following is not a purification technique?
(a) distillation (b) filtration (c) mixing (d) chromatography.
3. Which two types of change both produce new pure substances?
(a) physical and chemical (b) nuclear and chemical
(c) physical and nuclear (d) none of the above.
4. How many atoms are represented in the formula H_3PO_4 ?
(a) 8 (b) 3 (c) 7 (d) 1
5. The number of protons in the nucleus of an atom is called the _____ for the atom.
(a) mass number (b) family number (c) electron number (d) atomic number
6. The ground state of the hydrogen atom would have
(a) three electrons in the first orbit.
(b) two electrons in the first orbit.
(c) one electron in the first orbit.
(d) one electron in the first orbit and one electron in the second orbit.
7. Which element is a metal?
(a) Chlorine (b) sodium (c) argon (d) sulfur
8. Sodium has chemical properties most like
(a) cesium (b) magnesium (c) chlorine (d) mercury
9. Elements that conduct heat and electricity well are
(a) nonmetals. (b) noble gases (c) metals. (d) metalloids.
10. When you look at a gram of table salt (sodium chloride), what do you understand composes the crystal?
(a) atoms of sodium (b) molecules of sodium and chlorine
(c) sodium ions and chloride ions (d) molecules of sodium chloride

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11. The amount of energy required to remove an electron from an atom is the
 - (a) removal energy. (b) electron affinity. (c) ionization energy.
 - (d) cathode-ray energy.
12. An element with electronic structure of $1s^2 2s^2 2p^4$ is in which group of the periodic table?
 - (a) 2 (b) 4 (c) 6 (d) 8
13. Why are atoms at the bottom of a group in a periodic table larger than atoms at the top of the group?
 - (a) Larger atoms have more electrons.
 - (b) Larger atoms have more protons.
 - (c) Larger atoms have more energy levels occupied by electrons.
 - (d) Larger atoms have less screening effect by inner electrons.
14. Which substance is most likely to have covalent bonds?
 - (a) PCl_3 (b) KBr (c) MgF_2 (d) $ScCl_3$
15. Which substance does not contain molecules?
 - (a) sugar (b) ethanol (c) diamond (d) glucose
16. Which of the following molecules does not obey the octet rule?
 - (a) BF_3 (b) NH_3 (c) CH_4 (d) H_2O
17. Which is not a physical property of water?
 - (a) solid is less dense than liquid at normal freezing point
 - (b) relatively high heat capacity per unit of weight
 - (c) relatively low heat of vaporization (d) relatively large surface tension
18. Which chloride when added to water will produce a metal hydroxide precipitate?
 - (a) $NaCl$ (b) $CaCl_2$ (c) $AlCl_3$ (d) CCl_4
19. All of the following are properties of acids except one. Which is the exception?
 - (a) turn litmus from blue to red (b) taste sour
 - (c) react with metals to liberate hydrogen (d) have pH above 7

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20. Which is not generally associated with nuclear reactions.
 (a) outer electrons (b) atomic number (c) atomic mass (d) the nucleus
21. The product of the alpha decay of uranium-238 is
 (a) thorium-234. (b) thorium-230. (c) uranium-234. (d) uranium-242.
22. Which is smaller in terms of radioactive disintegrations per second?
 (a) one curie (b) one microcurie (c) one millicurie (d) one picocurie
23. An electrolytic solution
 (a) conducts electricity. (b) contains ions. (c) may contain some molecules.
 (d) has properties (a), (b), and (c).
24. H_3O^+ is the
 (a) hydrogen ion. (b) hydronium ion. (c) ammonium ion. (d) hydridium ion.
25. If 3 moles of a substance are dissolved in 500 mL (0.5 L) of solution, the concentration of this solution is
 (a) 3 M. (b) 1.5 M. (c) 6 M.
 (d) unknown since substance is not given and molecular weight is not available.
26. When concentrated sulfuric acid is diluted, always
 (a) add acid to water. (b) put acid in first, then add the water.
 (c) add acid and water at the same time. (d) limit the concentration to 1.0 M or less.
27. Chemical buffering systems
 (a) maintain constant pH. (b) consist of a conjugate acid-base pair.
 (c) absorb added H^+ or OH^- ions. (d) do all the above.
28. Why is pure water neutral?
 (a) Pure water has no H^+ ions and no OH^- ions.
 (b) Pure water has equal numbers of hydrogen and hydroxide ions.
 (c) Pure water has no dissolved carbon dioxide.
 (d) The pH of pure water at 25 °C is 7.

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29. C_{60} is
(a) a molecular substance. (b) a polymer. (c) a salt. (d) a covalent solid.
30. Which is the weak electrolyte?
(a) HCl (b) H_2SO_4 (c) HNO_3 (d) $HC_2H_3O_2$
31. The formula of a salt formed from Ca^{2+} and PO_4^{3-} ions is
(a) $CaPO_4$. (b) $Ca_2(PO_4)_3$. (c) $Ca_3(PO_4)_2$. (d) $Ca_3P_2O_4$.
32. Which compound is the strongest oxidizing agent?
(a) $KMnO_4$ (b) MnO (c) CO (d) CO_2
33. Which of the following might prevent corrosion of iron?
(a) a water spray (b) salt solutions (c) acid treatments (d) a coating of zinc
34. In a lead storage battery, what lead compound is formed at both the cathode and anode during discharge?
(a) lead oxide (PbO_2) (b) lead sulfate ($PbSO_4$)
(c) lead chloride ($PbCl_2$) (d) lead oxide (PbO)
35. In an electrolysis reaction, oxidation occurs at which electrode?
(a) anode (b) cathode (c) both electrodes (d) neither electrode
36. Calcium oxide from oyster shells is used to precipitate magnesium from sea water. The oxide reacts with water to form
(a) hydrogen (b) a sulfate (c) a hydroxide
(d) oxide ions which precipitate the magnesium in the aqueous medium.
37. Washing soda is a hydrated form of
(a) sodium bicarbonate. (b) calcium carbonate.
(c) sodium carbonate. (d) magnesium bicarbonate.
38. Hydrolysis is
(a) a water-splitting reaction. (b) an oxidation.
(c) a reduction. (d) required prior to a combustion.

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39. The complete combustion of C_2H_6 yields
 (a) C_2H_4 and H_2 . (b) CO and H_2O . (c) CO_2 and H_2O . (d) C and H_2 .
40. Which of the following is a structural isomer of pentane?
 (a) 2-methylpentane (b) 2-methylhexane (c) 2-methylbutane (d) 3-methylpropane
41. The primary component of natural gas is
 (a) methane. (b) ethane. (c) propane. (d) butane.
42. Among the following, the compound with the highest octane rating is
 (a) n-hexane. (b) 1-pentene. (c) isooctane. (d) methanol.
43. Hydrogen bonding between molecules is important in
 (a) alcohols. (b) ethers. (c) ketones. (d) hydrocarbons.
44. A free radical contains
 (a) only pairs of electrons. (b) only unpaired electrons.
 (c) pairs of electrons and one unpaired electron.
 (d) one electron pair and a number of unpaired electrons.
45. The name of the $C_2H_5^-$ group is
 (a) methyl. (b) ethyl. (c) propyl. (d) butyl.
46. Which of the following is not a characteristic of a metal?
 (a) high reflectivity of light (b) high thermal conductivity (c) high electrical conductivity
 (d) increasing electrical conductivity with increasing temperature
47. Which of the following combinations of atoms do you expect to yield a discrete molecule?
 (a) Ba and O (b) N and O (c) Cu and Ni (d) Na and F
48. How many nearest neighbors does each atom have in a body-centered cubic (bcc) structure?
 (a) 4 (b) 6 (c) 8 (d) 12
49. What oxidation state(s) do copper atoms possess in the $YBa_2Cu_3O_7$ superconductor?
 (a) +2 only (b) both +1 and +2 only (c) both +2 and +3 (d) both +1 and +3
50. How many grams of $AgBr$ can be made from 1.00 g of $KCl_{0.3}Br_{0.7}$? Atom weights for Ag, K, Br, and Cl are 107.87, 39.10, 79.9, and 35.45, respectively.