

每題 5 分, 共計 100 分

- What is the approximate fraction of ionic to the neutral form of ammonia in a solution of pH equal seven?
 - around 1 to 10
 - around 10 to 1
 - between 100 to 1 and 10 to 1
 - around 100 to 1
 - more than 100 to 1
- Which of the following statement is/are correct?
 - The isoionic pH of polyprotic specie is slight concentration dependence.
 - The isoelectric pH of polyprotic specie is not concentration dependence.
 - The isoionic pH is the pH at which the average charge of the polyprotic specie is zero.
 - The isoelectric pH is the pH of the pure neutral poluprotic acid.
 - All of above.
- Gave the equilibrium value of following equations:

$$\text{HgS}_{(s)} \rightleftharpoons \text{Hg}^{2+} + \text{S}^{2-} \quad K_{sp} = 5 \times 10^{-54},$$

$$\text{S}^{2-} + \text{H}_2\text{O} \rightleftharpoons \text{HS}^- + \text{OH}^- \quad K_{b1} = 0.8, \text{ and}$$

$$\text{HS}^- + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{S} + \text{OH}^- \quad K_{b2} = 1.1 \times 10^{-7}$$

Please calculate the concentration of $[\text{Hg}^{2+}]$ in M if the solution is set at pH of 8.

 - 2.4×10^{-30}
 - 1.9×10^{-24}
 - 2.1×10^{-25}
 - 2.1×10^{-24}
 - 1.2×10^{-25}
- In the Mohr titration, Cl^- is titrated with Ag^+ in the presence of CrO_4^{2-} , Which of the following method is used to detect the end point of the titration?
 - Formation of a soluble, colored complex at the end point.
 - Formation of a colored precipitate.
 - Adsorption of a colored indicator on the precipitate.
 - Light-scattering method.
 - Potentiometric method.
- What would be the equilibrium constant for annding of 10.0 mL of 0.0200 M ammonium chloride($\text{p}K_a = 9.244$) and 10.0 mL of 0.0320 M trimethylamine($\text{p}K_b = 4.200$)?
 - 1.8×10^{-2}
 - 3.60

(背面仍有題目,請繼續作答)

- c) 3.60×10^{-3}
d) 1.80
e) 4.21
6. Which of the following method is/are used to extract metal ions from aqueous sample?
a) C-18 column solid phase extraction.
b) Liquid-liquid chelate extraction.
c) Adjusting of pH of aqueous sample.
d) Ionic membrane extraction.
e) All of above.
7. Which of following reagents can be used for preparation of meat samples for determining their metal content?
a) Nitric acid.
b) Aqua regia.
c) Sulfuric acid.
d) Hydrofluoric acid.
e) All of above.
8. Which of following technique is/are commonly used to estimate the random error of analyses?
a) Control chart.
b) Duplicate analysis.
c) Standard Reference Materials or Certified Reference Materials test.
d) Quality control sample analysis.
e) Inter-laboratory comparison.
9. What is the statistics test that we can use it to decide whether a datum is consistent with the remaining data or not?
a) Student's test.
b) Q test.
c) F test.
d) Any of above test.
e) None of above test.
10. Please find the pH of water containing 0.10 M KCl at 25°C ($\gamma_{H^+} = 0.83$, $\gamma_{OH^-} = 0.76$).
a) 7.02
b) 7.00
c) 6.98
d) 6.96
e) none of above.

11. Which of the following ionization method in mass spectrometry can give molecular weight information for most organic compound?
- Electron impact.
 - Chemical ionization.
 - Electro spray ionization.
 - Field ionization.
 - Fast atom bombard.
12. Which of the following factors will influence the analyte retention time?
- The phase ratio of the separation column.
 - The solvent strength of mobile phase.
 - Column temperature.
 - The polarity of stationary phase.
 - The mobile phase average speed.
13. If thermal equilibrium exists, the relative population of any two energy level are given by Boltzmann's distribution:

$$\frac{N^*}{N_0} = \frac{g^*}{g_0} e^{-\frac{\Delta E}{kT}} \quad \text{where } N \text{ is the population of each state, } g \text{ is the}$$

number of degeneracy state of each state, and T is kelvins and k is Boltzmann's constant (1.380658×10^{-23} J/k). The lowest excited state of a sodium atom lies 3.371×10^{-19} kJ/atom above the single ground state and has two degeneracy states, what is the fraction of atom in the excited state?

- 1.67×10^{-4}
 - 1.67×10^{-3}
 - 1.67×10^{-2}
 - 1.67×10^1
 - 1.67×10^2
14. Which of following gas chromatographic detector s/are destructive type?
- Flame ionization detector.
 - Flame photometric detector.
 - Thermo-conductance detector.
 - Nitrogen-phosphor detector.
 - Mass spectrometry detector.
15. Which of the following statements is/are correct?
- Usually fluorescence method is more sensitive than absorption method.
 - The fluorescence method is less precision than adsorption method.
 - The signal of double beam spectro-instrument usually is more accurate than single beam instrument.

(背面仍有題目,請繼續作答)

- d) The height of a prism can influence the resolution of spectrum.
- e) The spectrum sensitivity is not influenced by monochromator's slit width.
16. Which of the following detectors is/are not the detector used in HPLC method?
- a) Ultra-Violet detector.
- b) Refract-index detector.
- c) Flame ionization detector.
- d) Mass spectrum detector
- e) Nitrogen-Phosphor detector.
17. Which of the following factors is/are not influence the open tubular GC column's performance?
- a) Column diameter.
- b) Eddy diffusion.
- c) Average mobile phase velocity
- d) Mass transfer resistant in mobile and stationary phases.
- e) Column temperature.
18. Which of the following factors will affect fluorescence and phosphorescence intensity?
- a) Structural rigidity.
- b) Temperature.
- c) Solvent.
- d) Transition type.
- e) Dissolved Oxygen.
19. Which of the following statement is/are not correct?
- a) Densities of supercritical fluids are higher than the liquid substance.
- b) Speed of supercritical fluid extraction is faster than liquid extraction.
- c) High performance liquid chromatography has the highest separation efficiency among all chromatography method.
- d) Gas chromatography only can apply to separate high volatile compounds.
- e) In capillary electrophoresis the separation efficiency is proportional to the applied voltage.
20. Which of the following analytical instrument can provide molecular structure information?
- a) Mass spectrometer.
- b) Inferred spectrometer.
- c) Ultra violet spectrometer.
- d) Nuclear magnetic resonance spectrometer.
- e) High performance liquid chromatography.