選擇題。每題五分，答錯倒扣壹分。

1. Consider two spectra of the same compound. The first spectrum was the result of ensemble averaging of sixteen individual spectra. The second spectrum was the result of the ensemble averaging of one thousand twenty-four spectra. When looking at the first spectrum and then the second spectrum, the signal-to-noise ratio would be expected to
   A. increase by a factor of four　B. increase by a factor of eight
   C. increase by a factor of sixteen　D. increase by a factor of sixty-four
   E. none of the above

2. Which of the following types of noise can be reduced by narrowing the bandwidth of the instrument?　A. Flicker Noise　B. Shot Noise　C. Chemical Noise
   D. Environmental Noise　E. None of the above

3. Which of the following radiation sources is most commonly used in molecular ultraviolet (UV) spectroscopy　A. Nernst glower　B. tungsten lamp　C. xenon lamp
   D. deuterium lamp　E. none of the above

4. Which of the following has the greatest potential resolution?
   A. Echelle monochromator　B. Interference filter　C. Absorption filter
   D. Echelette monochromator　E. None of the above

5. Which of the following detectors allows the simultaneous measurement of multiple wavelengths of radiation and eliminates the need for a monochromator?
   A. photomultiplier tube B. silicon photodiode　C. bolometer
   D. charge-coupled device　E. vacuum phototube

6. What is the most common source and sample holder used in atomic emission spectroscopy?
   A. Laminar flow burner　B. Direct current plasma　C. Electrothermal furnace
   D. Inductively coupled plasma　E. None of the above

7. What type of background correction used in atomic absorption spectroscopy is based on the fact that placing a high current on a hollow cathode lamp induces self absorption by the lamp which results in broadening of the emission line?
   A. Zeeman correction　B. Continuum source correction　C. Smith-Heiftje correction
   D. Two-line correction　E. None of the above

8. Atomic line broadening resulting from frequency fluctuations due to the motion of atoms in the flame or furnace is known as　A. Doppler broadening.　B. pressure broadening
   C. uncertainty broadening.　D. Zeeman broadening.　E. none of the above

9. A major advantage of atomic emission spectroscopy over atomic absorption spectroscopy is
   A. the low cost of instrumentation.　B. absence of interferences when performing quantitative analysis.
   C. lower temperature of the atomizer.　D. ability to perform simultaneous multielement analysis.
   E. none of the above

10. Pyroelectric detectors, which are used in most IR spectrometers, operate on the principle that
   A. certain crystals have a temperature dependent polarization.
   B. dissimilar metals, when joined, have a temperature dependent potential (voltage).
   C. certain semiconductors experience a decrease in resistance upon the absorption of IR radiation.
   D. the absorption of IR radiation on the surface of certain materials results in the ejection of electrons
   E. none of the above

(背面仍有題目,請繼續作答)

11. One of the major advantages of an FTIR over a dispersive IR is
A. the low cost of the instrument. **B.** the ease of sample preparation.
C. the speed of analysis allowing ensemble averaging of multiple spectra to improve S/N ratio.
D. the use of a laser source for high intensity output. **E.** None of the above

12. A mass spectrometry ionization process is considered hard if
A. ionization results in many base peaks. **B.** the spectrum contains a large molecular ion peak.
C. ionization results in many daughter peaks. **D.** only the molecular ion is formed.
E. none of the above.

13. Which of the following ion source/mass analyzer combinations would be best suited for the analysis of small organic molecules (< 1000 amu) when all that is required is the total mass of the molecules?
A. Chemical ionization/quadrupole filter **B.** Field desorption/ TOF analysis
C. Electron impact/sectored magnet analysis **D.** Fast atom bombardment/quadrupole filter
E. Any of the above

14. For two components to be separated in a chromatograph, the selectivity factor (α) between the two components must be
A. = 1 **B.** > 1 **C.** < 1 **D.** >10 **E.** none of the above

15. According to *Plate Theory*, column efficiency decreases as
A. plate height (*H*) increases and plate number (*N*) increases
B. plate height (*H*) increases and plate number (*N*) decreases
C. plate height (*H*) decreases and plate number (*N*) increases
D. plate height (*H*) decreases and plate number (*N*) decreases

16. How does increasing the length of a chromatographic column effect the resolution (R_s) and selectivity factor (α) for a pair of components in a mixture?
A. R_s decreases, α increases **B.** R_s increases, α decreases **C.** R_s remains constant, α remains constant
D. R_s remains constant, α increases **E.** R_s increases, α remains constant

17. At the limit of detection, the relative standard deviation is 100%. At the lower limit of quantitative measurements, the relative standard deviation is
A. 100% **B.** 50% **C.** 30% **D.** 20% **E.** 10% **F.** 0% **G.** none or the above

18. Any noise generated fro transducer circuit is particularly critical because it usually appears in an amplified form in the instrument readout. To attenuate this type of noise, most instruments employ what for the first stage of amplification?
A. chopper amplifier **B.** operational amplifier **C.** lock-in amplifier **D.** difference amplifier
E. feed-back amplifier

19. Which of the following is not a component of a binary counter?
A. signal shaper **B.** n-bit DAC **C.** gate **D.** clock **E.** none of the above

20. Which of the following states about a series RC circuit is incorrect?
A. To use an RC circuit as a low-pass filter, the output is taken across the capacitor
B. In an RC circuit with an ac input, the phase of capacitance reactance is $\pi/2$ behind that of R
C. The higher the frequency of ac input, the larger the capacitance reactance
D. The larger the capacitance reactance, the larger the impedance
E. None of the above