

Electromagnetic and Ionizing radiation

Exam 6 — Chapter 30 - Light Emission, Black Body Radiation, Fluorescence and Phosphorescence

Name: _____

Date: _____

Raw Score: _____

Percentage Score: _____ %

Proctor for this Examinaton: _____ Form: _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) The visible emission spectrum of hydrogen is characterized by a series of four lines that represent electron transitions from higher energy states to a lower level at what excited state?
 - A) first excited state ($n = 2$)
 - B) second excited state ($n = 3$)
 - C) fourth excited state ($n = 5$)
 - D) third excited state ($n = 4$)
 - E) none of the preceding

- 2) The energy of a photon is
 - A) the quotient of Planck's constant and the frequency of the photon.
 - B) all of the preceding.
 - C) inversely proportional to its frequency.
 - D) directly proportional to its wavelength.
 - E) none of the preceding.

- 3) Light emitted in the ultraviolet region of the spectrum forms which of the following series of lines?
 - A) Balmer
 - B) Paschen
 - C) Lyman
 - D) all of the preceding
 - E) none of the preceding

- 4) When a fluorescent material is also phosphorescent, the emitted light will almost always be
 - A) higher frequency
 - B) greater in amplitude
 - C) longer wavelength
 - D) shorter wavelength
 - E) the same frequency

- 5) The mineral Scheelite, an important ore of tungsten, is identified by the fact that
- A) it is highly phosphorescent under long-wave ultraviolet light
 - B) unlike most tungsten minerals, it is not fluorescent or phosphorescent.
 - C) it fluoresces brilliant red under long-wave ultraviolet light
 - D) it is highly fluorescent under mid-wave ultraviolet light
 - E) it fluoresces brilliant blue-white under short-wave ultraviolet light
- 6) In a demonstration of phosphorescence in the lecture, which of the following were able to cause bright fluorescence and phosphorescence of a zinc sulfide screen?
- A) 250 milliwatt red laser
 - B) 250 milliwatt green laser
 - C) 20 milliwatt violet laser
 - D) all of the preceding
 - E) none of the preceding
- 7) What kind of a spectrum is produced by an incandescent object?
- A) bright line emission
 - B) bright line absorption
 - C) continuous
 - D) dark line absorption
 - E) none of the preceding
- 8) Which of the following expressions correctly relates temperature in Kelvins to peak wavelength of emitted light in a perfect absorber (Wien's Law)?
- A) $\lambda_{\max} = bT^4$
 - B) $T = hc/\lambda_{\max}$
 - C) $\lambda_{\max} = 1/T$
 - D) $\lambda_{\max} = b/T^4$
 - E) none of the preceding
- 9) In a fluorescent lamp, mercury vapor provides uv photons which excite molecules of a chemical coated on the inside of the glass bulb. This chemical is referred to as a(n)
- A) quencher
 - B) phosphor
 - C) emitter
 - D) photofluor
 - E) none of the preceding
- 10) Which of the following are frequently fluorescent?
- A) the mineral willemite
 - B) zinc sulfide
 - C) scorpions
 - D) all of the preceding.
 - E) none of the preceding.

- 11) Fluorescent decay or deexcitation takes place in approximately which of the following time intervals?
- second or longer
 - microsecond
 - millisecond
 - picosecond
 - nanosecond
- 12) The energy flux, irradiance, or power per unit area of a perfectly absorbant incandescent object is given by the formula $F = \sigma T^4$. What is the name given to this equation?
- Blackbody Law
 - Planck's Law
 - Wien's Law .
 - Stefan-Boltzmann Law
 - none of the preceding
- 13) Phosphorescent decay (return to the ground state) takes place over approximately what time interval
- millisecond
 - second or longer
 - nanosecond
 - picosecond
 - microsecond
- 14) Fluorescence differs from incandescence in that the energy of excitation is
- provided by photons
 - thermal
 - electrical
 - chemical
 - none of the preceding
- 15) Which series of emission lines have frequencies in the visible region of the spectrum?
- Balmer
 - Paschen
 - Lyman
 - Brackett
 - none of the preceding
- 16) The hydrogen alpha line is what color?
- | | | | | |
|---------|-----------|----------|--------|-----------|
| A) blue | B) yellow | C) green | D) red | E) violet |
|---------|-----------|----------|--------|-----------|
- 17) What is the energy of a photon having a wavelength of 530 nm?
- | | | | | |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| A) $1.20 \times 10^{-27} \text{ j}$ | B) $1.19 \times 10^{-26} \text{ j}$ | C) $2.40 \times 10^{-34} \text{ j}$ | D) $1.17 \times 10^{-32} \text{ j}$ | E) $3.75 \times 10^{-19} \text{ j}$ |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
- 18) Some materials respond to ultraviolet light of only a particular wavelength, as shown in the lecture. There will tend to be a direct correlation between the wavelength of the uv light and
- the absorption maximum (λ_{max}) of the material in question.
 - the color of the phosphorescence
 - the color of the fluorescence
 - all of the preceding
 - none of the preceding

- 19) Electrons may be raised to a higher energy level by
- electrical excitation.
 - absorption of sufficiently energetic photons.
 - heating matter to very high temperatures.
 - all of the preceding.
 - none of the preceding
- 20) Fraunhofer lines represent
- ultraviolet hydrogen emission lines.
 - absorption lines in the spectrum of the Sun.
 - infrared hydrogen absorption lines.
 - emission lines in the spectrum of the Sun
 - none of the preceding
- 21) Some fluorescent materials are also phosphorescent, as shown in the lecture. The conversion of electrons from the spin-allowed state of fluorescence to the spin-forbidden state of phosphorescence is called
- spin conversion
 - spin-spin coupling
 - spin-lattice coupling
 - intersystem crossing
 - none of the preceding
- 22) The incandescence of an object that absorbs all light that is incident upon it is called
- Cherenkov radiation
 - blackbody radiation.
 - Stefan-Boltzmann radiation.
 - luminosity.
 - none of the preceding.
- 23) In fluorescence, an excited electron has its spin antiparallel to the spin of the electron with which it was paired in the ground state. Which of the following describes this spin state?
- A) doublet B) quadruplet C) multiplet D) singlet E) triplet
- 24) Helium
- was discovered in the spectrum of the Sun before it was ever found on the Earth.
 - has more total emission lines than hydrogen, but fewer lines in the visible spectrum
 - has twice the number of spectral lines as hydrogen, because it has twice the number of electrons
 - all of the preceding
 - none of the preceding
- 25) In what region of the electromagnetic spectrum do electrons falling from higher energy states to the second excited state ($n = 3$) radiate?
- A) x-ray B) microwave C) visible D) ultraviolet E) infrared