Your code is: ACGFGE

Put your name here:

Keep this exam CLOSED until advised by the instructor.

Fill out the bubble sheet: last name, first initial, student number, section number and code.

60 minute long closed book exam.

A two-sided 8.5 by 11 handwritten help sheet is allowed.

When done, hand in your bubble sheet and your exam.

Possibly useful constants:

- $k_e = 8.99 \times 10^9 \text{ Nm}^2/\text{C}^2$
- $\varepsilon_0 = 8.85 \times 10^{-12} \text{ As/(Vm)}$
- $\mu_0 = 4\pi \times 10^{-7} \text{ Vs/(Am)}$
- $c = 3.00 \times 10^8 \text{ m/s}$
- $e = 1.60 \times 10^{-19} \text{ C}$
- $m_e = 9.11 \times 10^{-31} \text{ kg}$
- $m_e c^2 = 0.511 \text{ MeV}$
- $h = 6.63 \times 10^{-34} \text{ Js}$
- $h = 4.14 \times 10^{-15} \text{ eVs}$
- $hc = 1240 \text{ eVnm}$
- $\sigma = 5.67 \times 10^{-8} \text{ W/(m}^2\text{K}^4)$
- Wien’s constant = $2.898 \times 10^{-3} \text{ Km}$
- $R_H = 1.097 \times 10^7 \text{ 1/m}$
- $E_0 = 13.6 \text{ eV}$
- $a_0 = 0.529 \text{ Angstrom}$
- $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$
- $1 \text{ AMU (1 u)} = 931.494 \text{ MeV/c}^2 = 1.67 \times 10^{-27} \text{ kg}$
- $\times$ Field directly into page.
- $\bullet$ Field directly out of page
A telescope consists of a mirror with radius of curvature 19 m and an eyepiece of focal length 26 cm. Approximately what is the magnitude of its magnification?

\[ \text{A}\oslash 17.38 \quad \text{B}\oslash 25.20 \quad \text{C}\oslash 36.54 \quad \text{D}\oslash 52.98 \quad \text{E}\oslash 76.82 \quad \text{F}\oslash 111.39 \quad \text{G}\oslash 161.52 \quad \text{H}\oslash 234.20 \]

The near point of an eye is 140 cm. A corrective lens is to be used to allow this eye to focus clearly on objects 19 cm in front of it. What should be the focal length of this lens (in cm)?

\[ \text{A}\oslash 18.8 \quad \text{B}\oslash 22.0 \quad \text{C}\oslash 25.7 \quad \text{D}\oslash 30.1 \quad \text{E}\oslash 35.2 \quad \text{F}\oslash 41.2 \quad \text{G}\oslash 48.2 \quad \text{H}\oslash 56.4 \]

A parallel plate capacitor with plate separation \( d \) is connected to a battery. The capacitor is fully charged to \( Q \) Coulombs and a voltage of \( V \). (\( C \) is the capacitance.) Answer the following questions regarding the capacitor charged by a battery.

For each statement below, select True or False.

\[ \text{A}\oslash \text{True} \quad \text{B}\oslash \text{False} \]

Two currents go into the page, and two are pointing out of the page. Point \( a \) is at the center of the square, and points \( b \) and \( c \) are in the middle of two of the sides.

What is the direction of the magnetic field at point \( a \)?

\[ \text{A}\oslash \text{To the left.} \quad \text{B}\oslash \text{To the right.} \quad \text{C}\oslash \text{Up (to the top of the page).} \quad \text{D}\oslash \text{The magnetic field is zero at this point.} \quad \text{E}\oslash \text{Down (to the bottom of the page).} \]

What is the direction of the magnetic field at point \( b \)?

\[ \text{A}\oslash \text{To the right.} \quad \text{B}\oslash \text{The magnetic field is zero at this point.} \quad \text{C}\oslash \text{To the left.} \quad \text{D}\oslash \text{Up (to the top of the page).} \quad \text{E}\oslash \text{Down (to the bottom of the page).} \]

What is the direction of the magnetic field at point \( c \)?

\[ \text{A}\oslash \text{Up (to the top of the page).} \quad \text{B}\oslash \text{The magnetic field is zero at this point.} \quad \text{C}\oslash \text{Down (to the bottom of the page).} \quad \text{D}\oslash \text{To the right.} \quad \text{E}\oslash \text{To the left.} \]

Select True or False for the following statements about diffraction of light on a diffraction grating.

\[ \text{A}\oslash \text{True} \quad \text{B}\oslash \text{False} \]

If the distance between the screen and the grating is doubled, then the distance between the bright fringes also doubles.

If the wavelength of the light is increased, then the distance between the bright fringes decreases.

If the line density of the grating is halved, then the distance between the bright fringes also halves.
Some possible transitions of the hydrogen atom are listed below:

A: \( n_i = 4, n_f = 7 \)
B: \( n_i = 3, n_f = 5 \)
C: \( n_i = 3, n_f = 6 \)
D: \( n_i = 2, n_f = 5 \)
E: \( n_i = 6, n_f = 3 \)
F: \( n_i = 5, n_f = 3 \)
G: \( n_i = 5, n_f = 2 \)
H: \( n_i = 7, n_f = 4 \)

where \( n_i \) and \( n_f \) are the initial and the final principal quantum numbers respectively.

For which transition will the atom gain the most energy?

13. A ○ A B ○ B C ○ C D ○ D E ○ E F ○ F G ○ G H ○ H

Which transition will emit light with the shortest wavelength?


The work function of a surface determines the minimum _______ of light which will cause electrons to be emitted.

15. A ○ wavelength B ○ frequency C ○ intensity

If two sources emit the same number of photons per second, one near the red end of the spectrum will emit _______ one near the blue end.

16. A ○ less energy than B ○ more energy than C ○ the same amount of energy as