CODE - ABFAIB - PHY232C, Summer 2006 - Virtual University Physics 2 2
Exam 3
Name:

Your code is: ABFAIB

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.

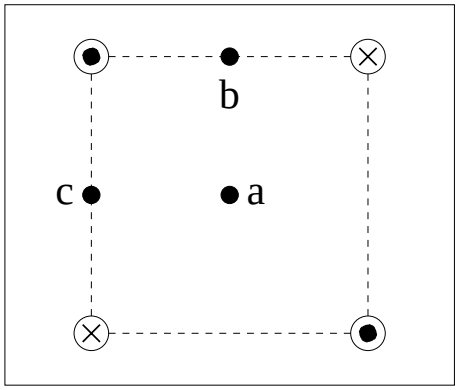
A two-sided 8.5 by 11 handwritten help sheet is allowed.

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

Possibly useful constants:

- $k_e = 8.99 \times 10^9$ Nm^2/C^2
- $\epsilon_0 = 8.85 \times 10^{-12}$ As/(Vm)
- $\mu_0 = 4\pi \times 10^{-7}$ Vs/(Am)
- $c = 3.00 \times 10^8$ m/s
- $e = 1.60 \times 10^{-19}$ C
- $m_e = 9.11 \times 10^{-31}$ kg
- $m_e c^2 = 0.511$ MeV
- $h = 6.63 \times 10^{-34}$ Js
- $h = 4.14 \times 10^{-15}$ eVs
- $hc = 1240$ eVnm
- $\sigma = 5.67 \times 10^{-8}$ W/(m^{2}K^4)
- Wien's constant $= 2.898 \times 10^{-3}$ Km
- $R_H = 1.097 \times 10^7$ 1/m
- $E_0 = 13.6$ eV
- $a_0 = 0.529$ Angstrom
- 1 eV $= 1.60 \times 10^{-19}$ J
- 1 AMU (1 u) $= 931.494$ MeV/c^2 $= 1.67 \times 10^{-27}$kg
- $\times$ Field directly into page.
- $\bullet$ Field directly out of page

Four electric currents, equal in magnitude are arranged at the corners of a square as shown in the figure.



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.

3 pt What is the direction of the magnetic field at point **a**?

1. **A**◯ To the right.
B◯ To the left.
C◯ Down (to the bottom of the page).
D◯ Up (to the top of the page).
E◯ The magnetic field is zero at this point.

3 pt What is the direction of the magnetic field at point **b**?

2. **A**◯ The magnetic field is zero at this point.
B◯ To the right.
C◯ Down (to the bottom of the page).
D◯ To the left.
E◯ Up (to the top of the page).

3 pt What is the direction of the magnetic field at point **c**?

3. **A**◯ To the left.
B◯ Down (to the bottom of the page).
C◯ Up (to the top of the page).
D◯ The magnetic field is zero at this point.
E◯ To the right.

11 pt The near point of an eye is 110 cm. A corrective lens is to be used to allow this eye to focus clearly on objects 17 cm in front of it. What should be the focal length of this lens (in cm)?

4.**A**◯ 13.9 **B**◯ 15.7 **C**◯ 17.8 **D**◯ 20.1
E◯ 22.7 **F**◯ 25.7 **G**◯ 29.0 **H**◯ 32.8

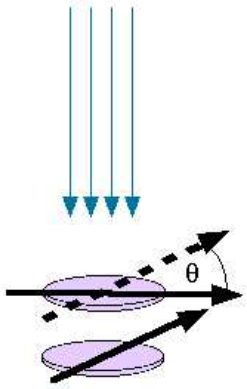
9 pt Select True or False to each of the following questions.

▷ A converging lens can be used to correct nearsightedness.
5. **A**◯ True **B**◯ False

▷ In the human eye, most of the refraction occurs at the air cornea interface.
6. **A**◯ True **B**◯ False

▷ The lens of a human eye has its longest focal length when the ciliary muscles are compressed.
7. **A**◯ True **B**◯ False

10 pt Two polaroids are placed in an unpolarized beam of light with an angle $\theta = 14.8^o$ between their axes.



What percent of the incident light makes it through?

8.**A**◯ 14.94 **B**◯ 19.87 **C**◯ 26.42
D◯ 35.14 **E**◯ 46.74 **F**◯ 62.16
G◯ 82.67 **H**◯ 109.96

9 pt Select True or False for the following statements.

▷ The speed of electromagnetic waves in vacuum is not proportional to their wavelength.
9. **A**◯ True **B**◯ False

▷ A wire carries an a.c. current i=$I_0\sin(\omega t)$. There is no electromagnetic radiation from the wire.
10. **A**◯ True **B**◯ False

▷ Sunlight perpendicularly strikes two surfaces of equal area. One surface is a perfect absorber and the other surface is a perfect reflector. The force exerted by the sunlight on the reflecting surface is half the size of the force exerted by the sunlight on the absorbing surface.
11. **A**◯ True **B**◯ False

12 pt Starting with a real object, answer the following statements (True or False) about the image formed by a single optical element.

▷ An object placed between a concave mirror and its focal point will produce an image which is smaller than the object, virtual and upright.
12. **A**◯ True **B**◯ False

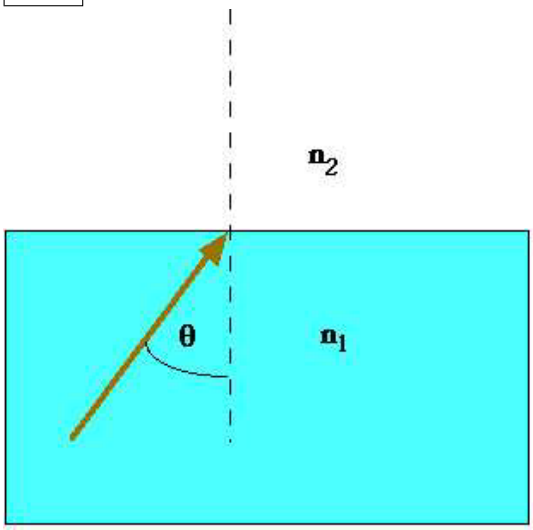
▷ A converging lens can never produce a virtual, upright and reduced image.
13. **A**◯ True **B**◯ False

▷ A diverging lens always produces a virtual, upright and reduced image.
14. **A**◯ True **B**◯ False

▷ An object placed between a convex mirror and its focal point will produce an image which is bigger than the object, virtual and upright.
15. **A**◯ True **B**◯ False

---

10 pt



What is the maximum angle θ (in degrees) which allows the light to escape through the surface?

$n_1 = 1.69$,
$n_2 = 1.2$

16.**A**◯ 9.49 **B**◯ 11.86 **C**◯ 14.83 **D**◯ 18.53
E◯ 23.16 **F**◯ 28.96 **G**◯ 36.19 **H**◯ 45.24

---

9 pt Select True or False for the following statements.

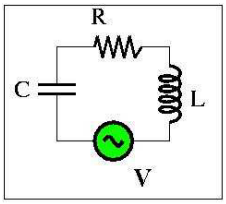
▷ A capacitor and a resistor in series with an AC generator draws no current.
17. **A**◯ True **B**◯ False

▷ As the frequency increases, the impedance of a capacitor increases.
18. **A**◯ True **B**◯ False

▷ If a resistor, capacitor and inductor in a series circuit are at resonance, then the voltage across the capacitor is zero.
19. **A**◯ True **B**◯ False

---

11 pt Consider the RLC circuit shown in the figure below. If the circuit is running at its resonanant frequency and the RMS current through the resistor is 0.149 A, what is the RMS voltage across the inductor?
Use the following data:
R = 590 Ω, L = 12.2 H, C = 16.3 μF.

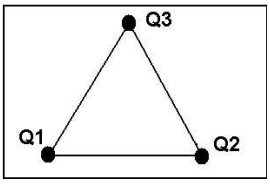


(in V*)*

20.**A**◯ 5.28×10^1 **B**◯ 6.60×10^1 **C**◯ 8.25×10^1
D◯ 1.03×10^2 **E**◯ 1.29×10^2 **F**◯ 1.61×10^2
G◯ 2.01×10^2 **H**◯ 2.52×10^2

---

10 pt The figure shows three charges Q1, Q2 and Q3 fixed in place at the corners of an equilateral triangle. The length of each side of the triangle is 20.0 cm. Recall that all of the interior angles of an equilateral triangle are 60 °.



For Q1 = 17.00 μC, Q2 = 17.00 μC, and Q3 = 4.60 μC find the net electrostatic force acting on charge Q3.
(in N*)*

21.**A**◯ 6.39 **B**◯ 7.99 **C**◯ 9.99
D◯ 1.25×10^1 **E**◯ 1.56×10^1 **F**◯ 1.95×10^1
G◯ 2.44×10^1 **H**◯ 3.05×10^1