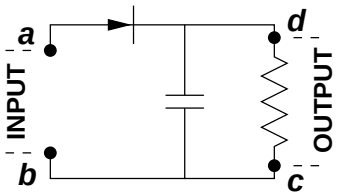
**Pratt, Scott** **Section 999**

*–Introductory Physics II* *FINAL EXAM–*

Spring, 1998 CAPA ID is **7997**



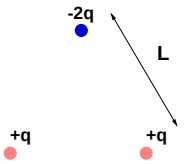

**1.** [3pt] Consider the diagram above. (For each statement select T True, F False).

A) If a car battery is connected between a and b, an AC signal will be generated between c and d.

B) This device could be used as an AC-DC converter.

C) The three circuit elements are a resistor, a capacitor and a transistor.

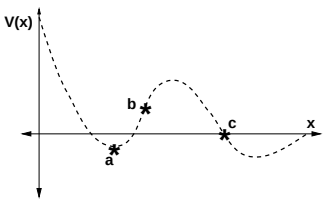
---




**2.** [3pt] Consider three charges arranged in an equilateral triangle of length $L = 1.30\times10^{-2}$ $m$. How much work (in $J$) is required to move the negative charge to infinity? DATA: $q = 3.10 \times 10^{-6}$ $C$.

A) $2.08 \times 10^{1}$ B) $2.35 \times 10^{1}$ C) $2.66 \times 10^{1}$ D) $3.00 \times 10^{1}$
E) $3.39 \times 10^{1}$ F) $3.84 \times 10^{1}$ G) $4.33 \times 10^{1}$ H) $4.90 \times 10^{1}$

---




**3.** [3pt] Consider the plot of electric potential vs. position above. (For each statement select T True, F False).

A) The electric field at $b$ is zero.

B) The electric field at $a$ is zero.

C) An electron at $c$ experiences a force to the left.

---

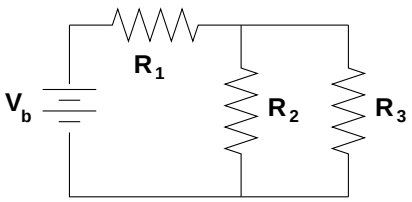
**4.** [3pt] Consider two large oppositely charged parallel plates separated by $1.30 \times 10^{-3}$ $m$. A potential difference of 60 $V$ is applied between the plates. What is the electric field (in $V/m$) between the plates?

A) $4.62 \times 10^{4}$ B) $6.14 \times 10^{4}$ C) $8.16 \times 10^{4}$ D) $1.09 \times 10^{5}$
E) $1.44 \times 10^{5}$ F) $1.92 \times 10^{5}$ G) $2.55 \times 10^{5}$ H) $3.40 \times 10^{5}$

**5.** [3pt] If an electron is released at rest from the negative plate, what is the electron's velocity (in $m/s$) when it reaches the positive plate. DATA: $e$ = -1.602×10$^{-19}$ $C$, $m_e$ = 9.11×10$^{-31}$ $kg$.

A) $1.95 \times 10^{6}$ B) $2.60 \times 10^{6}$ C) $3.45 \times 10^{6}$ D) $4.59 \times 10^{6}$
E) $6.11 \times 10^{6}$ F) $8.13 \times 10^{6}$ G) $1.08 \times 10^{7}$ H) $1.44 \times 10^{7}$

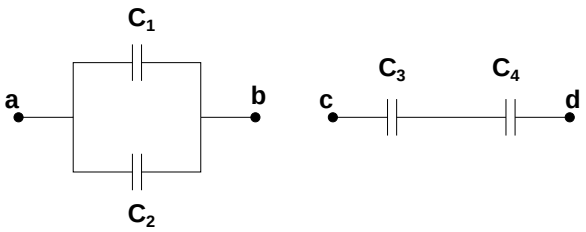
---




**6.** [3pt] Consider the circuit above. What is the effective resistance (in $\Omega$) seen by the battery? DATA: $R_1$ =13.0 $\Omega$, $R_2$ =52.0 $\Omega$, $R_3$ =52.0 $\Omega$.

A) $2.39 \times 10^{1}$ B) $2.70 \times 10^{1}$ C) $3.05 \times 10^{1}$ D) $3.45 \times 10^{1}$
E) $3.90 \times 10^{1}$ F) $4.41 \times 10^{1}$ G) $4.98 \times 10^{1}$ H) $5.63 \times 10^{1}$

---



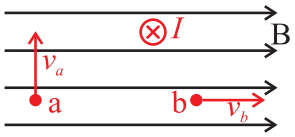

**7.** [3pt] Consider the sections of two circuits illustrated above. (Give ALL correct answers, i.e., B, AC, BCD...)

A) $C_{ab}$ is always less than or equal to $C_1$.

B) $C_{cd}$ is always less than or equal to $C_3$.

C) After connecting $a$ and $b$ to a battery, and waiting a sufficient time, $Q_1$ always equals $Q_2$.

---



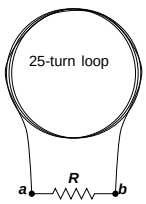

**8.** [3pt] Consider the two positive charges, $a$ and $b$, and a wire carrying a current $I$ directed into the page as shown. They are in the presence of a constant magnetic field. (For each statement select T True, F False).

A) The wire experiences no magnetic force.

B) Particle $b$ feels no magnetic force.

C) Particle $a$ will move in a circular orbit.

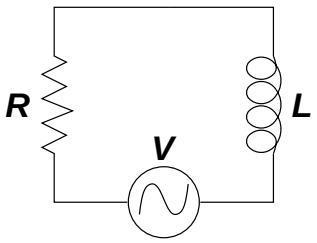
---




**9.** [3pt] A circular coil (radius $r$ = 0.023 $m$) has 25 turns and is connected to a resistor $R$ = 9.0 $\Omega$. A magnetic field, directed perpendicular to the loop, rises from zero to 0.23 $T$ in 0.025 $s$. What is the average voltage (in $V$) around the resistor during that time?

A) $2.87 \times 10^{-1}$ B) $3.82 \times 10^{-1}$ C) $5.08 \times 10^{-1}$ D) $6.76 \times 10^{-1}$
E) $8.99 \times 10^{-1}$ F) 1.20 G) 1.59 H) 2.12

---




**10.** [3pt] What is the r.m.s. current (in amps) in the circuit above? DATA: $L$ =2.31×10$^{-1}$ $H$, $R$ =55 $\Omega$, $V_{rms}$ =110 $V$, The frequency of the source is 60 $Hz$.

A) $1.67 \times 10^{-1}$ B) $2.42 \times 10^{-1}$ C) $3.51 \times 10^{-1}$ D) $5.08 \times 10^{-1}$
E) $7.37 \times 10^{-1}$ F) 1.07 G) 1.55 H) 2.25

---

**11.** [3pt] An object whose height is 2.1 $cm$ is placed 16.6 $cm$ from a converging lens with a focal length of 8.3 $cm$. What is the height (in $cm$) of the image?

A) $-2.26 \times 10^{-1}$ B) $-3.28 \times 10^{-1}$ C) $-4.75 \times 10^{-1}$ D) $-6.89 \times 10^{-1}$
E) $-9.99 \times 10^{-1}$ F) $-1.45$ G) $-2.10$ H) $-3.04$

---

**12.** [3pt] An object is placed half way between a concave mirror and its focal point. (For each statement select T True, F False).

A) The image is inverted.

B) The image is larger than the object.

C) The image is virtual.

---

**13.** [3pt] An electron has a wavelength of $2.89 \times 10^{-10}$ $m$. What is its kinetic energy? Give your answer in $eV$.

A) $1.54 \times 10^{1}$ B) $1.80 \times 10^{1}$ C) $2.11 \times 10^{1}$ D) $2.46 \times 10^{1}$
E) $2.88 \times 10^{1}$ F) $3.37 \times 10^{1}$ G) $3.95 \times 10^{1}$ H) $4.62 \times 10^{1}$

---

**14.** [3pt] The electron in a hydrogen atom in its ground state has (only one answer is correct)

A) zero kinetic energy

B) zero ionization energy

C) zero spin angular momentum

D) zero binding energy

E) zero orbital angular momentum

---

**15.** [3pt] 8.0 kilograms of neutral hydrogen atoms are converted to neutral $^4He$ atoms via the reaction: $4p+4e \rightarrow ^4He + 2e$ plus two neutrinos which can be treated as massless. How much mass (in $kg$) has been converted to energy? DATA: Proton mass = 1.007276 u, electron mass = 0.000549 u, Helium nucleus mass = 4.001506 u.

A) $1.88 \times 10^{-2}$ B) $2.73 \times 10^{-2}$ C) $3.96 \times 10^{-2}$ D) $5.74 \times 10^{-2}$
E) $8.32 \times 10^{-2}$ F) $1.21 \times 10^{-1}$ G) $1.75 \times 10^{-1}$ H) $2.54 \times 10^{-1}$

---

**16.** [3pt] Consider the statements below regarding cosmology. (For each statement select T True, F False).

A) Hubble's constant is a measure of the brightness of the sun.

B) Three degree background radiation is a remnant of the big bang.

C) The RED SHIFT refers to the leftist tendencies of mid-1930s physicists.

---

**17.** [3pt] Particle $X$, which has a mass 11 times that of a proton and is at rest, decays into a proton and antiproton with equal and opposite velocities. What is the velocity (as a fraction of $c$) of the proton?

A) $9.83 \times 10^{-1}$ B) 1.11 C) 1.26 D) 1.42
E) 1.60 F) 1.81 G) 2.05 H) 2.31

---