Introductory General Physics - Physics 112 N
College of Sciences
Old Dominion University
Summer Semester 2009
Pre Final Test : Chapters 17-30
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1. An asteroid has acquired a net negative charge of 128C from being bombarded by the solar wind over the years, and is currently in equilibrium whereby it expels electrons at the same rate as it acquires them. How many more electrons does it have than protons?

Answer: $128/(1.6 \times 10^{-19}) = 8 \times 10^{20}$

(10 points)

2. An electron is released from rest at distance of 9cm from a proton. How fast will the electron be moving when it is 3 cm from the proton?

- **A) 75 m/s**
- **B) 106 m/s**
- **C) 130 m/s**
- **D) 1.6$\times 10^3$ m/s**
- **E) 4.64$\times 10^5$ m/s**

(10 points)

Answer:B

Solution

$U_1 = kq^2/r_1$ ($r_1 = 9 \times 10^{-2}$)**- Potential energy at distance 9cm.**
$U_2 = kq^2/r_2$ ($r_1 = 3 \times 10^{-2}$)**- Potential energy at distance 3cm.**
$K = \frac{1}{2}mv^2$ **- kinetic energy at distance 3cm.**

Energy conservation:

$K = U_2 - U_1$

$v = \sqrt{2K/m_e}$

Substituting we get:

$v = 106\ m/s$

3. The heater element of 120 V toaster is 2.1 m length of nichrome wire, whose diameter is 0.48 mm. The resistivity of nichrome at operating temperature of toaster is $1.3 \times 10^{-6} \Omega \cdot m$. The toaster is operated at a voltage 120 V. The power drawn by the toaster is closetst to:

- **A) 950 W**
- **B) 920 W**
- **C) 990 W**
- **D) 1000 W**
- **E) 1100 W**

Answer: A

(10 points)

4. A solenoid 3.0 cm long consists of 3921 loops of wire. If the magnetic field inside the solenoid is 4.0 T, what is the magnitude of the current that flows through it?

- **A) 24 A**
- **B) 0.042 A**
- **C) 310 A**
- **D) 3.0 A**

(10 points)

Answer: A

5. For an RLC circuit with a resistance of 11.0 kΩ, a capacitance of 9μF, and an inductance of 26.0 H, what frequency is needed to minimize the impedance?

- **A) 0.010 kHz**
- **B) 0.065 kHz**
- **C) 10 kHz**

- **D) 1.7 kHz**

(10 points)

Answer: A

6. A ray of light in air is incident on a flat piece of glass, at an angle of $\phi = 28^0$ with respect to the normal. The glass has an index of refraction n =1.5. What is the angle between the reflected and refracted rays?

(10 points)

Answer: 134^0

7. An erect object is 50 cm from a concave mirror of radius 60 cm. The distance of the image from the mirror, in cm, is closest to:

- **A) 19**
- **B) 35**
- **C) 60**
- **D) 75**
- **E) 120**

(10 points)

Answer: D

8. An astronaut on a spaceship moving at 0.927c says that the trip between the two stars took 6.33 y. How long does this jurney appear to someone in the rest frame of the two stars?

- **A) 16.9 y**
- **B) 2.37 y**
- **C) 3.42 y**
- **E) 18.7 y**

(10 points)

Answer: A

9. In massive stars, three helium atoms fuse together, forming carbon nucleus. The reaction heats the core of the star. The

ne mass of three helium nucle must therefore be

- **A) higher than that of carbon nucleus**
- **B) less than that of carbon nucleus**
- **C) the same as that of carbon nucleus**

(10 points)

Answer: A

10. A radioactive nuclide of atomic number Z emits an alpha particle and the daughter nucleus then emits a beta particle. What is the atomic number of resulting nuclide?

- **A) Z-1**
- **B) Z+1**
- **B) Z-2**
- **B) Z-3**

(10 points)

Answer: A