FINAL_EXAM_SPH3U_JUN2010
Answer Section

PART A - TRUE/FALSE

1. ANS: F PTS: 1 REF: K/U OBJ: 2.2
   STA: FM1.07
2. ANS: F PTS: 1 REF: K/U OBJ: 2.2
   STA: FM1.07
3. ANS: F PTS: 1 REF: K/U OBJ: 2.1
   STA: FM1.06
4. ANS: T PTS: 1 REF: K/U OBJ: 12.3
   STA: EM1.02
5. ANS: T PTS: 1 REF: C OBJ: 12.3
   STA: EM1.02
6. ANS: F PTS: 1 REF: K/U OBJ: 12.6
   STA: EM1.01
7. ANS: F PTS: 1 REF: K/U OBJ: 4.2
   STA: EW1.01
8. ANS: T PTS: 1 REF: K/U OBJ: 4.3
   STA: EW1.01 | EW1.03
9. ANS: F PTS: 1 REF: K/U OBJ: 6.1
   STA: WS1.01
10. ANS: F PTS: 1 REF: K/U OBJ: 6.2
    STA: WS1.02

PART B - MULTIPLE CHOICE

11. ANS: C PTS: 1 REF: I OBJ: 2.4
    STA: FM2.04
12. ANS: B PTS: 1 REF: K/U OBJ: 2.4
    STA: FM1.08
13. ANS: B PTS: 1 REF: K/U OBJ: 12.1
    STA: EM1.01
14. ANS: C PTS: 1 REF: I OBJ: 12.3
    STA: EM1.01
15. ANS: A PTS: 1 REF: K/U OBJ: 12.3
    STA: EM1.02
16. ANS: D PTS: 1 REF: C OBJ: 12.4
    STA: EM1.01
17. ANS: A PTS: 1 REF: I OBJ: 12.4
    STA: EM1.01
18. ANS: C PTS: 1 REF: I OBJ: 12.4
    STA: EM1.01
19. ANS: B PTS: 1 REF: K/U OBJ: 12.5
    STA: EM1.01
20. ANS: D PTS: 1 REF: K/U OBJ: 12.5

STA: EM1.01

21. ANS: C PTS: 1 REF: I OBJ: 12.5
STA: EM1.01
22. ANS: A PTS: 1 REF: K/U OBJ: 12.5
STA: EM1.01
23. ANS: C PTS: 1 REF: I OBJ: 12.5
STA: EM1.01
24. ANS: E PTS: 1 REF: K/U OBJ: 4.2
STA: EW1.02
25. ANS: A PTS: 1 REF: K/U OBJ: 4.4
STA: EW1.03
26. ANS: E PTS: 1 REF: K/U OBJ: 4.6
STA: EW1.04
27. ANS: E PTS: 1 REF: K/U OBJ: 6.1
STA: WS1.01
28. ANS: E PTS: 1 REF: K/U OBJ: 6.1
STA: WS1.01
29. ANS: E PTS: 1 REF: K/U OBJ: 6.4
STA: WS2.01
30. ANS: D PTS: 1 REF: K/U OBJ: 6.5
STA: WS2.01
31. ANS: A PTS: 1 REF: I OBJ: 6.6
STA: WS1.04
32. ANS: B PTS: 1 REF: K/U OBJ: 6.8
STA: WS1.06
33. ANS: A PTS: 1
34. ANS: D PTS: 1
35. ANS: C PTS: 1

PART C – WORD PROBLEMS

36. ANS:
A free-body diagram encourages you to identify all forces that are acting on an object which, in turn, will determine that object's motion.

PTS: 1 REF: K/U OBJ: 2.1 STA: FM1.06

37. ANS:
The wavelength increases (according to the wave equation, $v \propto \lambda$). The frequency is unchanged, as frequency is determined only by the source.

PTS: 1 REF: K/U OBJ: 6.3 STA: WS2.01

PROBLEM SOLVING

38. ANS:
$Q = -3.0 \times 10^{-7}\ \text{C}$
$e = -1.6 \times 10^{-19}\ \text{C}$
$N = ?$

$Q = Ne$

$$N = \frac{Q}{e}$$

$$= \frac{-3.0 \times 10^{-7}\ \text{C}}{-1.6 \times 10^{-19}\ \text{C}}$$

$$= 1.875 \times 10^{12}$$

The pith ball gained 1.9×10^{12} electrons.

PTS: 1 REF: I OBJ: 12.2 STA: EM1.01

39. ANS:
$V_T = 120\ \text{V}$
$R_1 = 10.0\ \Omega$
$I_T = 15.0\ \text{A}$
$R_2 = ?$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_2} = \frac{1}{R_T} - \frac{1}{R_1}$$

$$= \frac{1}{10.0\ \Omega} - \frac{1}{15.0\ \Omega}$$

$$= \frac{1}{30.0\ \Omega}$$

$$R_2 = 30.0\ \Omega$$

$$R_T = \frac{V_T}{I_T}$$

$$= \frac{120\ \text{V}}{12.0\ \text{A}}$$

$$= 10.0\ \Omega$$

An additional 30.0 Ω of resistance is needed.

PTS: 1 REF: I OBJ: 12.6 STA: EM1.01

40. ANS:

$P = 855\ \text{W}$

$\Delta E = 3.39 \times 10^9\ \text{J}$

$\Delta t = ?$

$$P = \frac{\Delta E}{\Delta t}$$

$$\Delta t = \frac{\Delta E}{P}$$

$$= \frac{3.39 \times 10^7\ \text{J}}{855\ \text{W}}$$

$$= 3.96 \times 10^4\ \text{s}$$

$$= \frac{3.96 \times 10^4\ \text{s}}{3600\ \text{s/h}}$$

$$= 11.0\ \text{h}$$

It will take 11.0 h.

PTS: 1 REF: I OBJ: 12.7 STA: EM1.01

41. ANS:

$\lambda = 1.5\ \text{m}$

$N = 25\ \text{cycles}$

$t = 5.0\ \text{s}$

$v = ?$

$$f = \frac{N}{t}$$

$$= \frac{25\ \text{cycles}}{5.0\ \text{s}}$$

$$= 5.0\ \text{Hz}$$

$v = f\lambda$

$= (5.0\ \text{Hz}) \times (1.5\ \text{m})$

$= 7.5\ \text{m/s}$

The speed of the waves is 7.5 m/s.

PTS: 1 REF: K/U OBJ: 6.3 STA: WS1.02

42. ANS:
Ans: 5 A

first find the total resistance of the two parallel resister
The voltages, V2 and V3 are the same. After combining the two parallel resistors, we get series circuit.
The current passing through the resistors in series is 10A.
Find the voltage drop in each of the two resistor

$$R_1 = \frac{V_1}{I_1} = \frac{10}{10} = 1, R_2 = R_3 and R_2 \,//\, R_3 = R_{2+3} = \frac{R}{2}$$

From $V = IR \Rightarrow R = \frac{V}{I}$, where $R_1 and R_{2+3}$ are in series.

$$R_{total} = 1 + R_{2+3} = 1 + \frac{R}{2}$$

$$\frac{2+R}{2} = \frac{V}{I} \Rightarrow R = \frac{2}{3}\frac{V}{I} = \frac{40}{10} \Rightarrow R = 2(4-1) = 6\Omega$$

Since the voltages $V_2 = V_3 = 40V - 10V = 30$, the current passing through V_3 is $I_3 = \frac{V_3}{R} = \frac{30}{6} = 5A$

PTS: 1

43. ANS:

(a) 16 m [N]

(b) average velocity = slope of line joining endpoints at $t = 3.0$ s and $t = 7.0$ s (3.5 m/s [N])

(c) from $t = 3.0$ s to $t = 4.5$ s, velocity = 6.7 m/s [N]

(d) $$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$$

$$= \frac{24\text{ m}}{8.0\text{ s}}$$

$$= 3.0\text{ m/s}$$

44. ANS:

a) Total time in hour is found by multiplying the time the television is set on per day by the 30-day period as:

$$t = 4.0(\frac{h}{day})(30 days) = 120 \text{ h}$$

b) We use the total time found in part a) and the power given in the problem to find the solution as:

$$P = \frac{\Delta E}{t} \Rightarrow \Delta E = (P)(t) = (80 \text{ W})(120 \text{ h}) = 9600 \text{ W. h}$$

c) To find the cost, we multiply the cost of kW . h with the total kW . h found in part b). But, first we need to change 9600 W. h in to kW . h by diving with 1000 since 1kW is 1000 W as follow:

$$\text{Cost} = \frac{\$0.050}{kW.h} 9600 W.h \frac{1kW}{1000W} = \$0.48$$

45. ANS:

We were supposed to plug the bulb into the 220 V, but we plug instead to 120 V. We should use the actual voltage we plugged in to get the power output.

The formula that relates power with voltage and resistor can be derived from the general formula of power that involves voltage and current (P = I.V) by combining Ohm's low (V = IR).

Since current is not given in this problem, we replace current by voltage and resistance as $I = \frac{V}{R}$ and substitute the I equation into $P = I.V = \frac{V}{R}.V = \frac{V^2}{R}$. This new formula shows that $P = \frac{V^2}{R}$

Substituting the values of V and R, we obtain:

$$\Rightarrow P = \frac{V^2}{R} = P = \frac{120^2}{500} = 28.8 \text{ W or } 29 \text{ W}$$