Physics 2204 Common Exam
Answer Section

1. ANS: B PTS: 1 DIF: L1 REF: Pg 24
   OBJ: 325-5
2. ANS: A PTS: 1 DIF: L1 REF: Pg 26
   OBJ: 325-2
3. ANS: A PTS: 1 DIF: L2 REF: Pg 26
   OBJ: 325-2
4. ANS: B PTS: 1 DIF: L2 REF: Pg 26
   OBJ: 325-2
5. ANS: A PTS: 1 DIF: L1 REF: Pg 34
   OBJ: 325-7
6. ANS: D PTS: 1 DIF: L3 REF: Pg 24; Pg 28
   OBJ: 325-5; 325-2
7. ANS: C PTS: 1 DIF: L1 REF: Pg 24
   OBJ: 325-2
8. ANS: B PTS: 1 DIF: L2 REF: Pg 28
   OBJ: 325-2
9. ANS: A PTS: 1 DIF: L2 REF: Pg 28
   OBJ: 325-2
10. ANS: D PTS: 1 DIF: L1 REF: Pg 44
    OBJ: 325-8
11. ANS: B PTS: 1 DIF: L2 REF: Pg 42
    OBJ: 325-5
12. ANS: A PTS: 1 DIF: L2 REF: Pg 42
    OBJ: 325-5
13. ANS: D PTS: 1 DIF: L1 REF: Pg 44
    OBJ: 325-8
14. ANS: B PTS: 1 DIF: L3 REF: Pg 46
    OBJ: 325-8
15. ANS: A PTS: 1 DIF: L1 REF: Pg 44
    OBJ: 325-8
16. ANS: B PTS: 1 DIF: L2 REF: Pg 48
    OBJ: 325-8
17. ANS: C PTS: 1 DIF: L2 REF: Pg 46
    OBJ: 325-8
18. ANS: B PTS: 1 DIF: L1 REF: Pg 52
    OBJ: 326-3
19. ANS: C PTS: 1 DIF: L2 REF: Pg 52
    OBJ: 326-3
20. ANS: B PTS: 1 DIF: L2 REF: Pg 50
    OBJ: 212-3;213-2
21. ANS: B PTS: 1 DIF: L1 REF: p. 60
    OBJ: 326-1
22. ANS: A PTS: 1 DIF: L1 REF: p. 58
    OBJ: 325-9
23. ANS: C PTS: 1 DIF: L1 REF: p. 66
    OBJ: 212-3
24. ANS: D PTS: 1 DIF: L1 REF: p. 58
    OBJ: 325-9
25. ANS: C PTS: 1 DIF: L2 REF: p. 58
    OBJ: 325-9
26. ANS: C PTS: 1 DIF: L2 REF: p. 58
    OBJ: 325-9
27. ANS: C PTS: 1 DIF: L3 REF: p. 62
    OBJ: 326-1
28. ANS: C PTS: 1 DIF: L2 REF: p. 58
    OBJ: 325-9
29. ANS: C PTS: 1 DIF: L2 REF: p. 60
    OBJ: 326-1
30. ANS: A PTS: 1 DIF: L1 REF: p. 78
    OBJ: 212-7 and 327-1
31. ANS: A PTS: 1 DIF: L1 REF: p. 78
    OBJ: 212-7 and 327-1

32. ANS: B PTS: 1 DIF: L1 REF: p. 92
OBJ: 327-5 and 327-8
33. ANS: A PTS: 1 DIF: L2 REF: p. 84
OBJ: 327-7 and 327-8
34. ANS: B PTS: 1 DIF: L1 REF: p. 82
OBJ: 212-4
35. ANS: B PTS: 1 DIF: L3 REF: p. 82
OBJ: 327-5, 327-6 and 327-8
36. ANS: C PTS: 1 DIF: L2 REF: p. 88
OBJ: 327-5, 327-6 and 327-7
37. ANS: B PTS: 1 DIF: L2 REF: p. 80
OBJ: 327-2
38. ANS: C PTS: 1 DIF: L2 REF: p. 84
OBJ: 327-7 and 327-8
39. ANS: B PTS: 1 DIF: L2 REF: p. 80
OBJ: 327-2
40. ANS: D PTS: 1 DIF: L2 REF: p. 88
OBJ: 327-5, 327-6 and 327-7

41. (a) ANS:

(i) (0.5) $\vec{a} = \frac{Rise}{Run}$
(0.5) $\vec{a} = \frac{-10\ ^{m}/_{s}}{2.0\ s} = -5\ ^{m}/_{s^2}$

(ii) (0.5) $\vec{d} = A_1 + A_2 + A_3$
(0.5) $\vec{d} = (2.0\ s)(10\ ^{m}/_{s}) + \frac{1}{2}(1.0\ s)(10\ ^{m}/_{s}) + \frac{1}{2}(2.0\ s)(-10\ ^{m}/_{s})$
(0.5) $\vec{d} = 20\ m + 5\ m + (-10\ m)$
(0.5) $\vec{d} = 15\ m$

PTS: 3 DIF: L2 REF: Pg 26 OBJ: 325-2

(b) ANS:

<u>First Section of Journey</u> (Uniform Motion)

v = 41 m/s
t = 1.6 s

(0.5) d = vt = (41 m/s)(1.6s) = 66 m

<u>Second Section of Journey</u> (Free-fall)

v_1 = 41 m/s

a = - 9.80 m/s^2

(0.5) v_2 = 0.0 m/s (maximum height)

(0.5) $v_2^2 = v_1^2 + 2ad$

$$d = \frac{v_2^2 - v_1^2}{2a}$$

(0.5) $$d = \frac{(0.0 m/s^2) - (41 m/s^2)}{2(-9.8 m/s^2)}$$ Units incorrect

$$d = \frac{0.0 m^2/s^2 - 1681 m^2/s^2}{-19.6 m/s^2}$$

(0.5) d = 86 m

<u>Total Displacement</u>

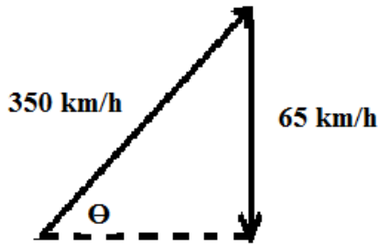
(0.5) $d_{total} = d_1 + d_2$

= 66 + 86
= 152
= 150 m

The total displacement for the toy rocket is 150 m.

PTS: 3 DIF: L3 REF: Pg 28 OBJ: 325-2

(c) ANS:



(1)

(0.5) $sin\theta = \frac{65}{350} = 0.1857$

(0.5) $\theta = \sin^{-1} 0.1857 = 11^0$

(1) The pilot must head $[E11°N]$

PTS: 3 DIF: L2 REF: Pg 32 OBJ: 325-7

42. (a) ANS:

(1) $\vec{F}_{NETx} = \vec{F}_{1x} + \vec{F}_{2x} = (-4.0 \times 10^2\ N) + (3.0 \times 10^2\ N)\cos(50) = -207.16\ N$

(1) $\vec{F}_{NETy} = \vec{F}_{1y} + \vec{F}_{2y} = (0\ N) + (3.0 \times 10^2\ N)\sin(50) = 229.81\ N$

Magnitude:

(1.0) $F_{NET} = \sqrt{(-207.16)^2 + (229.81)^2} = \sqrt{95727.9} = 309.4 = 310\ N$

Direction:

(0.5) $\theta = tan^{-1}\left(\frac{229.81}{207.16}\right) = 47.97^\circ = 48^\circ$

(0.5) The net force acting on the controller is $310\ N\ [W48^\circ N]\ or\ [N42^\circ W]$

PTS: 4 DIF: L2 REF: Pg 42 OBJ: 325-5

(b) ANS:

$p_{T_{before}} = p_{T_{after}}$

(0.5) $p_{athlete} + p_{sled} = p_{both}$

(0.5) $m_a v_a + m_s v_s = m_b v_b$

(1.0) $(65)(3.5) + (12)(0) = (77)(v_b)$

(0.5) $227.5 = 77v_b$

(0.5) $3.0 m/s = v_b$

(1) Significant digits/Units

The velocity is 3.0 m/s [E]

PTS: 4 DIF: L2 REF: Pg 50 OBJ: 326-3

(c) ANS:

$a = \frac{Fnet}{m}$

(1) $3 = \frac{m(9.8)}{m+7}$

(1) $3(m+7) = 9.8m$

$3m + 21 = 9.8m$

$21 = 9.8m - 3m$

$\frac{21}{6.8} = m$

(1) $m = 3.1\ Kg$

PTS: 3 DIF: L3 REF: Pg 46 OBJ: 325-8

43. (a) ANS:

(1) i) $E_t = E_k + E_p$

$= 1/2mv^2 + mgh$
$= 0 + (80.0\ kg)(9.80\ m/s^2)(70.0\ m)$
(1) $= 5.49 \times 10^4\ J$ or $54.9\ kJ$

The total mechanical energy is 54.9 kJ.

(1) ii) $E_k = E_t - E_p$

$1/2(80.0\ kg)v^2 = 5.49 \times 10^4\ J - (80.0\ kg)(9.80\ m/s^2)(30.0\ m)$

$(40.0\ kg)v^2 = 5.49 \times 10^4\ J - 2.35 \times 10^4\ J$

$v^2 = 3.14 \times 10^4\ J / 40.0\ kg$

(1) $v = 28.0\ m/s$

The speed of the stunt man is 28.0 m/s when he is 30.0 m from the ground.

PTS: 4 DIF: L2 REF: Pg 60 OBJ: 326-1

(b) ANS:

$E_e = \frac{1}{2}kx^2 = \frac{1}{2}\left(10800\ {}^{N}/_{m}\right)(0.35\ m)^2$
(0.5) $E_e = 661.5\ J$
$efficiency = \frac{output}{input} \times 100\%$
(1.0) $output = (0.75)(661.5\ J) = 496.125\ J$
(0.5) $output = E_g = m\vec{g}h$
(0.5) $496.125\ J = (45\ kg)\left(9.80\ {}^{m}/_{s^2}\right)h$
(0.5) $h = \frac{496.125\ J}{441\ N} = 1.125\ m = 1.1\ m$ above the uncompressed trampoline

PTS: 3 DIF: L3 REF: Pg 66, Pg 68 OBJ: 326-1, 214-7, 326-8

(c) ANS:

$W = \Delta E_k$

(0.5) $Fd = \frac{1}{2}mv^2$

(1.0) $F = \frac{(1.2\ kg)(28\ {}^{m}/_{s})^2}{2(1.5\ m)}$

(0.5) $F = 313.6\ N = 310\ N$

PTS: 2 DIF: L2 REF: Pg 64 OBJ: 326-7

44. (a) ANS:

(2) $f = \frac{f_o v_s}{v_s \pm v_o} = 910Hz$

(1) Significant digits/Units

PTS: 3 DIF: L2 REF: Pg 88 OBJ: 327-6

(b) ANS:

(2) i) diagrams will vary

(1) ii) The distance between each successive resonance is half a wavelength.

(1) $\frac{1}{2}\lambda = 0.12$

$\lambda = 0.24m$

(1) iii) $f = \frac{v}{\lambda}$

$f = \frac{344m/s}{0.24m}$

$f = 1.4x10^3 Hz$

The frequency of the tuning fork is 1.4 x 10^3 Hz.

PTS: 5 DIF: L2 REF: Pg 90 OBJ: 327-5

(c) (1) Diffraction will only occur if the wavelength of the wave is larger than the width of the barrier

(1) Sound has a larger wavelength than the barrier and will diffract (bend) around the corner of the building. You will hear the sound.

(1) Light has a smaller wavelength than the barrier and will not diffract around the corner of the building. You will not see the light.

PTS: 3 DIF: L3 REF: Pg 84 OBJ: 327-8