ACCOUNTING QUESTIONS

SECTION A

QUESTION 1

1.1 Impulse ü (1)
1.2 Conservation of mechanical energy ü (1)
1.3 Dispersion ü (1)
1.4 Infra red radiation ü (1)
1.5 Faraday's law ü (1)
[5]

QUESTION 2

2.1 At its highest point, the ball experiences only the gravitational force of the earth. ü ü (2)
2.2 If the speed doubles, the kinetic energy is 4 times greater. ü ü (2)
2.3 When white light passes through the cool vapour of an element and is observed through a diffraction grating, an absorption spectrum is observed. ü ü (2)
2.4 The largest potential difference would be across the resistor that has the largest electrical resistance. ü ü (2)
2.5 The rms current is the effective current that will flow in a coil of a generator during one cycle. ü ü (2)**[10]**

QUESTION 3

3.1 B ü ü
3.2 A ü ü
3.3 D ü ü
3.4 A ü ü

3.5 B ü ü **[10]**

SECTION A TOTAL = [25]

SECTION B

QUESTION 4

4.1.1 Acceleration ü (1)

4.1.2 Acceleration due to gravity ü is the same for the falling ball as for the bouncing ball which means that the velocity-time gradients must be the same. ü (2)

4.1.3 Height that the ball was dropped from ü ü OR the displacement of the ball as it travels to the ground (2)

4.1.4 A to B is + which implies that its velocity downwards is positive. At C the ball starts moving upwards which means that its velocity is negative. (1)

4.1.5 The collision between ball and ground was not elastic and some kinetic energy has been "lost" during the bounce ü, hence the ball leaves the ground with less kinetic energy and therefore less speed. ü (2)

4.2.1 Total mechanical energy of the ball at the top = Total mechanical energy of the ball at the bottom

$PE_{top} + KE_{top} = PE_{bottom} + KE_{bottom}$ (&)

$mgh + 0 = 0 + \frac{1}{2}mv^2$

$v^2 = 2(9,8)(1,2)$(&)

$v = 4,85\ m.s^{-1}$ downwards ü (3)

Since the ball is travelling in a straight line downwards the following equation may also be used:

$V_f^2 = v_i^2 + 2g\Delta y$

$= 0 + 2(9,8)(1,2)$

$V_f = 4,85\ m.,s^{-1}$ downwards.

4.2.2 $PE_{bootom} + KE_{bootom} = PE_{top} + KE_{top}$

$0 + \frac{1}{2}mv^2 = mgh + 0$ ü

$v^2 = 2(9,8)(0,75)$

$v = 3,83\ m.s^{-1}$ upwards. ü (2)

The equation $v_f^2 = v_i^2 + 2g\Delta y$ could also be used here.

4.2.3 $\Delta \boldsymbol{p} = \boldsymbol{m(v_f - v_i)}$ ü

$\Delta p = 0,15(-3,83 - 4,85)$ ü

$\Delta p = -1,30\ kg.m.s^{-1}$ upwards ü (3)

4.2.4 $F\Delta t = \Delta p$

$F(0,10) = -1,30$ ü

$F = -13,00N$ ü OR

$F = 13,00N$ upwards ü (3)**[19]**

QUESTION 5

5.1 The total linear momentum in a closed system remains constant in magnitude and direction unless it is acted on by a net external force.

OR

In a closed system, the total momentum before a collision is equal to the total momentum after collision in magnitude and direction. (2)

5.2 The law of conservation of momentum only applies in a closed system. ü In the system being considered friction is an external force and is not part of the system under investigation. ü So the air tract is used to make the frictional force as small as possible ü. (3)

5.3 p = mv ü
= (0.38 + 0.02) ü x 1.2
= 0.48 $kgms^{-1}$ ü in original direction of motion
(3)

5.4 p before = p after

$m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2)v_f$ ü

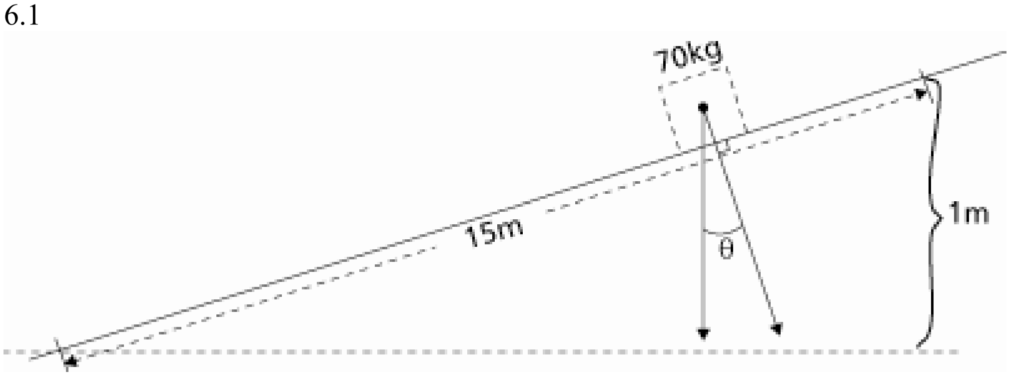
$0.02 \times v_{1i} + 0 = 0.48$ ü

$V_{1i} = 24\ ms^{-1}$ ü

The ball had a velocity of $24ms^{-1}$ before it entered the catcher. (3)**[11]**

QUESTION 6

6.1



6.1.1 SIN θ = 1/15 ü
θ = 3.82° ü

component down slope = W sin θ ü
= (70)(9,8) sin (3.82)
= 45.70 N ü (4)

6.1.2 P = F v ü
P = (45.70)(9.0) ü
P = 411.3 W ü (3)

6.2.1 Because the friction force between the bicycle wheels and the ground is neglected, we can say that:
Kinetic energy → Potential energy ü (1)

6.2.2 $KE_{bot} + PE_{bottom} = KE_{top} + PE_{top}$ ü

$\frac{1}{2} mv^2 + 0 = 0 + mgh$

$h = v^2/2g$

$h = (9.0)^2/(2(9,8))$

h = 4.13 m ü ü

sin θ = h/distance

distance = 4,13/sin3,82° = 62.44 m ü ü (5)**[13]**

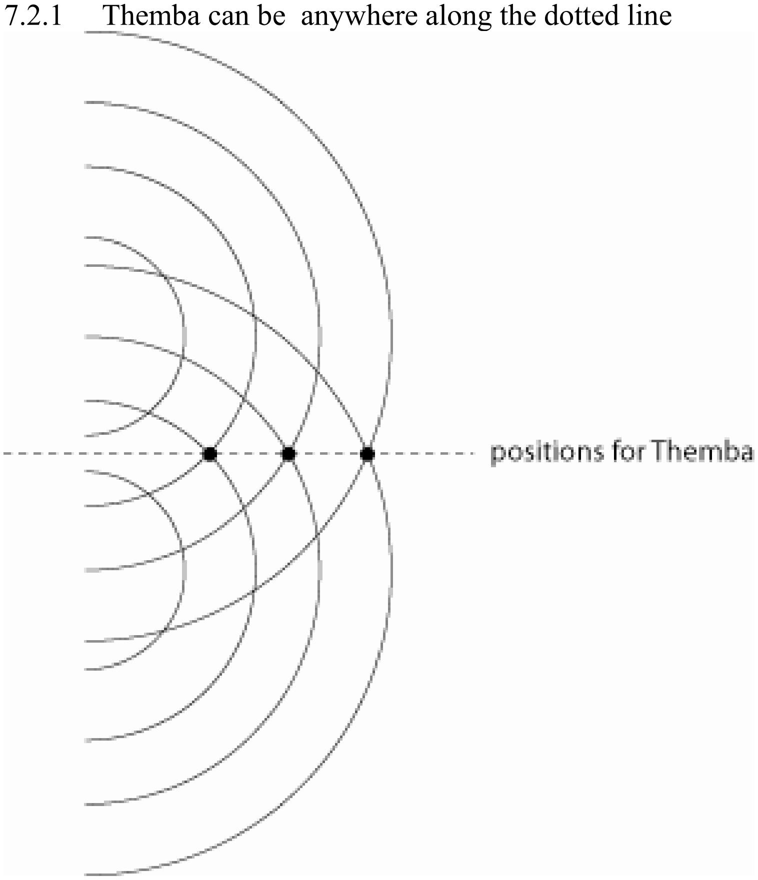
QUESTION 7

7.1.1 Magenta and yellow. ü (all correct or no marks) (2)

7.1.2 Cyan ü (1)

7.1.3 Cyan lens is made from <u>blue</u> and <u>green</u> so lets through the blue ü image. A magenta lens is made from <u>blue</u> and <u>red</u> – letting through both ü blue and red images, meaning that the images are not separated for each eye. [ü for colours of lenses – all must be correct.] (3)

7.2.1 Themba can be anywhere along the dotted line (4)



7.2.2 destructive interference (2)

7.2.3 higher frequency or shorter wavelength
Sources further apart (2)

7.2.4 Diffraction (1)

7.2.5 The music will involve many frequencies and so no clear interference pattern will result. (2)

7.3.1 Doppler effect ü (1)

7.3.2 Y ü (1)

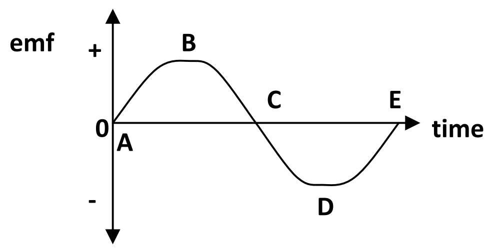
7.3.3.1 N ü (1)

7.3.3.2 $f_o = \frac{v_S}{v_S - v_A} f_S$ $= \frac{340}{340 - 24}$ ü (bottom subs) (520 ü) f_o = 559,5 Hz ü (3)

7.3.3.3 (a) Wavelength increases ü
(b) Frequency of the dolphin's call remains the same ü (2)**[25]**

QUESTION 8

8.1 X – slip rings ü (2)
8.2 Mechanical to electrical ü (1)
8.3 c to d ü (1)

8.4


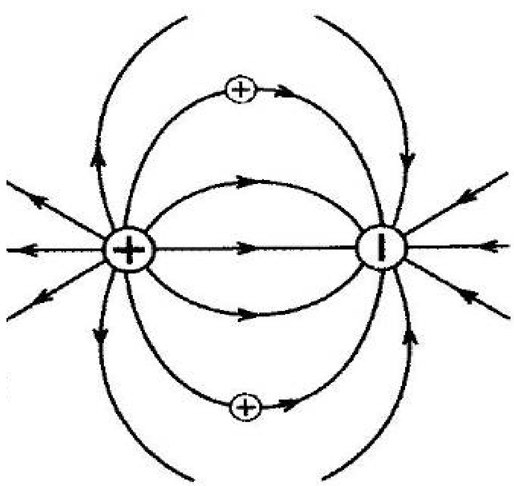
Sine curve (AE) ü ü
Labels ü ü (4)

8.5
Speed of rotation – faster Þ bigger emf
Magnet strength – stronger Þ bigger emf
Number of coils – more coils Þ bigger emf
Curved magnets – field lines at 90^o for longer
Two variables for 2 marks each. (4)

8.6 A DC generator has a split ring commutator ü while an AC generator has slip rings. ü (2)**[14]**

QUESTION 9

9.1 The electrostatic force between two point charges is directly proportional ü to the product of the charges and inversely proportional to the square distance between them. ü (2)



9.2
Correct diagram
Lines perpendicular to charge
Arrows (3)

9.3 $F = \frac{kQ1Q2}{r^2}$ ü

$= \frac{9 \times 10^{9} \times 6 \times 10^{-9} \times 7 \times 10^{-9}}{(0.15)^2}$ ü

$= 1.68 \times 10^{-5}$ N ü (3)

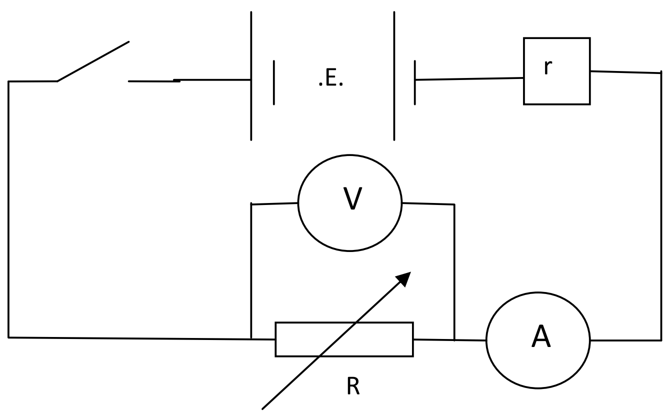
9.4 Attraction ü (1)

9.5.1 F is a quarter the original size. ü

9.5.2 F is a quarter the original size. ü (2)**[11]**

QUESTION 10

10.1



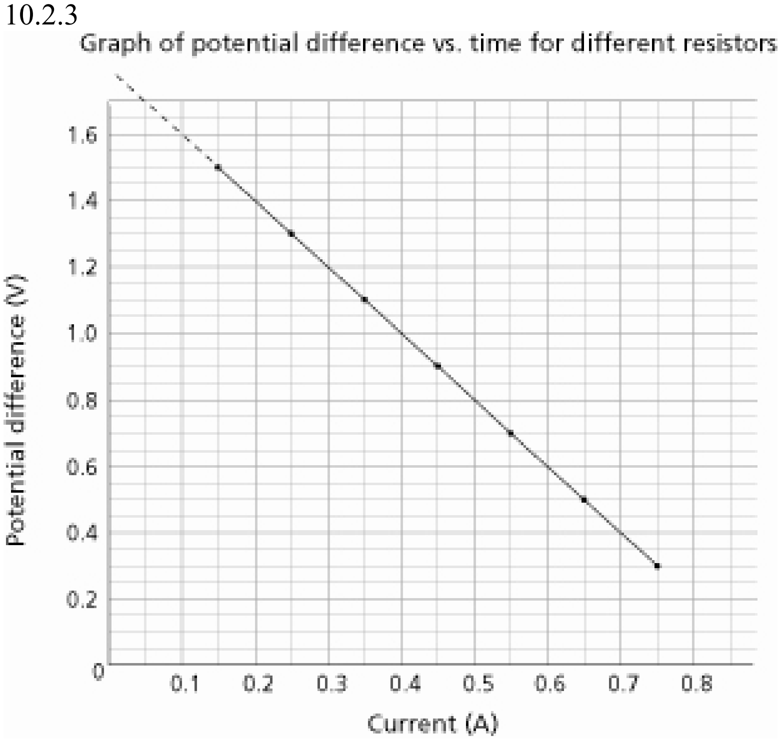
Correct position of ammeter ü
Correct position of voltmeter ü
All connections in place ü

(3)

10.2.1 dependent variable – voltage ü
Independent variable – current ü (2)

10.2.2 temperature ü (1)

10.2.3



Scale ü
Accuracy ü
Labels ü ü
Best fit line ü
Heading ü (6)

10.3.1 The emf of a cell can be obtained when the cell is not delivering any current. Therefore; where the current = 0A on the graph, the emf = 1.8 V ü (1)

10.3.2 The maximum current that can flow is when the potential difference across the resistor is zero which means that there is no resistance in the external circuit. Therefore where the potential difference is zero, the line cuts the current axis at (maximum current) = 0.9A ü (1)

10.3.3 $r = \frac{E}{I}$ ü

$= \frac{1.8}{0.9}$ ü

$= 2\ \Omega$ ü (3)**[17]**

QUESTION 11

11.1 No effect ü as frequency of incoming radiation must be above threshold ü (2)

11.2 Intensity increased therefore more photons ü
1 photon releases 1 electron; therefore ü
Current increases ü (3)

11.3 electrons collide with air particles ü, electrons slow down, less current ü (2)

11.4 $hf = W_0 + KE_{max}$ ü ü
hf = energy of incoming photon ü
W_0 = work function OR min energy needed to free electron ü
KE_{max} = max kinetic energy of ejected electron ü (5)

11.5 from graph, $f_0 = 4\times10^{14}$ Hz ü

$c = f_0\lambda$

$3\times10^{8} = 4\times10^{14}\,\lambda$ ü

$\lambda = 7{,}50 \times 10^{-7} m$ ü (3)**[15]**