Name of the Student:_____

Max. Marks : 21 Marks   **Time : 21 Minutes**

Mark Schemes

Q1.

(a) (i)   1 N per A per m
           or 1 Wb m^{-2}
           or quotes: $B = F/IL$ with terms defined
           or induced $EMF = \Delta BAN/t$ with terms defined
           or a slightly flawed attempt at the definition in
           statement form

                                                              C1

           It is the flux density (perpendicular to a wire) that
           produces a force of 1N per m on the wire when
           the current is 1A
           or
           $B = F/IL$ **and** 1 T is flux density when $F = 1$N; $I = 1$A
           and $L = 1$ m
           or induced $EMF = \Delta BAN /t$ and 1 T is the flux change
           when emf = 1V for $A=1$ $N =1$ and $t =1$ or similar

                                                              A1
                                                                     2

     (ii) force on charge due to E field , $F_E= Eq$ **or** Vq/d
           and
           force due to B field, $F_B = Bqv$
           or $Eq=Bqv$

                                                              B1

           $= Bqv$; cancels q **and states explicitly** $v = \dfrac{E}{B}$
           or $v = \dfrac{V}{dB}$

                                                              B1
                                                                     2

     (iii) $v = 20000/0.14$ (seen) **or** 143×10^{3} m s^{-1}

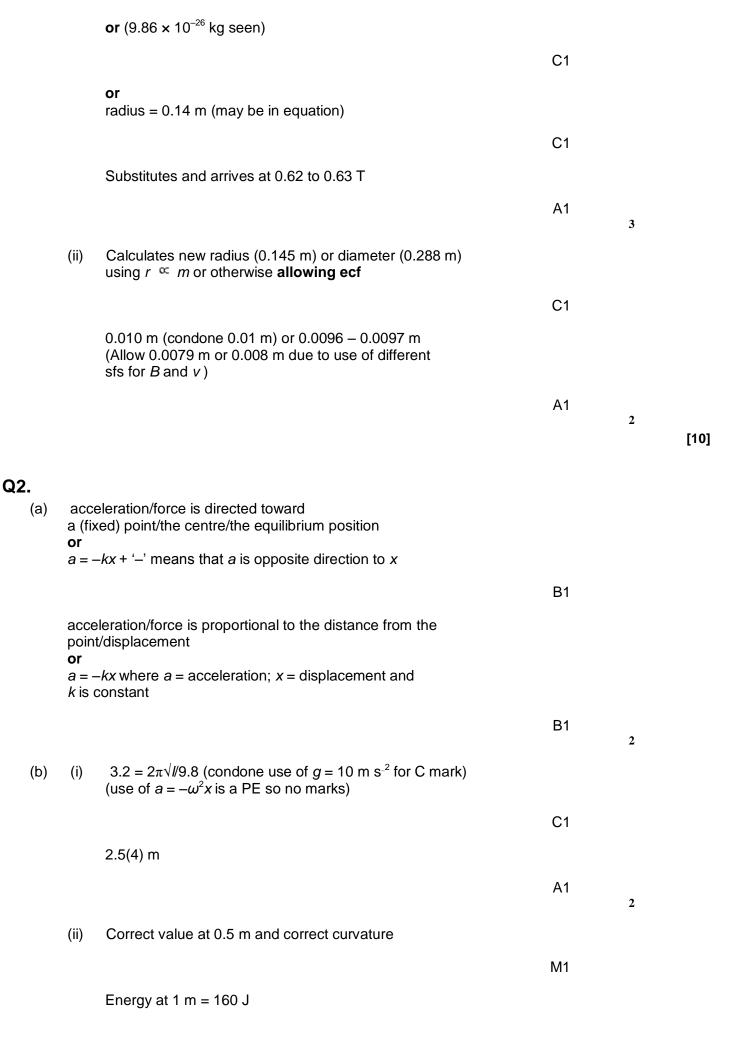   B1
                                                                     1

(b) (i) $Bqv = mv^2/r$ or $r = mv/Bq$ (allow e instead of q)
           mass of ion = $1.7 \times 10^{-27} \times 58$ (may be in equation)

or (9.86×10^{-26} kg seen)

C1

or
radius = 0.14 m (may be in equation)

C1

Substitutes and arrives at 0.62 to 0.63 T

A1

3

(ii) Calculates new radius (0.145 m) or diameter (0.288 m)
using $r \propto m$ or otherwise **allowing ecf**

C1

0.010 m (condone 0.01 m) or 0.0096 – 0.0097 m
(Allow 0.0079 m or 0.008 m due to use of different
sfs for B and v)

A1

2

[10]

Q2.

(a) acceleration/force is directed toward
a (fixed) point/the centre/the equilibrium position
or
$a = -kx +$ '$-$' means that a is opposite direction to x

B1

acceleration/force is proportional to the distance from the
point/displacement
or
$a = -kx$ where a = acceleration; x = displacement and
k is constant

B1

2

(b) (i) $3.2 = 2\pi\sqrt{l/9.8}$ (condone use of $g = 10$ m s^{-2} for C mark)
(use of $a = -\omega^2 x$ is a PE so no marks)

C1

2.5(4) m

A1

2

(ii) Correct value at 0.5 m and correct curvature

M1

Energy at 1 m = 160 J

A1

2

[6]

Q3.

(a)   Time for one cycle

M1

One cycle defined correctly in terms of diagram, can be on diagram

A1

2

(b)   B

B1

Mention of air resistance, allow drag OR bob faster in centre of motion

B1

Links two ideas

B1

3

[5]