ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

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MARKING SCHEME

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PHYSICS 9188/2

1 (a) Random error is due to the observer while systematic error is due to B1
the instrument. B1

(b) (i) 1. Check zero error B1

2. take readings spirally *and average.* B1

3. take readings at different points and average B1

(ii) $R = \left(\dfrac{V}{\pi L}\right)^{\frac{1}{2}} = \left(\dfrac{25}{\pi \times 20 \times 10^{-2}}\right)^{\frac{1}{2}}$

$=$ 6,3078 m C1

$\dfrac{\Delta R}{R} = \dfrac{1}{2}\dfrac{\Delta V}{V} + \dfrac{1}{2}\dfrac{\Delta L}{L}$

$=$ $0,5 \times \dfrac{0,3}{25} + \dfrac{0,5 \times 0,1}{20} = 0,0085$ C1

0,006 + 0,0025

$\Delta R = 0,05$

$\therefore R = (6,31 \pm 0,05)$ m A1

/pt masses

2 (a) The force of attraction between two particles is directly proportional to B1
the product of their masses
∧

and inversely proportional to the square of the distance between their
centres of mass. B1

(b) (i) A satellite which is always at the same point above the earth's
surface (and has a period of 24 hours) B1

(ii) $F = \dfrac{GMm}{r^2} = m\omega^2 r$ B1 B1

$r^3 = \dfrac{GM}{\omega^2}$

but $g = \dfrac{GM}{R^2}$ C1

$r^3 = \dfrac{gR^2}{\omega^2}$

$r = \sqrt[3]{\dfrac{gR^2}{\omega^2}}$ A0

3   (a)   (i)   Pressure falls when velocity rises or vice-versa   B1

         (ii)   -   lamina flow   B1

               -       liquid to be compressible *L constant density*   B1

               -       liquid should be non-viscous *Lno frictional forces*   B1

                                                Max 2

   (b)   (i) $A_1V_1 = A_2V_2$

               $60 \times 2{,}3 = 5{,}5\,V_2$ C1

               $V_2 = 25{,}09\ \text{ms}^{-1}$ $\cancel{25\,\text{ms}^{-1}}$

                                accept 25,0ms⁻¹   A1

        (ii) $P_1 + \dfrac{1}{2}\rho V_1^2 = P_2 + \dfrac{1}{2}\rho V_2^2$

               $P_1 - P_2 = \dfrac{1}{2} \times 800\left(25{,}09^2 - 2{,}3^2\right)$ C1

                    $2{,}48 \times 10^5\,Pa$

               $= 2{,}50 \times 10^5\ Pa$ ~~25~~✗   A1

4   (a)   -   collisions between particles and walls are perfectly elastic   B1

           -    Newtonian mechanics can be applied   B1

           -    Volume occupied by molecules is negligible compared to

                 volume of container   B1

           -    time of collision is negligible as compared to time between

                 collisions   B1

           -    intermolecular forces are negligible   B1

      - *molecules are in continuous random motion.*   Max 4

   (b)   (i)   -   p.e is due to attraction of molecules   B1

                  -    ke is due to motion of molecules   B1

        (ii)   no intermolecular forces imply that potential energy is zero   B1

5   (a)   (i)   angle of deflection should be about 180°   B1

        (ii) $E_k = \dfrac{Qq}{4\pi\varepsilon_o r}$ M1

            $4{,}8 \times 10^6 \times 1{,}6 \times 10^{-19} = \dfrac{79 \times 2 \times \left(1{,}6 \times 10^{-19}\right)^2}{4\pi\varepsilon_o r}$ C1

            $r = 4{,}74 \times 10^{-14}\,\text{m}$ A1

            $4{,}7 \times 10^{-14}\,\text{m}.$

(b) - tracers   B1
     - thickness control   B1
     - cancer treatment   B1
     - carbon dating   B1
     - sterilisation of medical equipment   B1
     - *generating electricity*   Max 3

6 (i) First Total Current arriving at a junction equals total current leaving the junction $\sum I = 0$ B1

   Second Round any closed loop the algebraic sum of the e.m.f. E is equal to the algebraic sum of the products of current I and resistance R   B1

   $\sum EMF = \sum I R$

   (ii) First   charge   B1

   Second energy   B1

              Reject for mis-match

7 (a) (i) 1. Overlapping of two or more waves to produce a combined effect.   B1

        2. Bending of waves when passing through an opening or round an obstacle   B1

    (ii) - sources must be coherent *(constant phase difference wave*)   B1
          - sets of waves must have approximately the same amplitude   B1
          - sources shld be very close to each other   max 2.

   (b) (i) $d\sin\theta = n\lambda$

        $\dfrac{1\times10^{-3}}{900}\sin\theta = 1\times 630\times10^{-9}$ C1

        $\theta = 38.4°$ *34.5°*   A1

    (ii) maximum is when $\sin\theta = 1$ B1

        $n = \dfrac{d}{\lambda}$

        $= \dfrac{\frac{10^{-3}}{900}}{630\times10^{-9}}$

        OR
        2nd order = 69.1°   B1
        3rd = $\sin^{-1}\left(\dfrac{3\times 630\times10^{-9}}{900\times10^{3}}\right)$ B1

        $= 1.76 = 2$ C1

   ∴ There are 2 bright fringes – one on each side of the central maxima   A1

8 (a) (i) microphone/solar cell/LDR/Thermistor/strain gauge   B1

   (ii) loudspeaker/buzzers/LED/Relay   B1

   (b) (i) Part or whole of output fed back to the inverting input   B1

   (ii) - gain less affected by temperature changes   — B1
        - Bandwitdth is greater   B1
        - input signal can be stronger without causing saturation
           and therefore reduced distortion   B1
                                                                    Max 2

9 (a) (i) Any metal / graphite / Sodium chlorate   B1
             reject salt

   (ii) Glass (wax)   B1

   (iii) Rubber (wool, plastics, nylon), terylene   B1

   (b) in elastic deformation, material returns to original shape when deforming
        forces have been removed

        while plastic deformation does not return to original shape.   B1

   (c) (i) Hooke's law is obeyed   B1 M1
             Extension proportional to force   B1

   (ii) strain energy = $\frac{1}{2}Fe$ C1

                       = $\frac{1}{2}.25 \times 0{,}20$

                       = 2,5 J   A1