V. MAGUDI

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

1'03

MARKING SCHEME

NOVEMBER 2010

PHYSICS **9188/5**

1 (a) (i) 1. peak value is the maximum value of an alternating current. Minimum value of alternating voltage/current — B1

2. r.m.s value is the steady voltage which dissipates ~~the~~ ~~same~~ energy in a resistor as the alternating voltage ~~of the same value.~~ — B1

a.c at the same rate as accept current — B1

(ii) 1. $V = V_o \cos wt.$

$w = 2\pi f = 20\pi$ — M1

$f = 10H_z$ — A1

2. peak value $V_o = 200V$ — ~~B1~~ A1

3. $Vrms = \frac{V_o}{\sqrt{2}} = \frac{200}{\sqrt{2}}$ — C1

$= 141,4V$ 2 s.f.g — A1

1140V

(b) (i) — ~~B1~~

- ~~consists of primary and secondary windings~~ — ~~B1~~

- laminated (to reduce eddy currents) i.e. so that flux linkage between primary and secondary is as high as possible — B1

lets energy loose

- a.c. in primary is set ~~up on~~ an alternating magnetic field in iron core — B1
which in turn induces an a.c. in secondary coil — B1

e.m.f

- primary voltage and secondary affected by the turns ratio

$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$ any ratio use gives equation or this — B1

(i) 2. high voltage implies low currents hence — M1 — max 4

less energy losses $(P = I^2R)$ due to joule heating — A1 — B1

hence thinner cables can be used max 2

1. alternating voltages can be stepped up — B1
and down ~~hence necessitating the use of thinner cables~~ — B1
has alternating magnetic field which causes electromagnetic induction hence
~~an economic advantage~~ — ~~B1~~

(c) (i) - infinite input impendance / does not draw current — B1

- infinite open loop gain — B1

- zero output impendance — B1

- infinite slew rate — B1

- infinite bandwidth — B1

Max 4

(ii) negative feedback is when part of output is fed back into the inverting input — B1

negative

(iii) Advantages
- increases bandwidth — B1
- improves stability / does not produce [illegible] — B1
- gain predictable — B1
- reduces distortion of signal — B1

Max 2

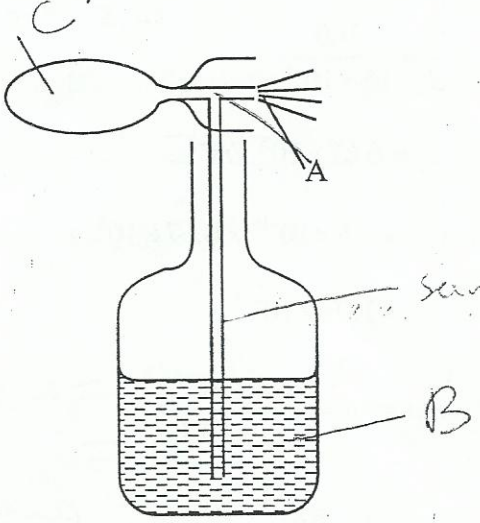
Disadvantage
- reduces gain — B1

2 (a) (i) An increase in pressure results in a decrease in velocity or vice versa — B1

equation not required not wrong

(ii)
- fluid is incompressible / constant density — B1
- fluid is non viscous / frictional forces — B1

(iii)



(i) same cross-sectional area

diagram — B2

- C ~~squeezed~~ — ~~B1~~
blown out at high speed at A
- air moves out of high speed at *A* — B1
- making pressure at *A* lower than in *B* — B1
- pressure difference forces perfume out A, W — B1

(b) 1. $A_A V_A = A_B V_B$ C1

$3.90 \times 10^{-4} \times 5.2 \times 10^{-3} = 2.10 \times 10^{-4} V_2$

M1

$V = 9.66 \times 10^{-3} ms^{-1}$ A1

2. $P_A - P_B = \frac{1}{2}\rho\left(V_B^2 - V_A^2\right)$

$= \frac{1}{2}\ 790\left(9.66 \times 10^{-3^2} - 5.2 \times 10^{-3^2}\right)$ C1

$= 0.026Pa$ A1

mixed units & plus an

3 (a) Electric field strength is force **per** unit (positive) charge B1

unit = NC^{-1} Vm^{-1} A1

(b) (i) $t = \frac{d}{s} = \frac{2,5 \times 10^{-2}}{5,5 \times 10^{7}}$ C1

$= 4,55 \times 10^{-10} s$ accept 2 s.f A1

4,5 not 4,6

(ii) $E = \frac{v}{d} = \frac{100}{15 \times 10^{-3}}$ C1

$= 6,67 \times 10^{3}\ Vm^{-1}$ A1

(iii) $F = QE = 1,6 \times 10^{-19} \times 6.67 \times 10^{3}$ A1

$= 1.07 \times 10^{-15} N$ A1

(iv) $F = ma \Rightarrow a = \frac{1,07 \times 10^{-15}}{9,11 \times 10^{-31}}$

$= 1,17 \times 10^{15} ms^{-2}$ accept 2 s.f A1

~~$V_x = 5,5 \times 10^{7} m/s$~~ A0

considering vertical motion

(v) $Vy^2 = u^2 + 2as$

$Vy^2 = 2 \times 1,17 \times 10^{15} \cdot \frac{15 \times 10^{-3}}{2}$

$Vy = 4,19 \times 10^{6} ms^{-1}$ C1

$V = \sqrt{V_x^2 + V_y^2}$ A1

$= 5,52 \times 10^{7} ms^{-1}$

$Vy = uy + at$

$Vy = (1,17 \times 10^{15})(4,55 \times 10^{-10})$

$= 5,32 \times 10^{5} m/s$

$V = \sqrt{V_x^2 + V_y^2}$

$5,5 \times 10^{7} ms^{-1}$

(c) A magnetic field is placed perpendicular to the electric field B1

and into paper B1

4 (a) - Newtonian mechanics can be applied B1

- negligible intermolecular forces B1

- volume of molecules negligible compared to volume occupied by gas B1

- molecules are perfectly elastic spheres B1

- duration of collision is negligible compared to time between collisions B1

- collisions between molecules and walls of container are perfectly elastic B1

- velocity of molecules uniform ~~between collisions~~ max 4

(b) (i) sum of all the microscopic kinetic and potential energies of molecules B1

(ii) no intermolecular forces imply zero potential energy B1

(c) ~~(i) $pe = 0$~~ ~~A1~~

(ii) $W = p\Delta V = 1000 \times 10^3 \times (5{,}8 - 2{,}5) \times 10^{-4}$ C1

$= 330J$ A1

(iii) ~~$\Delta U = Q + W$~~ C1

$= 150 + 330$

$= 480J$ A1

Its an ~~increase~~. B1

5 (a) (i) charge per unit voltage B1

(ii) work done per unit positive charge in bringing the charge from infinity to the point B1

(b) (i) $V = \frac{Q}{4\pi\varepsilon_o r}$ B1

(ii) $C = \frac{Q}{V} \Rightarrow V = Q/C$ B1

$\frac{Q}{C} = \frac{Q}{4\pi\varepsilon_o r}$ C1

$C = 4\pi\varepsilon_o r$ AO

(c) (i) $20V$ is the maximum voltage which can safely operate the capacitor B1

(ii) 1. Energy supplied $= CV^2 = 15 \times 10^{-6} \times 3^2$ C1

$= 1,35 \times 10^{-4} J$ A1

2. Energy stored $= \frac{1}{2} CV^2$

$= \frac{1}{2} \times 15 \times 10^{-6}.3^2$ C1

$= 6,75 \times 10^{-5} J$ A1

(iii) Some energy is lost as heat in the connecting wires B1
and is ~~dissipated as electromagnetic radiation~~ B1
Energy supplied greater than Energy stored

ST JOHN
CLIFFORD
SIMMS