ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

Chikata

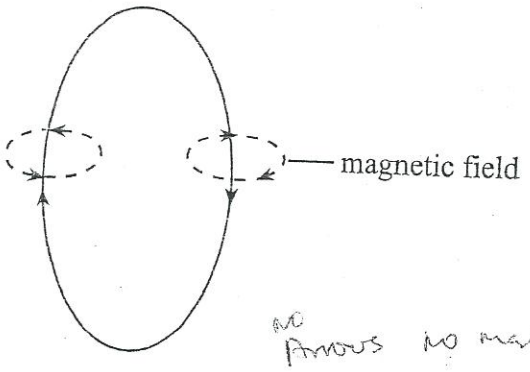
MARKING SCHEME

JUNE 2011

PHYSICS

9188/5

1 (a) (i)



no arrows no mark

Fig.1.1

(ii) B = F/*Il* terms explained — B1 B1

(iii) $F = BIl$ — F/e = BI

$= 2.4 \times 10^{-3} \times 2 \times 5 \times 10^{-2}$ — $= 2.4 \times 10^{-3} \times 2$ A

$= 48 \times 10^{3}$ N/m — C1

$= 2.4 \times 10^{-4}$ N into plane of paper (into paper) — A1A1

(b) (i) move towards the face DCEF — B1
Fleming's LHR — B1
Current in direction opposite that of electrons — B1

(ii) no shift — B1
$F = BIl \sin\theta$ $\theta = 0$ or $180°$ — B1

(c) (i) operational amplifier — B1

(ii) Advantages: — B1
increased brandwidth
less distation — distortion
greater operational stability — B1
predictable gain — B1
any one good adv — B1

Disadvantage: smaller gain — B1

(d) (i) conservation of mass — C1
conservation of charge / Calculation — C1
A = 56 and B = 92 — A1 A1, A1

(ii) neutron has no charge no. — B1
(can easily interact with nucleus)

(iii) Total mass before split = 236.109u C1
Total mass after split = 235.927u
Mass difference = 0.182u C1
Energy released = 931×0.182
= 169.4 MeV A1

2 (a) *mean speed*: average of the speeds of the molecules B1
mean square speed: average of the squares of the speeds of the molecules B1

(b) Gas particles are in random motion B1
particles colliding with walls of container B1
a force is exerted per unit area B1

(c) $p = \frac{1}{3}\rho < c^2 >$ C1

Cr.m.s. = $\sqrt{\frac{3 \times 1.01 \times 10^5}{9.0 \times 10^{-2}}}$ C1

= 1 830 m/s A1

$p = \frac{nRT}{V}$ C1

$\frac{N}{V} = \frac{p \times N_A}{RT}$

= $2.68 \times 10^{25}\ m^{-3}$ A1

(d) Hydrogen molecules are smaller than the other two B1
Hydrogen has lowest density B1
so has highest mean square speed so with B1
quickly escape AO
[Max 2]

3 (a) fluid which is: non-viscous B1
incompressible B1

(b) mass per unit time at wider part = mass per unit time at narrow part B1

$$\frac{M_1}{t} = \frac{A_1 h_1 \rho}{t}$$

$$\frac{M_2}{t} = \frac{A_2 h_2 \rho}{t}$$

$$\frac{h_1}{t} = v_1; \frac{h_2}{t} = v_2$$

B1 cp

B1 C1

$A_1 v_1 \rho = A_2 v_2 \rho$

A1

$A_1 v_1 = A_2 v_2$

Principle of conservation of mass B1

(c) (i) $P_1 + \frac{1}{2}\rho v_1^2 = \text{constant}$ (high pressure associated with low speed.) reject equation

(terms explained) B1

(ii) jet has very small cross-sectional area so that gas comes out at high speed B1

A high speed flow is associated with low pressure so air comes into barrel B1

low speed outside → high pressure ∴ ΔP = from gas at —

(iii) $V_2 = \frac{7.85 \times 10^{-7} \times 12.5}{1.18 \times 10^{-4}}$ C1

$= 8.32 \times 10^{-2}$ m/s

$P_1 - P_2 = \frac{1}{2}\rho\left(v_2^2 - v_1^2\right)$

$= \frac{1}{2} \times 1.6 \times \left(12.5^2 - \left(8.32 \times 10^{-2}\right)^2\right)$ C1

$= 125$ Pa A1

4 (a) *density*: mass per unit volume B1

specific latent heat of fusion: amount of heat needed per unit mass to cause a substance to melt at its melting point / at constant T° B1

- *solid* – particles close to each other B1

(b) *liquid*: particles (not far apart) are of comparable separation to solids B1

gas: particles are far apart B1

- solid (most dense), gas (least dense) B1

(c) (i) heat lost by iron

$= 50 \times 10^{-6} \times [2\,500 - 1\,810]\, 7\,870 \times 480$ C1

$= 130\,000$ J A1

(ii) heat needed by copper

$= 20 \times 10^{-6} \times [8\,930 \times 385 \times (1\,810 - 301] + 20 \times 10^{-6} \times [21 \times 10^{4}]$

$= 104\,000$ J C1

heat needed by cobalt

$= 30 \times 10^{-6} [8\,900 \times 420 \times (1\,810 - 301) + 25 \times 10^{4}]$ C1

$= 169\,000$ J

Total by copper and cobalt

$= 273\,000$ J A1

(ii) Energy available is less than energy needed so not feasible B1

5. (a) correct diagram of summing amplifier

5 (a) correct diagram of summing amplifier

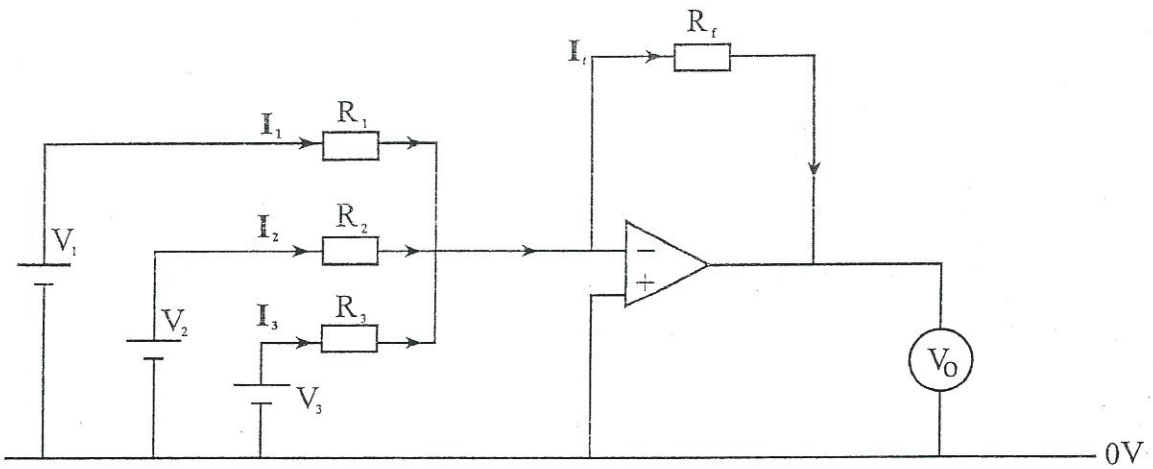


Fig. 5.1

Total $I_T = I_1 + I_2 + I_3$ B1

(b) (i) Operation amplifier does not saturate B1

Correct combination A = 1, B = 0, C = 1, D = 0 B1

$\left.\begin{matrix} j = 1 \\ k = 0 \end{matrix}\right\}$ or statement to that effect B1

$\left.\begin{matrix} i = 0 \\ g = 0 \\ h = 0 \end{matrix}\right\}$ correct input for OR gate B1

correct input and output o for NAND gate B1

(ii) any trial and error method will trigger the alarm B1

(c) Aerial B1

↓

amplifier/demodalator B1

↓

loud speaker B1

(d) cultural invasion
redundancy/loss of jobs B1