## MARK SCHEME for the May/June 2008 question paper

## 5054 PHYSICS

5054/02
Paper 2 (Theory), maximum raw mark 75

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2008 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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## Section A

1 (a) turbine in first box or transformer in third box
turbine, generator, transformer
(b) pollution (e.g. smoke, fumes, toxic gases e.g. $\mathrm{CO}, \mathrm{SO}_{2}$ not ozone layer affected), global warming, greenhouse effect, acid rain
(c) (i) cannot be replaced, not being renewed/made, will run out, many years to form, finite (not cannot be used again/reused/recycled)
(ii) solar/Sun, wind, tidal, geothermal, biomass, hydro-electric, wave
[Total: 5]

2 (a) any attempt at a moment calculation, e.g. any $\mathrm{F}_{1} \mathrm{~d}_{1}=\mathrm{F}_{2} \mathrm{~d}_{2}$ seen, or answer 0.9 N C1 $0.8(0) \mathrm{N}$
(b) $\mathrm{P}=\mathrm{F} / \mathrm{A}$ formula stated B1
$2.6 \times 10^{5} \mathrm{~Pa}\left(2.571 \times 10^{5} \mathrm{~Pa}\right)$ B1
(c) action and reaction are equal and opposite or every force has an equal and opposite force or force on body $A$ is equal and opposite to force on body $B$
[Total: 5]

3 (a) (i) molecules/atoms/particles escape/leave or liquid molecules change to gas/ vapour
fastest/high energy molecules evaporate/energy needed to break bonds/latent heat
(ii) hot air less dense or cold air more dense or air expands or body heat conducted into air
(b) trapped air
air is a bad conductor/good insulator convection current reduced or (air) flow reduced (shiny) heat/IR/radiation reflected or shiny less radiation/heat emitted evaporation reduced/air more humid, etc. ANY 3 lines 1 each B3
[Total: 6]

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4 (a) from liquid to gas (accept liquid to vapour) B1 nitrogen change starts at 1 min or stops at 4 min or lasts $3 \mathrm{~min} \quad$ (all times $\pm 0.2 \mathrm{~min}$ ) B1 oxygen boils/liquid to gas starts at 4.8 min or stops at 5.6 min or lasts 0.8 min B1
(b) mcT algebraic (or words) formula B1
$9\left({ }^{\circ} \mathrm{C}\right)$ seen C 1
any 1 correct calculation 3060 or 14400 (J) C1
17000 J (17460 J)
(b) (i) fluorescent (screen), photographic (plate), CCD/semiconductor/photoelectric/GM tube
(ii) (X-rays) absorbed/stopped by bone or do not penetrate bone (not reflected by bone) B1 less absorption/pass through flesh/skin/body, etc. or travel in straight lines or effect on detector, e.g. ionisation, photo black (on development), light emitted
[Total: 5]

6 (a) $R=V / I$ in any algebraic (e.g. $V=I R$ ) or numerical form
$1200 \Omega$
(b) decreasesM1
to constant value/to 0.2 A A1
(c) longer or thinner or hotter or material/made of poorer conductor (higher resistivity)
(ii) downwards
(b) (i) rough circle around each wire ( -1 any crossing lines) B1
correct shape around both wires or large circle around both wires B1
direction of field correct on any one correct line and no direction wrong
(ii) attractive force drawn on/near each wire

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8 (a) thermionic emission or hot (filament/metal)
(b) (i) attracted by anode/+ve or repelled by filament/-ve B1
(ii) no obstruction/interference or electrons reach screen/travel through CRO or otherwise electrons collide (with atoms)/lose energy/deflected
(c) $8.0 \times 10^{14} \times 1.6 \times 10^{-19}$

C1
$1.3 \times 10^{-4}$ or $1.28 \times 10^{-4} \mathrm{~A}$ A1
[Total: 5]

## Section B

$9 \begin{array}{ll}\text { (a) K.E. (at start) } \\ \text { to heat (+ sound) }\end{array} \quad \begin{gathered}\text { B1 } \\ \\ \end{gathered}$
[Total: 2]
(b) (i) 30 m cao B1
(ii) area under graph or average speed $\times$ time or $(u+v) . t / 2$ or $30 \times 4 / 2$

60 m A1

(iv) $F=$ ma or $800 \times$ (iii) C1

6000 N ecf (iii) A1
[Total: 7]
(c) (i) more friction/grip/traction or more deceleration or decelerates faster or decelerates in less time B1 less (braking) distance B1 $\begin{array}{lc}\text { (ii) less friction or less deceleration or decelerates slower/longer } & \text { B1 } \\ \text { more (braking) distance } & \text { B1 }\end{array}$
(iii) less deceleration or decelerates slower/longer B1
more distance B1
[Total: 6]

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10 (a) (i) transverse-crest and troughs and longitudinal-compressions and rarefactions C1
transverse vibration at right angles and longitudinal along wave A1
diagram showing transverse wave at least one wavelength B1
diagram showing longitudinal wave (slinky/layers, etc.) at least one wavelength B1
(ii) high(er) pressure or denser or molecules/atoms/layers closer together B1
low(er) pressure or molecules, etc. further apart
(b) (i) tank containing water/waves and labelled dipper/vibrator ..... B1
source of light (labelled or clear) and screen/paper/projected image or stroboscope to view or illuminate ..... B1
(ii) plane barrier (labelled or clear) + incident waves ..... B1 reflected waves correct ..... B1
(accept circular waves with correct centres 0/2 if waves go through barrier)
(c) (i) 1.5 m ..... B1
(ii) $5 / 10$ or no of waves per second or $f=1 / T$ ..... C1
0.5 Hz ..... A1
(iii) $v=f \lambda$ or (i) $\times$ (ii) allow $v=f \lambda$ anywhere in (c) ..... C1
$0.75 \mathrm{~m} / \mathrm{s} \operatorname{ecf}$ (i) and (ii) ..... A1
[Total: 5]

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11 (a) (i) diagram with GM tube or other detector, source and absorber between B1
count/reading used in experiment B1
alpha stopped by paper/card $/ 2-10 \mathrm{~cm}$ air B1
between 2 mm and 2 cm aluminium/metal/lead stops beta B1
(some) gamma passes through aluminium/metal/lead B1
(ii) keep distance, e.g. use tongs
point source away (from user)
use a barrier, e.g. wear lead apron
use a lead container to store/transport sources
use for a short time or monitor with film (badge) ANY 2 lines B2
(iii) (otherwise) source decays/decreases (quickly) B1
experiment takes longer (than 1 second) or to give time for the experiment or source has to be replaced often
[Total: 9]
(b) gamma no deviation B1
alpha and beta opposite deflections (on diagram or stated)
or beta deflected more than alpha stated B1
alpha into paper and beta out of paper B1
may be stated on diagram but must be clear into/out of paper for 3rd mark
$\begin{array}{lll}\text { (c) } A \& C & \text { B1 } \\ & \text { (isotopes/A \& C) same number of protons } & \text { B1 } \\ & \text { (isotopes/A \& C) different numbers of neutrons } & \text { B1 }\end{array}$
[Total: 3]

- Incorrect prefixes to units and errors in powers of 10 are to be treated as arithmetical errors.
- Penalise wrong or missing units once per question.
- Answers with incorrect units will normally gain preceding C marks.


## MARKING SCHEME CODE

B1 independent mark
C1 compensation mark; given automatically if the answer is correct, i.e. the working need not be seen if the answer is correct; also given if the answer is wrong but the point is seen in the working
M1 method mark: if not given subsequent A marks fall (up to next B, M or C mark)
A1 answer mark
cao correct answer only (including unit)
eeoo each error or omission
ecf error carried forward; it usually is even where not specifically indicated, i.e. subsequent working including a previous error is credited, if otherwise correct

