UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

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.

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UNIVERSITY of CAMBRIDGE
International Examinations

Section A

1 **(a)** turbine in first box **or** transformer in third box C1
turbine, generator, transformer A1

(b) pollution (e.g. smoke, fumes, **toxic** gases e.g. CO, SO_2 **not** ozone layer affected), global warming, greenhouse effect, acid rain B1

(c) **(i)** cannot be replaced, not being renewed/made, will run out, many years to form, finite (**not** cannot be used again/reused/recycled) B1

(ii) solar/Sun, wind, tidal, geothermal, biomass, hydro-electric, wave B1

[Total: 5]

2 **(a)** any attempt at a moment calculation, e.g. any $F_1d_1 = F_2d_2$ seen, or answer 0.9 N C1
0.8(0) N A1

(b) P = F/A **formula** stated B1
2.6×10^5 Pa (2.571×10^5 Pa) 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 B1

[Total: 5]

3 **(a)** **(i)** **molecules**/**atoms**/**particles** escape/leave **or** liquid **molecules** change to gas/vapour B1
fastest/high energy molecules evaporate/energy needed to break bonds/latent heat B1

(ii) hot air less dense **or** cold air more dense **or** air expands **or** body heat **conducted** into air B1

(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]

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 min (all times ±0.2 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 (°C) seen C1
any 1 correct calculation 3060 or 14400 (J) C1
17000 J (17460 J) A1

[Total: 7]

5 **(a)** infrared B1
gamma (rays/waves) B1

(b) **(i)** fluorescent (screen), photographic (plate), CCD/semiconductor/photoelectric/GM tube B1

(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 B1

[Total: 5]

6 **(a)** $R = V/I$ in any algebraic (e.g. $V = IR$) or numerical form C1
1200 Ω A1

(b) decreases M1
to constant value/to 0.2 A A1

(c) longer **or** thinner **or** hotter **or** material/made of poorer conductor (higher resistivity) B2

[Total: 6]

7 **(a)** **(i)** from N to S **or** towards right B1

(ii) downwards B1

(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 B1

(ii) attractive force drawn on/near each wire B1

[Total: 6]

8 **(a)** thermionic emission **or** hot (filament/metal) B1

(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 B1

(c) $8.0 \times 10^{14} \times 1.6 \times 10^{-19}$ C1
1.3×10^{-4} **or** 1.28×10^{-4} A A1

[Total: 5]

Section B

9 **(a)** K.E. (at start) B1
to heat (+ sound) B1

[Total: 2]

(b) **(i)** 30 m cao B1

(ii) area under graph **or** average speed × time **or** (u + v).t / 2 **or** 30 × 4/2 C1
60 m A1

(iii) $(v–u)/t$ **or** $v = u + at$ **or** 30/4 **or** gradient **or** rise/run C1
7.5 (±0.1) m/s^2 A1

(iv) $F = ma$ **or** 800 × **(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

(ii) less friction **or** less deceleration **or** decelerates slower/longer B1
more (braking) **distance** B1

(iii) less deceleration **or** decelerates slower/longer B1
more **distance** B1

[Total: 6]

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 B1

[Total: 6]

(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)

[Total: 4]

(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)** × **(ii)** allow $v = f\lambda$ anywhere in **(c)** C1
0.75 m/s ecf **(i)** and **(ii)** A1

[Total: 5]

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 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 B1

[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

[Total: 3]

(c) A & C B1
(isotopes/A & C) same number of protons B1
(isotopes/A & C) different numbers of neutrons B1

[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