Cambridge Assessment International Education

Cambridge IGCSE®

PHYSICS **0625/04**

Paper 4 Theory (Extended) **For examination from 2020**

MARK SCHEME

Maximum Mark: 80

Specimen

This document consists of **6** printed pages.

mark scheme abbreviations

( )	the word, phrase or unit in brackets is not required but is in the mark scheme for clarification
accept	accept the response
AND	both responses are necessary for the mark to be allowed
c.a.o.	correct answer only
e.c.f.	error carried forward; marks are awarded if a candidate has carried an incorrect value forward from earlier working, provided the subsequent working is correct
ignore	this response is to be disregarded and does not negate an otherwise correct response
NOT	do not allow
note:	additional marking guidance
/ OR	alternative responses for the same marking point
owtte	or words to that effect
underline	mark is not allowed unless the underlined word or idea is used by candidate
units	there is a maximum of one unit penalty per question unless otherwise indicated
any [number] from:	accept the [number] of valid responses
max	indicates the maximum number of marks

1 **(a)** speed × time in any form, symbols, numbers or words
OR any area under graph used or stated [1]
13 (m/s) OR 24 (s) seen or used in correct context [1]
312 m (2 or 3 sig. figs.) [1]

(b) rate of change of speed OR gradient of graph OR 18/12 [1]
18 (m/s) OR 12 (s) seen or used in correct context [1]
1.5 m/s^2 [1]

(c) same gradient / slope OR equal speed changes in equal times OR
allow graph symmetrical [1]

2 **(a)** *mgh* OR 36 × 10 × 2.4 [1]
864 J OR N m (2 or 3 sig. figs.) [1]

(b) (*P* =) *E*/*t* in any form, words, symbols or numbers OR 864 / 4.4 [1]
196 W OR J / s (2 or 3 sig. figs.) [1]

(c) evidence that candidate understands the principle of energy conservation, expressed in words or as an equation (e.g. total energy is constant OR initial energy = final energy) or implied by statement accounting for difference [1]

some energy is dissipated into the surroundings OR difference due to increase in internal energy/heating/thermal energy (of belt, motor, surroundings) owtte
note: do not accept kinetic energy / sound / friction if no mention of heating [1]

(d) increase in potential energy of mass is greater
OR work done/energy used (to raise mass) is greater [1]
t = *E*/*P* OR *P* = *E*/*t* in any form, words or symbols AND power is constant [1]
speed reduced / time taken is longer [1]

3 **(a)** *p* = *mv* in any form, words or symbols [1]
0.16 kg m / s OR N s [1]

(b) use of principle of conservation of momentum in words, symbols or numbers [1]
use of combined mass 0.5(0) + 0.3(0) OR 0.8(0) (kg) [1]
0.2(0) m / s [1]

4 **(a)** three valid features listed without explanation [1]

any three features explained from:

copper/metal is a good conductor (of heat)
NOT of electricity

black is good absorber/bad reflector
ignore emitter

insulating material will reduce heat lost/conducted away (from pipes/sheet)
NOT prevents heat loss owtte

glass/trapping of air reduces/prevents convection/warm air being blown away

glass produces greenhouse effect/reference to far and near I.R. [max 3]

(b) 38 – 16 OR 22 [1]
$mc\theta$ OR 250 × 4200 × candidate's temperature difference [1]
2.31×10^7 (J) e.c.f. from previous line [1]
9.24×10^7 J OR e.c.f. from previous line × 4 correctly evaluated [1]
no unit penalty if J seen anywhere in **(b)** clearly applied to an energy

(c) valid explanation relating to at least one of the reasons below: [1]
note: if no explanation, this mark is not awarded even if more than three reasons are given

any three reasons from:
which direction roof faces
estimate output of panels
household needs / whether household will use all hot water
cost of panel / installation
time to recoup cost
whether roof is shaded
relevant environmental consideration (e.g. not using wood or other fuel to heat water) [max 3]

(d) nuclei join together, accept hydrogen for nuclei
to produce a different element / helium (and energy) [2]

5 **(a)** **(i)** any one from:
(molecules) move randomly / in random directions
(molecules) have high speeds
(molecules) collide with each other / with walls [max 1]

(ii) collisions with walls/rebounding causes change in momentum (of molecules) [1]
force is rate of change of momentum / force needed to change momentum [1]

(b) **(i)** $p_1V_1 = p_2V_2$ OR 300 × 100 (× 0.12) = p_2 × 0.40 (× 0.12) [1]

750 kPa [1]

(ii) (molecules) collide with walls more often owtte
OR more collisions with walls per second or per unit time owtte [1]
greater force per unit area [1]

6 **(a)** clear attempt at semi circles, at least 3 [1]
same wavelength as incoming wavefronts, by eye [1]

(b) speed ÷ wavelength or 20 ÷ 2.5 or $v = f\lambda$ [1]
8 Hz or 8 s^{-1} or 8 waves/second [1]

(c) candidate's **(b)** OR "the same" OR nothing [1]

(d) low frequency signals have longer wavelength (than high frequency signals) OR
high frequency signals have shorter wavelength [1]

low frequency signals / long wavelength signals diffract more OR
low frequency / short wavelength signals diffract less [1]

7 **(a)** rheostat/<u>variable</u> resistor AND
control/vary/change/ limit the current /resistance/power/ voltage <u>across heater</u> [1]

(b) (I =) P/V any form, words or numbers [1]
(I =) 1.25 (A) seen anywhere [1]
(V =) 6.0 – 3.6 OR 2.4 seen anywhere [1]
(R =) V/I in any form words or numbers [1]
1.92 Ω (2 or 3 sig. figs.) [1]
note: credit will also be given for alternative approaches

(c) battery running down/going flat/energy <u>of battery</u> used up OR V or e.m.f. less
OR more/increasing resistance (of heater) NOT resistance of X increases [1]
use of relationship between I and V or R OR the current decreases [1]

8 **(a)** output of A: 1, 1, 0, 0 c.a.o. [1]
output of B: 0, 1, 0, 0 e.c.f. from candidate's output of A [1]

(b) dark AND hot owtte
note: must be consistent with answer to **(a)** [1]

(c) B cannot provide enough power / current for lamp, or equivalent
OR allows remote lamp [2]
note: statement of function of a relay without reference to context gains 1 mark

9 **(a)** electrons / negative charges move towards the rod / to R (ignore just “attracted”)
ignore any mention of positive charges moving
any mention of positive electrons = 0 [1]

(b) negative charges (are) close(r) (to the rod) [1]
attraction between opposite charges greater than repulsion between like charges [1]

(c) coulomb [1]

10 γ rays [1]
(γ rays) detected at B [1]
(γ rays) not deflected by field / not charged [1]
charged particles / β particles (accept α for charged particles) [1]
β particles detected at C [1]
reference to direction of deflection / LH rule [1]
no α-particles OR only background detected at A [1]

11 **(a)** top bent down to R of layer [1]
middle straight on [1]
bottom deflected back to left [1]

(b) **(i)** deflection greater than 90°/the bottom one [1]

(ii) positive ignore numbers [1]

(iii) nothing/vacuum/space/electrons [1]

(c) 2 AND 2 [1]