Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/33**

Paper 3 Core Theory **May/June 2016**

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

M marks — are method marks upon which further marks depend. For an M mark to be scored, the point to which it refers **must** be seen in a candidate's answer. If a candidate fails to score a particular M mark, then none of the dependent marks can be scored.

B marks — are independent marks, which do not depend on other marks. For a B mark to scored, the point to which it refers must be seen specifically in the candidate's answers.

A marks — In general A marks are awarded for final answers to numerical questions. If a final numerical answer, eligible for A marks, is correct, with the correct unit and an acceptable number of significant figures, all the marks for that question are normally awarded. It is very occasionally possible to arrive at a correct answer by an entirely wrong approach. In these rare circumstances, do not award the A marks, but award C marks on their merits. However, correct numerical answers with no working shown gain all the marks available.

C marks — are compensatory marks in general applicable to numerical questions. These can be scored even if the point to which they refer are not written down by the candidate, **provided subsequent working gives evidence that they must have known it.** For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct substitution or working which shows that they knew the equation, then the C mark is scored. A C mark is not awarded if a candidate makes two points which contradict each other. Points which are wrong but irrelevant are ignored.

Brackets ( ) — around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given.

Underlining — indicates that this must be seen in the answer offered, or something very similar.

OR / or — indicates alternative answers, any one of which is satisfactory for scoring the marks.

e.e.o.o. — means "each error or omission".

o.w.t.t.e. — means "or words to that effect".

Ignore — indicates that something which is not correct or irrelevant is to be disregarded and does not cause a right plus wrong penalty.

Spelling — Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, beware of and do not allow ambiguities: e.g. spelling which suggests confusion between reflection / refraction / diffraction or thermistor / transistor / transformer.

Not/NOT — indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate i.e. right plus wrong penalty applies.

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e.c.f.	meaning “error carried forward” and is mainly applicable to numerical questions, but may occasionally be applied in non-numerical questions. This indicates that if a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by e.c.f. may be awarded, provided the subsequent working is correct, bearing in mind the earlier error.
Significant figures	Answers are normally acceptable to any number of significant figures $\geqslant 2$. Any exceptions to this general rule will be specified in the mark scheme.
Units	Deduct one mark for each incorrect or missing unit from an answer that would otherwise gain all the marks available for that answer: maximum 1 per question.
Arithmetic errors	Deduct only one mark if the **only** error in arriving at a final answer is clearly an arithmetic one. Regard a power-of-ten error as an arithmetic one.
Fractions	Only accept these where specified in the mark scheme.

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Question	Expected answer	Mark
1(a)	height (of water / liquid)	**B1**
1(b)(i)	3.10 (s) and 3.04 (s) and 3.16 (s)	**B1**
1(b)(ii)	correct sum (9.3) correct average (3.1)	**C1** **A1**
1(c)	15.5 × 60 or 930 930 ÷ 3.1 300 (drops)	**C1** **C1** **A1**
		Total: 7

Question	Expected answer	Mark
2(a)	(distance) = area under (speed-time) graph in words, numbers or symbols OR distance = speed × time 4.4 × 10 44 (m)	**C1** **C1** **A1**
2(b)	C (cyclist is) accelerating (so) forward force must be greater than backward force OR there is a resultant (forward) force	**B1** **B1** **B1**
2(c)	$P = F \div A$ 120 ÷ 16 7.5 N / cm^2	**C1** **C1** **A1** **B1**
		Total: 10

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Question	Expected answer	Mark
3(a)	force × distance (from pivot) OR 300 × 2.4 720 (N m)	**C1** **A1**
3(b)	sum of clockwise moment = sum of anticlockwise moment 720 = W × 1.6 OR 720 ÷ 1.6 450 (N)	**C1** **C1** **A1**
		Total: 5

Question	Expected answer	Mark
4(a)(i)	X: bulb Y: liquid (thread)	**B1** **B1**
4(a)(ii)	arrow at 0 °C	**B1**
4(b)	ice melts any **three** from: molecules gain energy (from surroundings) molecules vibrate faster break bonds between molecules molecules move freely	**B1** **B3**
		Total: 7

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Question	Expected answer	Mark
5(a)	any **two** from: lamps all have 6 V or full voltage (across them) OR lamps are brighter if one (lamp) breaks, little / no effect on other lamps can be switched on and off independently	**B2**
5(b)(i)	10 – 8.2 OR 1.8 (J)	**B1**
5(b)(ii)	diagram indicating smaller proportion of energy wasted (e.g. greater useful energy output OR smaller wasted energy output OR smaller energy input for same output)	**B1**
5(c)	any **two** advantages from: renewable (energy source) does not contribute to global warming does not contribute to atmospheric pollution conserves fossil fuel reserves any **two** disadvantages from: not a reliable supply of electricity large area of land needed (for a wind farm) unsightly threat to birds large number needed to replace one power station infrastructure more expensive (per MW) than fossil fuel power stations needs a suitable (windy) location	**B2** **B2**
		Total: 8

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Question	Expected answer	Mark
6(a)	X-rays microwaves	**B1** **B1**
6(b)	radio waves	**B1**
6(c)	any **one** from: cancer detection / treatment, sterilising (hospital equipment / dressings), gamma-ray photography / scanning, preserving food, detecting cracks in metal structures, locating leaks from underground pipes any **one** from: detecting forgeries, suntan beds, hardening dental fillings, astronomy, security pens, treating jaundice, locating blood / body fluids	**B1** **B1**
		Total: 5

Question	Expected answer	Mark
7(a)	normal drawn at X <u>above and in the block</u>	**B1**
7(b)	ray refracted toward normal drawn from X to side RS	**B1**
7(c)	angle of incidence correctly labelled angle of refraction correctly labelled	**B1** **B1**
7(d)	ray drawn refracted away from the normal	**B1**
		Total: 5

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Question	Expected answer	Mark
8(a)	(material Z) melts	**B1**
8(b)	any **five** from: (plastic lid) is a good insulator (plastic lid) reduces (heat loss by) convection (plastic lid) reduces (heat loss by) evaporation (vacuum) reduces / prevents (heat loss by) convection (vacuum) reduces / prevents (heat loss by) conduction shiny / silver surface is a poor radiator / bad emitter (of thermal energy) at 60 °C material Z solidifies material Z maintains a constant temperature (60 °C) during solidification / internal energy is given out	**B5**
		Total: 6

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Question	Expected answer	Mark
9(a)	$V = I \times R$ OR $V \div R$ in words, numbers or symbols 2.0 ÷ 6.0 0.33 (A)	**B1** **B1** **B1**
9(b)(i)	arrows indicating field drawn from N to S	**B1**
9(b)(ii)	force upwards / reverses	**B1**
9(c)(i)	any **two** from: increase current in the coil increase the strength of the magnets or magnetic field increase the number of turns in the coil	**B2**
9(c)(ii)	force on (each side of) coil or turning effect is in opposite direction or coil turns in opposite direction (because) current (through motor) is in opposite direction	**B1** **B1**
		Total: 9

Question	Expected answer	Mark
10(a)	Vp ÷ Vs = Np ÷ Ns in any form 230 / Vs = 4995 ÷ 555 or Vs = 230 ÷ 9 Vs = (555 ÷ 4995) × 230 25.6 (V)	**C1** **C1** **A1**
10(b)	step-down (transformer)	**B1**
		Total: 4

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Question	Expected answer	Mark
11(a)(i)	(chemical symbol): X (nucleon number): A (proton number): Z any two for one mark	**B2**
11(a)(ii)	1. 95 2. 146	**B1** **B1**
11(b)	same number of protons (in nucleus) different numbers of neutrons (in nucleus)	**B1** **B1**
		Total: 6

Question	Expected answer	Mark
12(a)	(fast moving) electron negative (charge)	**B1** **B1**
12(b)	line from count rate of 2000 8 (days)	**C1** **A1**
12(c)(i)	180 ÷ 4 45 (counts / min)	**C1** **A1**
12(c)(ii)	any **two** from: radiation mutates DNA / damages (living) cells radioactive material still present (in soil / reactor core / after many years) negative public perception of nuclear power radioactive waste on site contains isotopes with long half-lives	**B2**
		Total: 8

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