Cambridge IGCSE™

PHYSICS **0625/43**

Paper 4 Theory (Extended) **May/June 2025**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	11.5 m / s	**B1**
1(b)	45 m	**A3**
	(distance =) area under graph **OR** ½ *bh* (+ *bh*)	C1
	{0.5 × 20} + ½ {20 × 3.5} **OR** {10 + 35} **OR** [{0.5 + 4} ÷ 2] × 20	C1
1(c)	5.7 m / s^2	**A3**
	(deceleration =) (∆)*v* ÷ ∆*t* **OR** deceleration = gradient	C1
	(0 –) 20 ÷ {4(.0) - 0.5} **OR** 20 ÷ 3.5	C1

Question	Answer	Marks
2(a)	(*p* =) *mv* **OR** mass × velocity	**B1**
2(b)	7790 m / s	**A3**
	momentum before (collision) = momentum after (collision) **OR** $m_c v_c + m_n v_n = 6.55 \times 10^6$ **OR** (momentum of cone =) 120 × 7850 **OR** 9.42×10^5	C1
	$720v + \{120 \times 7850\} = 6.55 \times 10^6$ **OR** (momentum after collision =) $6.55 \times 10^6 - 9.42 \times 10^5$ **OR** 5.6×10^6	C1
2(c)	12 000 kg	**A2**
	120 000 (N) **OR** (*m* =) *W* ÷ *g* **OR** (*m* =) $1.2 \times 10^N \div 9.8$	C1

Question	Answer	Marks
3(a)	(F =) $W \div d$ **OR** $W = Fd$	**B1**
	110 ÷ 0.45 **OR** 244 (N)	**B1**
3(b)(i)	86 m / s	**A3**
	$E_k = ½ mv^2$ **OR** $110 = ½ mv^2$ **OR** $110 = ½ \times 0.03 \times v^2$	C1
	(v =) √ [{2 × 110} ÷ 0.03] **OR** $v^2 = \{2 \times 110\} \div 0.03$ **OR** $v^2 = 7333$	C1
3(b)(ii)	air resistance / drag / friction	**B1**
	energy lost to surroundings **/** energy transferred to thermal / internal energy	**B1**

Question	Answer	Marks
4(a)	any **three** from: • (copper / metal contains) free / delocalised <u>electrons</u> • <u>electrons</u> carry (thermal) energy through metal • <u>electrons</u> collide with (distant) ions • lattice vibrations transfer energy (to neighbouring ions) **OR** ions vibrate and cause (nearby / adjacent) ions to vibrate	**B3**
4(b)(i)	energy transferred per unit mass per unit temperature change	**A2**
	(thermal) energy (transferred) per unit temperature change	C1
4(b)(ii)	0.51 J / (g °C)	**A3**
	(energy lost by metal =) $54 \times c \times 69$ **OR** (energy gained by water =) $50 \times 4.2 \times 9$ **OR** 1890	C1
	energy lost by metal = energy gained by water **OR** $54 \times c \times 69 = 50 \times 4.2 \times 9$	C1

Question	Answer	Marks
5(a)	(refractive index is) the ratio of the speed of light in two different mediums **OR** (refractive index =) $\frac{\text{speed of light in air}}{\text{speed of light in water}}$ **OR** (refractive index =) $\frac{\text{sine of angle of incidence}}{\text{sine of angle of refraction}}$	**B1**
5(b)	P continues vertical	**B1**
	Q refracted away from normal in the correct direction	**B1**
5(c)	1.3	**A2**
	(n =) 1 ÷ sin 49 **OR** (n =) 1 ÷ sin c	C1
5(d)	any **two** from: • (ray travelling from) dense to less dense medium **OR** water is more dense than air • critical angle = 49° • angle of incidence exceeds critical angle / 49°	**B2**

Question	Answer	Marks
6(a)	sound with a frequency higher than 20 kHz	**B1**
6(b)	vibrations (of the wave / particles) are parallel to the direction of propagation	**B1**
6(c)(i)	(pulse of) ultrasound / sound / wave (sent into water) reflects from object	**B1**
	time to travel to object and back measured	**B1**
	depth = speed × time	**B1**

Question	Answer	Marks
6(c)(ii)	any **one** from: • non-destructive testing of materials • medical scanning (of soft tissue)	**B1**

Question	Answer	Marks
7(a)	0.5(0) A	**B1**
7(b)	3(.0) V	**A2**
	(V =) IR **OR** 0.5(0) × 6(.0)	C1
7(c)	12 – 3(.0)	**B1**
7(d)	180 Ω	**A3**
	I_2 = 9.0 ÷ 20 **OR** I_2 = 0.45 (A) **OR** I_1 = 0.05 (A)	C1
	(R =) 9 ÷ 0.05	C1

Question	Answer	Marks
8(a)(i)	(region) where (an electric) charge experiences a force **OR** (region) where a force acts on a (an electric) charge	**B1**
8(a)(ii)	**four** radial straight field lines starting at charge	**B1**
	at least **one** arrow on a field line towards the charge	**B1**

Question	Answer	Marks
8(b)	1600 C	**A3**
	$V = W / Q$ **OR** $(Q =)\ W / V$	C1
	$(Q =)\ 4.5 \times 10^N \div 2.9 \times 10^8$ **OR** 1.6×10^N	C1
8(c)	240 C	**A2**
	$(Q =)\ It$ **OR** $2(.0) \times 120$	C1

Question	Answer	Marks
9(a)(i)	any **three** from: • (current in the primary coil generates a) changing magnetic field (in primary coil) • (iron) core transfers the magnetic field (to the secondary coil) • secondary coil cuts the magnetic field / secondary coil is in (changing) magnetic field • an e.m.f. is induced (in the secondary coil) • (induced) current changes direction because the magnetic field changes direction	**B3**
9(a)(ii)	240 V	**A2**
	$V_s \div V_p = N_s \div N_p$ **OR** $(V_s =)\ 12 \times 20(\div 1)$	C1
9(b)	0.16 A	**A2**
	$P = I^2R$ **OR** $I^2 = P \div R$ **OR** $I^2 = 1.25 \times 10^{-3} \div 0.05(0)$ **OR** $I^2 = 0.025$	C1
9(c)	any **two** from: • less power / heating / energy losses • thinner / cheaper cables • pylons further apart / fewer pylons • transfer energy over long(er) distance	**B2**

Question	Answer	Marks
10(a)	distance travelled (in the vacuum of space) by light in one year	**B1**
10(b)	1.5×10^{11} m	**A2**
	9.5×10^{15} (m) **OR** (c =) $3(.0) \times 10^{8}$ (m / s) **OR** $3(.0) \times 10^{N} \times 490$	C1
10(c)	2.5×10^{-18} per second	**A3**
	(Hubble's constant =) gradient **OR** (H_0 =) $v \div d$	C1
	$2.5 \times 10^{4}(-0) \div \{100 \times 10^{20}(-0)\}$	C1
10(d)	electromagnetic radiation / light from (distant) galaxies	**B1**
	(observed) increase in wavelength (compared to wavelength measured on the Earth)	**B1**

Question	Answer	Marks
11(a)	time taken for half the nuclei (in any sample) to decay	**B1**
11(b)(i)	^{234}(U)	**B1**
	$_{92}$U	**B1**
	+ $^{0}_{-1}\beta$	**B1**
11(b)(ii)	neutron changes to a proton (plus an electron)	**B1**
11(c)	(α particles have) greater <u>kinetic</u> energy (than β particles)	**B1**
	(α particles have) greater charge (than β particles)	**B1**