



Cambridge IGCSE™

PHYSICS

0625/42

Paper 4 Extended Theory

October/November 2023

MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **15** printed pages.

Question	Answer	Marks
1(a)(i)	4.1 m / s ² (a =) $(\Delta)v / (\Delta)t$ OR 13(,0) / 3.2	A2 C1
1(a)(ii)	(acceleration is) change / increase in velocity per unit time OR rate of change of velocity	B1
1(b)(i)	straight line joining (0,0) and (3.2,13.0) horizontal line from 3.2 s to 12.0 s	B1 B1
1(b)(ii)	21 m area under speed-time graph (between 0 s and 3.2 s) OR average velocity $\times$ time	A2 C1
1(c)	$(W =) F \times d$ $F = ma$ OR $F(\Delta)t = m\Delta v$ $F = (1350 \times 13) \div 2$ OR 8775 (N) OR ($F =$) 1350×6.5 $W = 8775 \times 13.0 (= 1.1 \times 10^5 \text{ J})$ OR 114 075 (J)	B1 B1 B1 B1
1(d)	any sensible suggestion that <u>increases</u> the stopping distance explanation (to match suggestion)	B1 B1

Question	Answer	Marks
2(a)(i)	evaporation	B1
2(a)(ii)	air is drier	B1
	because water vapour has condensed / turned back to liquid in the condenser	B1
2(b)(i)	gravitational (force) OR weight	B1
2(b)(ii)	(force is) perpendicular to the motion (of the clothes)	B1
2(c)	uses (solar / wind) energy which is renewable OR energy (re)sources not used to generate electricity OR greenhouse gases not produced OR does not use (fossil) fuels	B1

Question	Answer	Marks
3(a)(i)	force $\times$ time (for which force acts)	B1
3(a)(ii)	0.056 Ns	A3
	$v = s/t$ OR $v = 0.67 / 0.18$ (m / s)	C1
	(impulse $\Rightarrow \Delta\{mv\}$ OR (impulse $\Rightarrow 0.015 \times 0.67 / 0.18$ OR (impulse $\Rightarrow 15 \times 0.67 / 0.18$ OR (impulse $\Rightarrow 5.6 \times 10^N$	C1
3(a)(iii)	(momentum is conserved as) air released from the balloon moves in the opposite direction to the balloon	B1
	momentum of balloon (and straw) is equal in size to momentum of air	B1
3(b)	resultant force = 0.84 N	A2
	correct vector triangle or rectangle drawn	C1
	direction 62° (below the horizontal)	A2
	correct resultant force vector with correct arrows on all vectors	C1
	use of trigonometry to find angle e.g. $\tan \theta = 0.74 / 0.40$	

Question	Answer	Marks
4(a)(i)	any three from: • increase in the (average) KE / speed of air particles • more frequent collisions of (air) particles (with bottle) • more forceful collisions of (air) particles (with bottle) • greater force per unit area gives greater pressure • volume unchanged and so pressure increases	B3
4(a)(ii)	(pressure decreases as) air (particles) escape from the bottle / into the air until pressure (inside the bottle) is same as (air) pressure outside the bottle OR until pressure (inside the bottle) is same as atmospheric pressure	B1
4(b)	$1.5 \times 10^4 \text{ J}$	A2
	$c = (\Delta)E / m\Delta\theta$ ($\Delta E =$) $mc\Delta\theta$ OR ($\Delta E =$) $0.18 \times 4200 \times 20$	C1
4(c)	3900 Pa	A2
	($\Delta p =$) $\rho g(\Delta)h$ OR ($\Delta p =$) $1.0 \times 10^3 \times 9.8 \times 0.4$ OR ($\Delta p =$) $1.0 \times 10^3 \times 9.8 \times 40$ OR ($\Delta p =$) 3.9×10^4	C1

Question	Answer	Marks
5(a)	indication of position of car along a straight line from X above and to left of road at junction.	B1
5(b)	Incident ray from car to mirror AND reflected ray from mirror towards X	B1
5(c)	angle of incidence equal to angle of reflection	B1
	converging lens (to left of eye)	M1
	rays refracted by additional converging lens	A1
	rays refracted by lens in eye to give converging rays	B1
	focal point of rays / image on retina	B1

Question	Answer	Marks
6(a)	(p.d. across LED = $4.5 - 1.2 =$) 3.3 V (V =) IR	A2 C1
6(b)	LED (is a diode, which) only allows current in one direction / has a very high resistance (when direction of current is reversed.) OR (it) is reverse-biased	B1
6(c)	$E = It$ OR $(t =) E / VI$ OR $Q = E / V$ AND $Q = I \times t$ (t =) $1050 \div [0.02 \times 4.5 \times 3600]$ OR (t =) 3.2 h	B1
6(d)	(charge =) 72 C	A2
	$I = Q / t$ OR $(Q =) It$ OR $(Q =) 0.02(0) \times 3600$	C1

Question	Answer	Marks
7(a)	use of electromagnetic radiation Bluetooth headset thermal imaging photography of people's faces sterilising medical equipment region of electromagnetic spectrum gamma rays radio waves infrared visible light all correct 2 marks 1 or 2 correct 1 mark	B2
7(b)	$3.0 \times 10^8 \text{ m/s}$	B1
7(c)(i)	0.12 m	A3
	(mid-point of frequency range identified as) 2.44 (GHz)	C1
	$v = f\lambda$ OR $(\lambda =) 3.0 \times 10^8 / 2.44 \times 10^9$ OR $(\lambda =) 1.2 \times 10^N$	C1
7(c)(ii)	(radio waves / signal) lose energy / get weaker / lose (signal) strength (passing through walls) owtte	B1

Question	Answer	Marks
8(a)	(92 is) the proton number / number of protons (in the nucleus) / atomic number	B1
	(235 is) the nucleon number / number of nucleons (in the nucleus) / mass number	B1
8(b)(i)	(nuclear) fission	B1
8(b)(ii)	nucleus converted to (more stable) nuclei with smaller total mass	B1
	mass (difference) is released / converted as (kinetic) energy (of products) / thermal energy	B1
8(c)(i)	any three from: • (thermal energy) used to heat / boil (cold) water OR make steam • steam is at high pressure • steam drives a turbine • turbine (connected to and) drives a generator • turbine moves a coil in a magnetic field	B3
8(c)(ii)	advantage - any one from: • (much) small(er) amount of fuel needed (to produce same amount of energy) • no greenhouse gases produced OR low carbon dioxide emissions • no air pollution (when operating normally) disadvantage – any one from • danger if any leak of radiation • produces hazardous / dangerous / toxic waste OR difficulty of storage of used radioactive material OR nuclear waste must be stored for a long time • expensive to build or decommission nuclear power plant or store nuclear waste	B1

Question	Answer	Marks
9(a)	Venus	B1
9(b)	The larger the mass (of the planet), the larger the gravitational field strength (at the surface)	B1
9(c)	orbit of planets is elliptical / is not circular	B1
9(d)	correct conversion of T into seconds i.e. $365.2 \times (24 \times 60 \times 60)$ OR 3.2×10^7	B1
	$(v =) \{2\pi r\} / T$	B1
	$2\pi \times 149.6 \times 10^6 / 365.2 \times 24 \times 60 \times 60$	B1

Question	Answer	Marks
10(a)	(interstellar clouds of) gas and dust OR (stellar) nebula	B1
10(b)	(inward) force of gravitational attraction (is balanced by)	B1
	(outward) force due to the high temperature (in the centre of the star)	B1
10(c)	hydrogen	B1
10(d)	planetary nebula	B1