

Cambridge IGCSE™

PHYSICS**0625/43**

Paper 4 Theory (Extended)

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MARK SCHEME

Maximum Mark: 80

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This document consists of **12** printed pages.

Question	Answer	Marks
1(a)	(deceleration is) decrease in velocity per unit time OR rate of decrease in velocity OR <u>negative</u> rate of change of velocity OR $-\Delta v / \Delta t$	A2
1(b)	negative acceleration OR change in velocity per unit time OR rate of change of velocity $a = \Delta v / (\Delta t)$ AND $(\Delta t =) 14 / 9.8$ OR $(\Delta t =) \Delta v / a = 14 / 9.8$	C1 B1
1(c)	10 m (initial) E_k of ball = (maximum) E_p gained OR $\frac{1}{2}mv^2 = mgh$ $(h =) E_p / mg$ OR $(h =) \frac{1}{2}v^2 / g$ OR $(h =) 12.74 / (0.13 \times 9.8)$ ($= 10$ m) OR $(h =) (\frac{1}{2} \times 196) / 9.8$	A3 C1 C1
1(d)	any three from: (ball) accelerates (accelerates) at 9.8 m/s^2 initially OR (accelerates) due to force of gravity - air resistance / resistive force increases (with speed / velocity) - resultant force (downwards) decreases - acceleration decreases - terminal velocity is reached when acceleration is zero OR terminal velocity is reached when resultant force is zero	B3

Question	Answer	Marks
2(a)	chemical (energy store)	B1
2(b)	if one lamp breaks, the other one will remain lit	B1
2(c)(i)	the useful energy / power output from the solar panel is 22% of the total energy / power input	B1
2(c)(ii)	68 W	A2
	(%) efficiency = {useful power output} / {total power input} ($\times 100\%$) OR 15 / 0.22	C1
2(d)	any two from: - no need for cables (to connect to mains) / good for locations remote from mains supply - less power loss than mains (electricity) that must be transmitted - not affected by mains power cuts	B2

Question	Answer	Marks
3(a)(i)	clockwise moment has increased (and no change to anti-clockwise moment)	B1
3(a)(ii)	(mass of backpack $\times$) 45 / (1.6 $\times$ 9.8)) 2.9 (kg) (at balance) sum of clockwise moments = sum of anti-clockwise moments OR (900 $\times$ 0.85) = 1.6 $\times$ (450 + W)	A3
	(clockwise moment =) 765 (N m) OR (moment due to backpack =) 45 (N m) OR (W =) [(900 $\times$ 0.85) – {450 $\times$ 1.6}] / 1.6	C1
3(b)(i)	(impulse is the) force $\times$ time (for which the force acts) OR $I = F \times t$ OR (impulse =) change in momentum OR $\Delta\{mv\}$	B1
3(b)(ii)	any three from: - change in momentum/impulse is the same (on both floors) (change in momentum/impulse) is over longer time - force = rate of change of momentum OR $F = \Delta\{mv\} / \Delta t$ - less force on child (so less injury)	B3

Question	Answer	Marks
4(a)	(average) KE of particles increases / particles move faster	B1
4(b)(i)	$\rho = m / v$ OR ($m =$) ρv $1 \text{ cm}^3 = 1 \times 10^{-6} \text{ m}^3$ OR $250 \text{ cm}^3 = 2.5 \times 10^{-4} \text{ m}^3$ OR $1000 \times 2.5 \times 10^{-4} (= 0.25 \text{ kg})$	M1 A1
4(b)(ii)	47000 J $(\Delta\theta =) 65 - 20 \text{ }^\circ\text{C}$ OR $(\Delta\theta =) 45 \text{ }^\circ\text{C}$ $E = mc\Delta\theta$ OR ($E =$) $mc\Delta\theta$ OR ($E =$) $0.25 \times 4200 \times 45$	A3 C1 C1
4(b)(iii)	thermal energy also transferred to the pan / surroundings OR thermal energy escapes from the water (as it is being heated)	B1
4(c)	any two from: (aluminium saucepan) takes longer to heat the water - more (thermal) energy is needed (with aluminium pan for the same increase in temperature) (because aluminium) has a higher specific heat capacity	B2

Question	Answer	Marks
5(a)	any three from: (metals contain) delocalised / free / mobile electrons (delocalised electrons) gain energy (from lattice vibrations of the atoms nearest to the hot water) (delocalised) electrons move through the metal (lattice) - collisions between the (delocalised) electrons and (remote) ions / atoms (transfers thermal energy to all parts of the metal container)	B3
5(b)	no delocalised / free electrons	B1
5(c)	particles are further / far apart fewer particle collisions (to transfer energy) OR no lattice vibrations (to transfer energy)	B1 B1 B1

Question	Answer	Marks
6(a)	where rays of light parallel (to the principal axis) converge after passing through lens (focal length is) the distance between (centre of) the lens and principal focus	B1 B1
6(b)	any two from: - ray from top of object to lens, parallel to principal axis, refracted to F_2 - ray from top of object through centre of lens, undeviated - ray from F_1, through top of object and on to lens, then parallel to principal axis rays extrapolated back to converge to the left of F_1 image drawn from principal axis to intersection with arrow (to show orientation)	M2 A1 A1

Question	Answer	Marks
7(a)(i)	evenly spaced straight vertical lines from one plate to the other arrows on lines pointing towards negatively charged plate	B1 B1
7(a)(ii)	(negatively charged particle has) force / attraction towards positively charged / positive (plate)	B1
7(b)(i)	34 C $I = Q / t$ OR $(Q =) It$ OR $28\,000 \times 0.0012$ (p.d. =) 3.6 MV OR 3.6×10^6 V	A2 C1
7(b)(ii)	$E = ItV$ OR $(V =) E / It$ OR $(V =) E / Q$ OR $(V =) 1.2 \times 10^8 / 34$	A2 C1

Question	Answer	Marks
8(a)(i)	(ultrasound is) sound with a frequency higher than 20 kHz	B1
8(a)(ii)	(sound travels) faster (in a liquid than in air) / ORA	B1
8(a)(iii)	3.0×10^8 m / s	B1
8(b)	any three from: • X-rays and ultrasound show internal body parts (without the need to cut open the body) • X-rays and ultrasound both travel through (some parts of) the body • images are formed by ultrasound (partially) reflecting (from boundaries between body matter) • images are formed by X-rays which (travel in straight lines and) pass through soft tissue and are absorbed by bone • X-rays show parts of the skeleton / X-rays show bones OR ultrasound shows image of soft tissues • an X-ray detector forms image from X-rays that travel through patient OR ultrasound detector forms image from sound waves reflected back (from body parts) • X-rays expose you to radiation (which can be harmful to humans)	B3

Question	Answer	Marks
9(a)	(alternating current / a.c. in primary coil / plate produces) changing magnetic field (in primary coil)	B1
	secondary / phone coil cuts (this) magnetic field OR secondary / phone coil is in this / changing magnetic field	B1
	(changing magnetic field) causes <u>induced</u> current (in secondary coil)	B1
9(b)(i)	$1 \text{ kWh} = 1000 \times 60 \times 60 \text{ J}$ AND $0.012 \times 3.6 \times 10^6 (= 4.3 \times 10^4 \text{ J})$	B1
9(b)(ii)	50% charged = $(4.3 \times 10^4 / 2 =) 2.15 \times 10^4 \text{ (J)}$ OR 63% charged in 30 min OR (50% charged in $t =$) 24 min $P = E / t$ OR $(t =) E / P$ OR $2.15 \times 10^4 / 15 \text{ (s)}$ OR energy provided in 30 min = $(15 \times 30 \times 60 =) 2.7 \times 10^4 \text{ (J)}$ $2.7 \times 10^4 > 2.15 \times 10^4$ OR 63% > 50% OR 30 min > 24 min	B1
		B1

Question	Answer		Marks
10(a)(i)	radiation (always) present in the environment OR radiation from natural sources		B1
10(a)(ii)	radon gas OR rocks / buildings OR cosmic rays OR food / drink		B1
10(a)(iii)	356 counts / min		A2
	(corrected count rate =) count rate – background count OR 382–26		C1
10(b)	beta	OR	B1
	gamma		
	alpha would be stopped by soil and not reach detector OR beta has sufficient range to be detected above ground	OR	B1
	gamma would pass through intact pipe as well cracked pipe so no difference detected OR beta stopped by intact pipe so variation between piped water and escaped water can be detected	OR	B1
	gamma is only radiation that will reach detector through soil OR less gamma reaches detector through solid pipe		
10(c)(i)	(very short half-life) doesn't allow time for detection before activity has dropped to too low a level OR doesn't allow for sufficient build up at the leak to detect difference in rate		
10(c)(ii)	(very long half-life) contaminates water supply		

Question	Answer	Marks
11(a)	redshift	B1
11(b)(i)	$(H_0 =) 2.2 \times 10^{-18}$ per second	B1
11(b)(ii)	2.6×10^8 m / s	A2
	$H_0 = v / d$ OR $(v =) H_0 d$ OR $(v =) 1.2 \times 10^{26} \times 2.2 \times 10^{-18}$	C1
11(b)(iii)	any two from: • more distant galaxies are moving away faster • universe is expanding • (if galaxies are moving away from each other now, then) in the past galaxies were closer together	B2