01. 0625_s23_ms_41 Q: 6

Question	Answer	Marks
(a)	(wavelength =) 0.16 m	**A2**
	$v = f\lambda$ **OR** (λ =) v / f **OR** (λ =) $3 \times 10^8 / 1.9 \times 10^9$	C1
(b)	(microwaves) only need short aerials / antennas	**B1**
	(microwaves) penetrate (some) walls	**B1**

Question	Answer	Marks
(c)(i)	labelled diagram of digital (signal) with blocks of high (1) and low (0) **AND** labelled diagram of analogue with continuously variable signal	**B1**
	digital (signal) consists of <u>two</u> values owtte	**B1**
	analogue (signal) varies over a range (of values) owtte	**B1**
(c)(ii)	any **two** from: • faster (data) transmission rate **OR** data can be compressed • data / signal transmitted over long(er) distances (as signal can be regenerated) • noise easily removed (from signal / data) **OR** signal can be regenerated	**B2**

02. 0625_s23_ms_43 Q: 5

Question	Answer	Marks
(a)(i)	infrared	**B1**
(a)(ii)	glass is transparent to visible light and (some) IR	**B1**
	(visible light and some IR) can carry high rates of data / information	**B1**
(b)(i)	(n =) 1.4	**A2**
	(n =) 1 / sin c **OR** (n =) 1 / sin c **OR** (n =) 1 / sin 45	**C1**
(b)(ii)	diagram shows that total internal reflection is taking place inside optical fibre	**B1**
	one or more <u>correct</u> reflections with $i > 45°$	**B1**

03. 0625_w23_ms_41 Q: 4

Question	Answer	Marks
(a)(i)	(point / place / position) where (all) the weight (seems to) acts	**B1**
(a)(ii)	a small tilt / rotation makes G no longer vertically above the base **OR** small tilt / rotation produces moment (that topples transmitter)	**B1**
(b)(i)	arrow(head) marked along wire W towards ground	**B1**
(b)(ii)	moment = $F \times d$ **AND** correct indication of F and d on Fig. 4.1.	**A3**
	(moment is) force × (perpendicular) distance (from base / pivot)	C1
	(moment is) force × perpendicular distance (from base / pivot)	C1
(c)	a use of radio waves, e.g. RFID / astronomy / Bluetooth / RADAR / wifi	**B1**

04. 0625_w23_ms_42 Q: 7

Question	Answer	Marks
(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
(b)	3.0×10^8 m / s	B1
(c)(i)	0.12 m	A3
	(mid-point of frequency range identified as) 2.44 (GHz)	C1
	$v = f\lambda$ **OR** (λ =) v / f **OR** (λ =) $3.0 \times 10^8 / 2.44 \times 10^9$ **OR** (λ =) 1.2×10^N	C1
(c)(ii)	(radio waves / signal) lose energy / get weaker / lose (signal) strength (passing through walls) owtte	B1

05. 0625_s22_ms_41 Q: 9

Question	Answer	Marks
(a)	digital (signal) consists of 1(s) and 0(s) / high value and low	B1
	analogue (signal) is (continuously) variable (in magnitude)	B1
(b)	NOR (gate) **and** 	B1
(c)		A2
	 (i.e. NOR gate symbol with two inputs joined seen)	C1

06. 0625_s22_ms_43 Q: 7

Question	Answer	Marks
(a)	ray from left hand corner of the mirror to the eye	B1
	angle of incidence = angle of reflection	B1
(b)	any **two** from: virtual upright same size as object laterally inverted	B2
(c)(i)	ultraviolet / X-rays / gamma rays	B1
(c)(ii)	infrared / microwaves / radio (waves)	B1

07. 0625_w22_ms_41 Q: 5

Question	Answer	Marks
(a)	infrared	**B1**
(b)(i)	(both) transverse / electromagnetic / travel in a vacuum / have the same (high) speed (in a vacuum)	**B1**
(b)(ii)	(it / visible light) compared with an e.m. radiation stated by candidate in **5(a)** in terms of frequency / wavelength	**B1**
(c)(i)		**B3**
	equipment e.g. black container, white container, thermometers **or** Leslie's cube and detector	B1
	measurements made warm / hot water in container **and** temperature decreases recorded **or** time to reach a given temperature / to cool **or** warm / hot water in cube **and** meter readings recorded	B1
	how a conclusion is reached better emitter surface cools quicker **or** greater reading from better emitter surface	B1

Question	Answer	Marks
(c)(ii)	any **two** appropriate quantities e.g. initial temperature of water mass / volume of water dimensions / surface area of container time of cooling mass of container shape of container smoothness of surface **or** surface area of face (of cube) distance of detector temperature of water at time of measurement smoothness of surface	**B2**

08. 0625_s21_ms_43 Q: 8

	Answer	Mark
(a)	digital signal only two states – low or high OR 0 or 1	**B1**
	analogue signal any value	**B1**
(b)	 correct symbol for NOR gate	**B1**
(c)(i)	AND	**B1**
	OR	**B1**
(c)(ii)	rows 1, 2, 5, 6 all 1	**B1**
	rows 3, 4, 7, 8 all 0	**B1**

09. 0625_w21_ms_41 Q: 6

Question	Answer	Marks
(a)(i)	(J) ultraviolet (radiation) (K) infrared (radiation) (L) radio (waves)	
	two correct	C1
	all three correct	A1
(a)(ii)	L **or** radio (waves)	B1
(b)	(c =) 3.0×10^8 (m / s) seen	C1
	(f =) v / λ in any form **or** $3.0 \times 10^8 / 1.2 \times 10^{-9}$	C1
	2.5×10^{17} Hz	A1
(c)(i)	stated medical use (e.g. treating cancer / X-ray shadowgraph / sterilising equipment)	B1
	statement of what happens to the X-rays (e.g. absorbed by tumour / bones / bacteria)	B1
	stated consequence (e.g. tumour killed **or** image / picture / shadow / photograph produced)	B1
(c)(ii)	can cause burns / (cell) mutation / cell damage / tumours / cancer / damages DNA etc.	B1

10. 0625_s19_ms_43 Q: 6

(a)(i)	diffraction	B1
(a)(ii)	wave on left half the wavelength of waves in Fig 6.1	B1
	both wavelengths on right same wavelength as on left	B1
	much less spreading than in Fig 6.1	B1
(b)	3 numbers correct	B1
	all 5 numbers correct (Correct answer: 1, 4, 5, 3, 2)	B1
(c)(i)	3.0×10^8 m/s	B1
(c)(ii)	$v = f\lambda$ in any form OR ($\lambda = v/f$)	C1
	96×10^6 seen	C1
	($\lambda = \frac{3.0 \times 10^8}{96 \times 10^6}$ =) 3.1 m	A1

11. 0625_m18_ms_42 Q: 6

(a)	A: infra-red B: ultra-violet C: X-(rays) D: γ-(rays)	B2
(b)(i)	n = sin i / sin r OR sin r = sin i / n OR sin r = sin 35 / 1.50	C1
	r = 22°	A1
(b)(ii)	Refraction at XY drawn with r < i	B1
	Refraction at XZ drawn with r > i	B1
(b)(iii)	Blue ray drawn below red ray in prism and drawn with r < i	M1
	Ray to right of prism diverging downwards from red ray	A1

12. 0625_w17_ms_43 Q: 6

(a)(i)	box next to 3.0×10^8 (second box down) ticked	**B1**
(a)(ii)	(λ =) c / f **or** $3.0 \times 10^8 / 4.8 \times 10^{14}$	**C1**
	$6.2 / 6.25 / 6.3 \times 10^{-7}$ m	**A1**
(b)(i)	1. sines have no unit **or** sines are ratio of two lengths **or** ratio of two speeds (whose units cancel) **or** units cancel	**B1**
	2. (v =) c / n **or** $3.0 \times 10^8 / 1.5$	**C1**
	2.0×10^8 m / s	**A1**
(b)(ii)	information / message / music/sound / signal / data (encoded as pulses of light) sent	**B1**
	light (travels along fibre) **or** infra-red (radiation)	**B1**
	light detected (at far end) **or** message decoded **or** total internal reflection mentioned	**B1**