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Mark Scheme (Results)

Summer 2012

GCSE Physics
5PH1H/01

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GCSE Physics 5PH1H/01 Mark Scheme – Summer 2012

Question Number	Answer	Acceptable answers	Mark
1(a)	**B** converging		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	**C** upside down and smaller		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	A description including the two of the following points • a paper / screen (between the objective and the eyepiece) (1) • move screen/lens (to and fro) (1) • to obtain an image which is in focus / clear / sharp (1)	Ignore: comments about image orientation or magnification at the focal point / focal length	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)	to magnify the image (produced by the objective) (1)	increase image size make image bigger enlarge the image Ignore: comments about image orientation	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(d)	transposition (1) t = x/v substitution (1) t = 39 000 000 000/300 000 000 evaluation (1) 130 (s)	Transposition and substitution may be in either order Transposition may be implied by correct figures Ignore powers of ten until final answer 39 000 000 ÷ 300 000 000 2mins 10sec give full marks for correct answer, no working give 2 marks for a power of 10 error, no working e.g. 0.13 (s)	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	An explanation linking the following points • 15 % of power /energy (1) • is transferred usefully (1) **Accept reverse argument** • 85% of power / energy (1) • is wasted (1)	15 W / 15 J/s / 15 J transferred as light converted into useful energy/ is not wasted	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	• two qualitative output labels (1) light (energy) and thermal /heat (energy) • a quantitative output label (1) 15 J for light/used /useful or on narrower arrow (of otherwise unlabelled Sankey diagram)	useful/used (energy) and wasted (85 J for heat/wasted or on broader arrow (of otherwise unlabelled Sankey diagram)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	Any **two** of the following reasons • Energy, e.g. (low-energy lamps) are more efficient / waste less energy / produce less heat (1) • Economy, e.g. (low-energy lamps) use less <u>electrical</u> energy /cost less to run / have a lower power (rating) (1) • Environment, e.g. using (low-energy lamps) reduces CO_2 emissions / saves fossil fuel (1) • Practical, e.g. (low-energy lamps) last longer / need replacing less often / (can be) easier to obtain (1)	Accept reverse arguments Accept 'they' for low-energy lamps idea of Payback, e.g. (low-energy lamps) are (more) cost effective (over time) Ignore unqualified environment statements filament lamps (have been) banned (in some countries)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)	An explanation linking these three points • energy gain is from power supply(1) • energy loss is by radiation(1) • the loss and the gain are equal /at the same rate(1)	energy (comes) from the mains / supplied with electrical energy thermal/heat energy emitted infrared emitted the loss and gain are in equilibrium allow the filament gains <u>and</u> losses energy for (1) only	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(a)	A description including the following points • (Particles) vibrate/oscillate (1) • (vibration) parallel to direction of wave / propagation (1)	Both marks may be awarded for a clear diagram move backwards and forwards/to and fro/ push and pull Accept idea of (a series of) compressions and rarefactions in the same direction as wave travel /energy transfers **Accept** they vibrate in the same direction that the wave is going (for 2 marks)	**(2)**

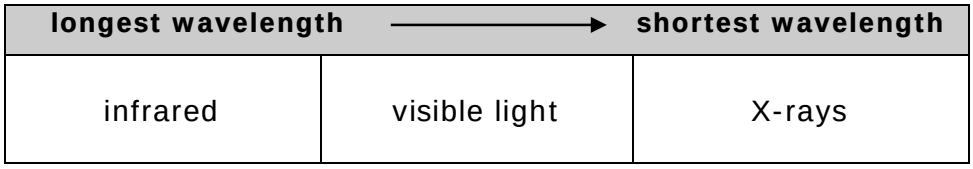
Question Number	Answer	Acceptable answers	Mark
3(b)	**B** the frequency of infrasound is too low		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	transposition (1) t = distance ÷ speed substitution (1) (2 x)2500 ÷ 340 evaluation (1) 14.7 (s)	**This is a "show that" question, there must be evidence of calculation** **Ignore** factor of 2 until final evaluation 2500 ÷ 340 = 2 marks 14.7 is evidence of calculation = 3 marks There are other ways to use the data e.g. 5000 ÷15 = 333 (m/s) (which is about 340 m/s) 2500 ÷7.5 = 333 (m/s) (which is about 340 m/s) **OR** 340 x 15 = 5100 (m) (which is about 5000 m) Give marks for transposition, substitution and evaluation clearly shown	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	Any **one** of the following points • idea of a conversation (1) • (4000 m is) a longer distance taking a longer time (to reach other elephant) (1) • time needed for waves to travel is about 24 s (1) • time gap between calls (sufficient) for elephant to hear a reply (1) • call lasts long enough to be identified by other elephants (OWTTE) (1)	longer distance and call takes (some) time waiting to see if there is a reply/response (from another elephant)	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(d)	A description linking the following points • detecting/ locating/ monitoring (infrasound) (1) • volcanic eruptions / underground explosions / earthquakes /nuclear explosions / meteor strikes (1)	Ignore references to ultrasound and infrared idea of need for a detecting instrument (1) idea of infrasound (waves) travelling through a medium (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	**C** the explosion of a massive star		**(1)**

Question Number	Answer	Mark
4(a)(ii)	 All three must be correct	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)	An explanation linking **three** of the following points • discovery of objects not detectable by visible light (1) • more information / data can be collected (1) • different (electromagnetic) waves can give different types of information (1) • produce magnified images (1) • (space telescopes) produce clearer images / images unaffected by Earth's atmosphere (1)	allow specific examples e.g. (discovery of) black holes/CMB / pulsars different telescopes provide different data/ images brighter/more detailed images ignore idea 'can see further' unless qualified	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(b)	Any **two** of the following points • Spitzer observes /uses infrared (1) • infrared is heat (1) • Sun produces (large amounts of) heat / infrared (1) • small amount of heat from distant galaxies would not be detected (amongst radiation from the Sun) (1)	ignore idea 'to protect telescope from heat/damage' infrared (waves)/heat from the Sun would interfere with/swamp/ruin image (of distant galaxies)	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	calculate **one** distance (1) e.g. 1.49×10^8 or 3.96×10^{13} evaluation (1) e.g. $(3.96 \times 10^{13} \div 1.49 \times 10^8)$ = 265 000 e.g. inverse $(1.49 \times 10^8 \div 3.96 \times 10^{13})$ 3.77×10^{-6} e.g. from comparison of times (2 200 000 ÷ 8.3) = 265 000	accept 149 400 000 or 39 600 000 000 000 265 060 265 771.18 Give 2 marks for a correct evaluation with no working shown or no distance calculation Give 2 marks for two correct distances and a correct comparative statement	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	the stars are so distant that a large unit of distance is needed	the numbers (of km or miles) would be too big (to understand)/ too long (to write down) (numbers of) light years are more manageable/ easier to understand	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)	Any **one** of the following points • unreliability (1) e.g. wind does not always blow / wind speed may be too high/too low • pollution (1) e.g. noise from wind turbines / wind turbines spoil the view	Ignore general references to weather ignore economic arguments the wind is unreliable only works when it is windy wind turbines can only use a (small) range of wind speeds visual pollution	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	transposition (1) current = power ÷ voltage substitution (1) 322 000 000 ÷ 132 000 evaluation (1) 2440 (A)	Transposition and substitution may be in either order Transposition may be implied by correct figures I = P ÷ V Ignore powers of ten until final answer i.e. give 2 marks for 322 ÷ 132 2439 (A) 2439.39….(A) 2.44 kA give full marks for correct answer, no working give 2 marks for a power of 10 error, no working e.g. 2.44 (A)	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	• calculation to find additional power generated e.g. 539 – 322 = 217 (MW) (1) • 2.9 (MW) (1)	217 without working 2.893 (MW) give full marks for correct answer, no working	**(2)**

Question Number		Indicative content	Mark
QWC	***5(c)**	A discussion to include some of the following points Social factors / economic factors • people may not like it (NIMBY) / pressure groups • cost arguments Environmental factors • spoiled view / risk of birdstrike • space for extra infrastructure eg. access roads / substations Associated hazards • danger from higher voltage • dangers from construction work in mountainous area • danger to maintenance crew from working at greater height Energy efficiency arguments • higher voltage leads to lower current • lower current means reduced heat losses • higher voltage means / lower current / can transmit energy further • reduced heat loss means improved efficiency Logical use of data • taller pylons can be seen from further away • net reduction in number of pylons / need to remove old ones • stronger materials needed for pylons / cables • need for new transformers Appropriate calculations • 1000 - 600 = 400 fewer pylons (approx) • current reduced by a factor of 132/400 (0.33)	**(6)**

Level	**0**	no rewardable material
1	**1-2**	• a limited discussion of the plan to replace the power transmission lines (or upgrade the wind farm) including two or more points, advantageous (A) or disadvantageous (D), which may appear as a list e.g. (A+D) is more efficient; is expensive OR (A+A) uses fewer pylons; current is lower OR (D+D) would spoil the view; high voltage is dangerous • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3-4**	• a simple discussion of the plan to replace the power transmission lines including two or more statements, advantageous (A) or disadvantageous (D), at least one of which links ideas e.g. (A) higher voltage *leads to* lower current + (D) if old pylons are removed they will go to waste OR (A) using higher voltage *means* energy can be transmitted further + (A) wasting less energy saves money OR (D) new pylons spoil the view more *because* they are taller + (D) danger to maintenance crew from working at greater height • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed discussion of the plan to replace the power transmission line, including an advantage (A) **AND** a disadvantage (D) both containing linked ideas, at least one of which shows use of the data e.g. (A) Increasing the voltage to 400 kV *leads to* a reduction in the current (needed to transmit the same power) + (D) higher voltages will *mean* that they need new transformers OR (A) it will be more efficient *because* less energy is wasted + (D) *even though* there will be 400 fewer pylons they will be taller and can be seen from further away • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	**A** infrared and microwaves		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	**C** lower frequency than ultraviolet		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	A description including **two** of the following points **Either** • UV penetrates the skin / can damage normal cells/ cause cell mutation/ionise cells (1) • can cause (skin) cancer / can cause premature ageing (1) **OR** • UV penetrates the eye / can damage/mutate cells in the eye (1) • can cause cataracts / damage to the retina (macular degeneration) (1)	Ignore “harm” or “harmful” Accept “tissue” for cells sunburn can cause (snow) blindness	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	An explanation linking two of the following points • (ultraviolet/it) has a higher frequency (than infrared) (1) • (therefore ultraviolet/it) has higher (photon) energy (1) • (ultraviolet/it) penetrates further /(ultraviolet/it) causes ionisation (1)	Accept reverse argument if clearly about IR has a shorter wavelength	**(2)**

Question Number		Indicative content	Mark
QWC	***6(c)**	A comparison including some of the following points **Similarities** • used white light from the Sun • glass prism • produced a visible spectrum **(Herschel's) infrared experiment** • used a thermometer to measure the temperature of different colours of the visible spectrum • temperature increased towards the red end • temperature increased more past the red end of the spectrum. • temperature rise was due to invisible rays named infrared **(Ritter's) ultraviolet experiment** • used silver chloride on paper this slowly turns black in visible light. • silver chloride turned black faster as the paper was put at the violet end of the spectrum • beyond the violet the silver chloride turned black even more rapidly • due to the presence of invisible rays (originally called chemical rays) now called ultraviolet	**(6)**

Level	**0**	no rewardable material
1	**1 -2**	• a limited description of **either** experiment including two or more basic points (written or shown on a labelled diagram) e.g. prism is made of glass; the colours of the spectrum are ROYGBIV OR (Herschel's) experiment discovered IR; he measured the temperature of the spectrum OR (Ritter) put sensitive (silver chloride) paper at different places in the spectrum; (Ritter's) experiment discovered UV • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 -4**	• a simple description of **either** experiment including a statement linking two ideas **and** a point of similarity **or** difference with the other experiment e.g. (Herschel) moved a thermometer beyond the red end of the spectrum and the temperature increased **and** both (Herschel's and Ritter's) experiments use a prism to produce the spectrum (NB this last point could be shown in a labelled diagram) OR The sensitive paper that (Ritter) used turns black in visible light and it turns black quicker when moved beyond the violet end of the spectrum **and** (Ritter's) experiment shows ultraviolet rays but (Herschel's) experiment shows infrared rays (NB this last point could also be shown in a labelled diagram) • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 -6**	• A detailed description including statements about each experiment that link ideas to show a point of similarity **AND** a point of difference e.g. (Herschel) measured the temperature of the colours and discovered a higher temperature beyond the red end **and** (Ritter) used sensitive (silver chloride) paper that turned black very quickly when moved beyond the violet end of the spectrum **and** both experiments use a prism to separate the colours of the spectrum **and** (Herschel's) experiment uses a thermometer instead of sensitive paper (already stated) • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

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