Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE

In Single Science Award (4SS0) Paper 1P

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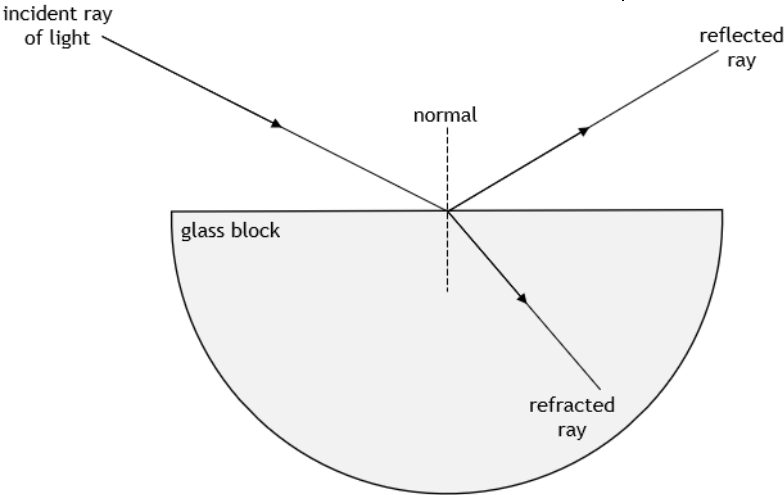
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Notes	Marks
1 (a)	D (the Sun); A is incorrect because a comet is the smallest object B is incorrect because the Earth is smaller than the Sun C is incorrect because the Earth and the Sun are larger than the Moon		1
(b)	A (alpha); B is incorrect because beta is less ionising than alpha C is incorrect because gamma is less ionising than alpha D is incorrect because gamma has a higher frequency than UV so is more ionising		1
(c)	B (ohm); A is incorrect because ampere is the unit for electric current C is incorrect because volt is the unit for voltage D is incorrect because watt is the unit for power		1
(d)	D (x-ray); A is incorrect because infrared has a longer wavelength than ultraviolet and x-ray B is incorrect because microwave has the longest wavelength C is incorrect because ultraviolet has a longer wavelength than x-ray		1
(e)	C (273 K); A is incorrect because this is subtracting 273, rather than adding 273 B is incorrect because this is adding 3, rather than adding 273 D is incorrect because this is adding 373, rather than adding 273		1

Total for question 1 = 5 marks

Question number			Answer	Notes	Marks
2	(a)	(i)	normal drawn perpendicular to boundary at point where ray of light is incident;	line can be drawn on either side of boundary or passing through boundary judge perpendicular by eye	1
		(ii)	straight refracted ray drawn passing into block and continuing path to the right; refraction drawn correctly;	refracted ray must be labelled DOP	2
		(iii)	straight reflected ray drawn reflecting from boundary and continuing path to the right; angle of reflection drawn equal to angle of incidence;	reflected ray must be labelled DOP	2

Question number	Answer	Notes	Marks
(b)	any six from:	allow any marking point if clear on diagram	6
	MP1. suitable light source;	e.g. ray box, laser, light box	
	MP2. draw around block on paper; MP3. mark point where light will enter block;	allow idea of drawing normal at point where light enters block	
	MP4. shine light into block and measure angle of incidence; MP5. use of protractor (to measure angle); MP6. mark point where ray exits block; MP7. use of ruler to draw path of (refracted) ray; MP8. measure angle of refraction; MP9. repeat for different angles of incidence; MP10. use of graph to show data;		

Question number			Answer	Notes	Marks
3	(a)		similarity – both have (approximately) circular orbits; difference – planets orbit stars, but moons orbit planets;	both marks can be awarded if clear in labelled diagram allow both have a constant orbital speed allow slightly elliptical for circular both needed for the mark ignore different speeds, radii, time periods	2
	(b)	(i)	idea that "planet" variable is categoric;	allow discontinuous, discrete for categoric allow idea that planet is not a continuous variable	1
		(ii)	correct reading of either Jupiter or Uranus orbital speed; attempt at finding ratio; correct evaluation; e.g. Jupiter = 13.0 (km/s) OR Uranus = 6.75 (km/s) ratio = 13.0 / 6.75 ratio = 1.9	allow numbers seen anywhere in calculation Jupiter = 13.0, Uranus = 6.5-7.0 allow answers left as fractions inverted ratio = 0.50-0.54 = 2 marks allow 6.5-7.0 for Uranus allow 6.75 / 13.0 allow 1.85-2.00	3
		(iii)	Earth is the closest planet to the Sun;	allow gravitational pull/strength (of Sun) greatest for Earth allow shortest time period	1

Total for question 3 = 7 marks

Question number			Answer	Notes	Marks
4	(a)	(i)	GPE = mass × g × height;	allow standard symbols and rearrangements e.g. GPE = m × g × h	1
		(ii)	substitution; evaluation; e.g. (GPE =) 0.52 × 10 × 0.82 (GPE =) 4.3 (J)	allow use of g = 9.8, 9.81 -1 for clear POT error allow 4.2, 4.26, 4.264, 4.17872, 4.18...	2
		(iii)	identical answer to (ii);	allow ecf from (ii) expect 4.3 (J)	1
		(iv)	selection of KE = ½ × mass × speed^2; substitution; rearrangement; evaluation; e.g. KE = ½ × m × v^2 4.3 = ½ × 0.52 × v^2 v = √[2 × 4.3 / 0.52] (v =) 4.1 (m/s)	seen or implied allow ecf from (iii) allow alternative method using v^2 = u^2 + 2as allow 4.0-4.1 (m/s)	4
	(b)		any three from: MP1. oil is more dense / viscous (than air); MP2. force of friction now present / greater (than before); MP3. ball now does work against friction; MP4. decrease in GPE same as before; MP5. idea that energy is conserved; MP6. some energy transferred to thermal store (of air/ball); MP7. means less energy transferred to KE;	allow oil is thicker allow drag, fluid/liquid resistance for friction allow upthrust is greater ignore resistance	3

Total for question 4 = 11 marks

Question number			Answer	Notes	Marks
5	(a)		filament lamp / LED / ammeter; added in **series** with other components;	marks may be awarded if shown on circuit diagram allow other components that would give a visual indication e.g. buzzer, motor etc. DOP	2
	(b)	(i)	electron(s);		1
		(ii)	substitution into charge = current × time; conversion of mA to A; evaluation of total charge; evaluation of number of charged particles; e.g. charge = 160 × 25 charge = 0.16 × 25 (charge =) 4.0 (C) number of particles = $(4.0/1.6\times10^{-19})$ = 2.5×10^{19}	-1 for POT error 4000 scores 2 marks	4

		(iii)	fewer charged particles / electrons (each second);
			with any **two** from:
			   current (in circuit) is decreased;
			   voltage is the same;
			   current is rate of flow of charge;
					3

Total for question 5 = 10 marks

Question number			Answer	Notes	Marks
6	(a)		any four from: MP1. <u>neutron</u> absorbed by nucleus; MP2. uranium-235 becomes uranium-236; MP3. nucleus splits; MP4. producing (two) daughter nuclei; MP5. producing neutrons; MP6. releasing/transferring energy;	condone atom for nucleus throughout allow collides for absorbs allow named daughter nuclei e.g. krypton and barium etc. ignore daughter cells condone producing energy, radiation	4
	(b)	(i)	idea that products of fission/radiation are harmful/dangerous; idea that shielding absorbs radiation / fission products;	allow specific danger e.g. daughter nuclei are radioactive etc. allow idea that radiation cannot penetrate concrete	2
		(ii)	particles collide with walls (of pipes); force is exerted on walls; pressure is force on an area;	ignore collisions with other particles allow p=F/A	3

Total for question 6 = 9 marks

Question number			Answer	Notes	Marks
7	(a)	(i)	(unbalanced) force = mass × acceleration;	allow standard symbols and rearrangements e.g. F = m × a	1
		(ii)	substitution; rearrangement; evaluation to at least 2s.f.; e.g. 223(000) = 10600 × acceleration acceleration = 223(000) / 10600 acceleration = 21.03…(m/s^2)	ignore units ignore units reject if ×1000 performed at the end of calculation allow 21, 21.0, 21.04 (m/s^2)	3
	(b)		substitution into a = v-u / t; rearrangement; evaluation; e.g. 20 = 330 (-0) / time time = 330 / 20 (time =) 17 (s)	 allow 15-17 (s)	3

Total for question 7 = 7 marks