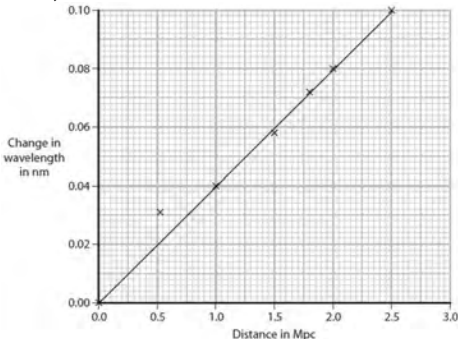**Pearson Edexcel**

Mark Scheme (Results)

January 2023

Pearson Edexcel International GCSE in Physics (4PH1)
Paper 2PR

Question number			Answer	Notes	Marks
3	(a)	(i)	newtonmeter;	allow spring balance, spring scale, dynamometer ignore forcemeter	1
		(ii)	independent: material (of the squares); dependent: force;	allow cloth ignore 'squares' on its own	2
		(iii)	any one from: • speed (of rotation); • direction of rotation; • temperature (of tumble dryer); • number of squares; • size / thickness / shape of square; • time (of rotation);		1
	(b)		any three from: MP1. idea of friction (between pieces of material); MP2. electrons/charge transferred between squares/material; MP3. squares become oppositely charged; MP4. square is negative if electrons gained; MP5. idea that opposite charges attract;	allow rubbing for friction ignore references to protons allow negative and positive squares/eq allow RA	3
	(c)		bar chart; idea that material/data is categoric;	allow bar graph ignore histogram allow discrete, not continuous, discontinuous	2
	(d)	(i)	charge = current × time (taken);	allow standard symbols and rearrangements e.g. $Q = I \times t$ ignore c, C for charge and current	1
		(ii)	substitution; evaluation; e.g. $Q = 4.3 \times 10^{-6} \times 2.3 \times 10^{-3}$ $(Q =) 9.9 \times 10^{-9}$ (C)	-1 for POT error allow use of prefixes e.g. 9.9 nC allow 9.89×10^{-9} (C)	2

Total for Question 3 = 12 marks

Question number	Answer	Notes	Marks
8 (a)	increase in wavelength (of wave); due to source/galaxy moving away (from observer)/eq;	allow decrease in frequency allow stretching wavelength allow observer moving away from source/galaxy	2 exp
(b) (i)	point at (0.5,0.03) identified;	reject if more than one point circled	1
(ii)	straight line drawn within 1 small square of each data point;	allow ecf from (i)	1
(iii)	change in wavelength = 0.03 (nm); substitution OR rearrangement; evaluation; e.g. change in wavelength = 0.03 (nm) $0.03/660 = v/300\,000$ OR $v = \Delta\lambda/\lambda \times c$ (v =) 14 (km/s)	allow ecf from (ii) correct within ½ small square allow ecf from incorrect reading of $\Delta\lambda$ if clear from working -1 for POT error award if seen anywhere in working allow 13.6… (km/s)	3
(iv)	any two from: MP1. **change in** wavelength increases with distance (from Earth or Milky Way); MP2. idea that (recession) velocity increases with distance (from Earth or Milky Way); MP3. galaxies are all moving away from each other;	allow red-shift for change in wavelength	2

Total for Question 8 = 9 marks