Pearson

Mark Scheme (Standardisation)

Summer 2017

Pearson Edexcel GCSE

In Physics (5PH3F) Paper 3F

edexcel

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2017
Publications Code 5PH3F_01_1706_MS

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	Acceptable answers	Mark
1(a)(i)	☒ **B** light **The only correct answer is B** **A** is not correct because gamma is ionising radiation **C** is not correct because alpha is ionising radiation **D** is not correct because X-rays are ionising		**(1)**

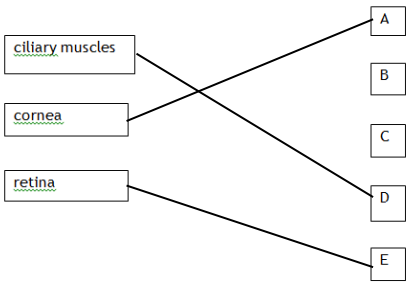
Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	Any of the following: • Checking the condition of a fetus (1) • Investigating heart/liver problems(1) • Breaking down kidney stones and stones elsewhere in the body(1) • Measuring the speed of blood flow in the body (1)	Accept fetal scanning/looking at baby in the womb detecting cancer Ignore pregnancy or pre-natal scan/check-ups	**(1)**

Question Number	Answer	Acceptable answers	Mark
1 (b)	A description including two of the following: • mutation of (healthy)cells/DNA (1 • kill/damage/destroy (healthy) cells/tissue • cancer/tumours • burns (1) • hair loss(1) radiation sickness(1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
1 (c)	An explanation linking any two of the following: • to reduce exposure to radiation (1) • (because) greater distance (from the source)(1) • intensity (of radiation) gets less (1) • (because)radiation (used on patients) does not penetrate walls (1)	reduce risk/ so they are not exposed to/affected by the radiation Ignore the effects of radiation such as cancer No marks for responses that refer to technicians being inside the room.	**(2)**

Question Number	Answer	Acceptable answers	Mark
1 (d)	Explanation linking two of the following: • {isotopes/they} are radioactive/ decay (1) (have) • short half-lives (1) • only emit positrons for a short time (1)	emit radiation/ lose energy quickly Ignore POSITRONS have a short half- life/decay/give off radioactivity. Ignore any reference to transportation	**(2)**

Total for question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)		One mark for each correct line ignore a box with more than one line	**(3)**

Question Number	Answer	Acceptable answers	Mark
2 (b)	☒ C 25 cm from the eye **The only correct answer is C** **A** is not correct because infinity is the far point of the average human adult eye **B** is not correct because 10 cm is too close to the eye to be the near point. **D** is not correct because 100 cm is too far away from the eye to be the near point.		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	Either distant objects are not in focus (1) or near objects are in focus/clear (1) or the near point is too close(1)	distant objects cannot be seen clearly can't see long distance/far away allow can see near objects	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	Either eyeball is too long (1) or cornea too curved (1) or lens too powerful (1) or focal length of lens too short (1) or far point closer than infinity (1) or ciliary muscles do not relax (1)	image formed in front of the retina lens is too fat/focal point in front of the retina	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(iii)	substitution (1) (power =) $\frac{1}{-0.5}$ evaluation (1) -2.0 (D)	2(D)	**(2)**

Total for question 2= 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)	☒ B a stable element is bombarded with protons **The only correct answer is B** **A** is not correct because neutrons cannot be accelerated to bombard a stable element as they have no charge **C** is not correct because unstable elements bombarded by protons will not produce radioactive isotopes. **D** is not correct because neutrons cannot be accelerated to bombard an unstable element as they have no charge		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)	An explanation linking two the following: (but) momentum is conserved (1) <u>kinetic</u> energy is lost /decreases/ is not conserved (1)	Ignore do not rebound allow lose all kinetic energy momentum is conserved but KE is not conserved is awarded (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	An explanation linking two of the following electrons and positrons/they have the same mass (1) velocities /momentums are + and - / in opposite directions (1) momentum of particles cancel out (1)	Ignore opposite charges.	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	☒ C gamma rays have no charge **The only correct answer is C** **A** is not correct because the questions concerns conservation of charge not motion in opposite dirctions **B** is not correct because gamma rays do not carry a charge **D** is not correct because the question is concerned with conservation of charge not conservation of energy		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(iii)	An explanation linking two of the following: the electrons and positrons have mass (1) gamma rays have no mass (1) gamma waves have energy (1) mass is converted to energy (1)	Ignore charges (mass energy is conserved) as gamma rays $E = mc^2$	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(d)	Description including two of the following:- have a large range / penetrate the body (1) may be detected (1) (weakly) ionising (1) produced at 180° to each other (1) have large amounts of energy (1)	(using) gamma camera(s) do not accept strongly ionising or not ionising detected outside the body (2)	**(2)**

Total for Question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	☒ B is strongly ionising **The only correct answer is B** **A** is not correct because alpha particles carry two positive charges. **C** is not correct because alpha radiation is made up of particles. **D** is not correct because alpha radiation b is only weakly penetrating and is stopped by a sheet of paper.		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i) and 4bii	Plot the points: 2,3150 (1) 5,1200 (1) Smooth curve of best fit passing through/ within two squares of all points (1)	+ or- half a square Reject point to point and multiple curves	**(2)** **(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(iii)	(as the) number of aluminium foil sheets /thickness of aluminium increases as the counter reading decreases (1)	Allow (there is a) negative correlation Allow inversely proportional	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(iv)	beta (radiation) detected by the counter gamma (also) being emitted (1) not enough aluminium sheets (1) some beta particles travel through the aluminium foil (1)	background radiation	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	Description including: neutron becomes a proton (1) electron (ejected) (1)	Ignore equations mass number stays the same atomic number increases by one award one mark correct reference to quarks udd goes to uud award two marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)	An explanation linking two of the following: mention of charge/electrons/charged particles(1) mention of flow/movement (1) DOP	Must score first marking point to be awarded second marking point	**(2)**

Total for question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	350 (cm^3)	Any value between 330 and 370 inclusive.	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	zero, nought, 0 (K)		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	(becomes a) liquid/solid	solidify / liquify / condenses ignore freeze	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	substitution $(V_2) = \frac{373 \times 25.0}{293}$ (1) evaluation $(V_2) = 31.8$ (cm^3) (1)	Accept answers that round to 32 (cm^3) with any number of decimal places Full marks are awarded for correct answers with no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	Increase the weight/force(on the piston)	Allow increase Newtons /N/mass Ignore changes in temperature and volume .	**(1)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	An explanation including some of the following points :- Before heating • ice and air in tin • ice particles vibrate about fixed positions • do not exert pressure on tin lid • air particles hit the lid and exert the same pressure as the air outside Heat applied Melting • ice(solid) becomes water (liquid) • water molecules move about within liquid • Water molecules slide over each other • do not exert pressure on lid. • air particles move faster / have more (kinetic) energy • exert more force/pressure on the lid/blow lid off Vaporisation • water becomes steam • particles of water vapour move randomly and exert a force/ pressure on the lid by colliding with it. • air and water vapour particles gain more energy as they are heated further and there are more collisions • force/pressure on the lid increases as more heat is supplied • force/pressure becomes great enough to blow the lid off of the tin	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of changes in state of matter without referring to kinetic theory e.g. the ice when heated becomes water • 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 explanation using Kinetic Theory that gives the behaviour of particles in a least one state of matter. e.g.the particles in a solid vibrate/in a gas the particles move freely. • 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

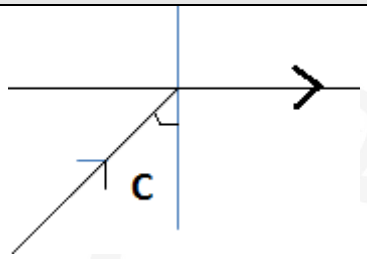
3	**5 - 6**	• a detailed explanation using Kinetic Theory to explain how a gas exerts a pressure on the tin lid e.g. the gas molecules/particles move fast and collide with the lid/tin/container exerting a pressure. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

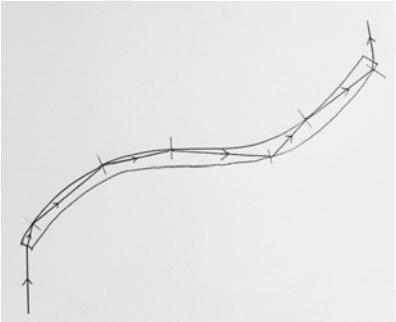
Total for question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a) (i)	refraction	Note refraction and reflection seen together loses the mark	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a) (ii)	Explanation linking: the speed of light changes (1) correct change identified (1)	(optical) density of mediums change (1) correct change identified(1) Light slows down in water gets two marks Water is more dense (than air) gets two marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)	Description including: reflection (1) total internal (1)	allow bounces back/ into fishe's eye Total internal reflection/TIR awarded 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(c)	 Ray drawn to the right from the intersection of the normal and the water surface along the boundary between the air and the water (1)	ignore reflected ray arrows helpful but not necessary	**(1)**

Question Number		Indicative Content	Mark
QWC	***6(d)**	A description of how the endoscope works and some uses, including some of the following points: How it works  credit drawing accurate by eye • uses optical fibres • multiple reflections occur in fibre– may be seen in diagram • due to total internal reflection taking place • angle(s) of incidence > critical angle • light transmitted along optical fibre • reflected light allows images to be seen and recorded Uses Medical diagnosis • looking inside the boy • to investigate the gastro-intestinal tract (stomach etc. • to look for ulcers / cancers etc. • for other internal investigations e.g. uterus, bladder etc. (laparoscopes etc. as versions of endoscopes) Medical treatment • to carry laser light to treat ulcers/cancers • Key hole surgery Non-medical uses • plumbing • car mechanics	**(6)**

		• any remote access	
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of either the how the endoscope works OR its uses e.g. made of optical fibres / total internal reflection OR looking inside people etc. • 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 how the endoscope works and one of its uses e.g made of optical fibres AND looking inside people OR a detailed description of how the endoscope works e.g. sends light up and down optical fibres /optical fibres using TIR/diagram OR A detailed description of the use e.g. looking inside people to look for cancers/ulcers • 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 0f one AND a simple description of the other e.g. sends light up and down optical fibres **AND** looking inside the body OR made of optical fibres AND looking inside the body to look for cancers/ulcers • for example to look for cancers • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 6 =12 marks

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom