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Mark Scheme (Results)

Summer 2019

Pearson Edexcel
In Physics (1PH0) Paper 2F

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General Marking Guidance

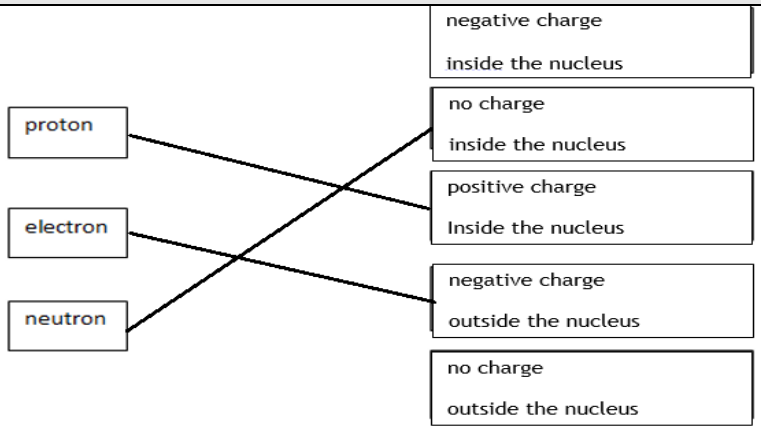
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

Question Number	Answer	Mark
1(a)	 One mark for each correct line. More than one line from a box on the left loses the mark for that box.	(3)

Question Number	Answer	Additional guidance	Mark
1(b)	2.5(A)	Accept $2\frac{1}{2}$ (A)	(1)

Question Number	Answer	Additional guidance	Mark
1(c)	substitution (1) (Q=)0.9 x 50 evaluation (1) 45 unit (1) coulomb	award 2 marks for the correct answer without working If no substitution seen 4.5 or 450 scores 1 mark only independent mark C, c, As Accept recognisable spellings of coulomb	**(3)**

(Total for Question 1 = 7 marks)

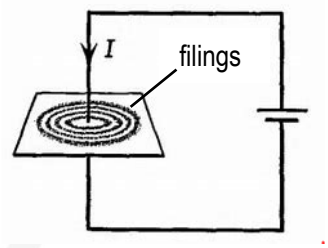
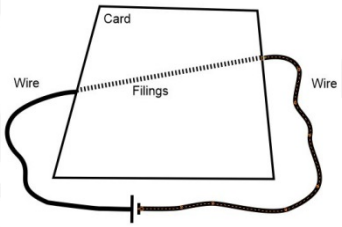
Question Number	Answer	Mark
2(a)	**C** 3 **C** is the only correct answer. **A** is incorrect because it does not include the pressure of the water above the diver. **B** is incorrect because it only includes the pressure of 10m of water above the diver. **D** is incorrect because it includes the pressure 0r 30m of water above the diver.	**(1)**

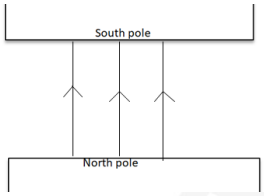
Question Number	Answer	Additional guidance	Mark
2(b)	An explanation to include the following MP1: (as the balloon rises) it gets bigger (1) Any **two** from: MP2: (because) density of air decreases / fewer (air) particles (in the atmosphere) (1) MP3: pressure (outside the balloon) decreases (1) MP4: pressure inside (balloon) is greater than pressure outside (1)	accept balloon bursts air gets thinner accept a named component of air Two from MP2, MP3 and MP4 can still be awarded even if MP1 is not.	**(3)**

Question Number	Answer	Additional guidance	Mark
2(c)	(area) = 6.0 x 2.0 = 12 (1) substitution (1) (P=) $\frac{15\,000}{(12)}$ evaluation (1) 1300(Pa)	award one mark for 6.0 x 2.0 seen with no alternative area calculation Accept 15000/(any value) for this mark. accept 1250 (Pa) award full marks for the correct answer without working	**(3)**

(Total for Question 2 = 7 marks)

Question Number	Answer	Mark
3(a)	**C** cobalt **C** is the only correct answer. **A** is incorrect because aluminium is not magnetic. **B** is incorrect because carbon is not magnetic. **D** is incorrect because copper is not magnetic.	(1)

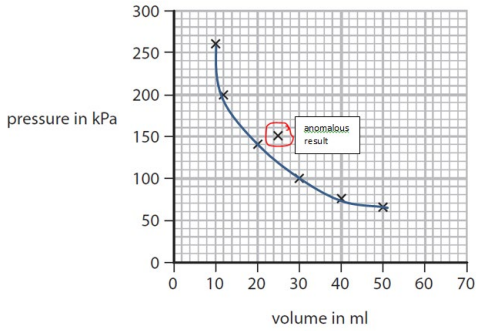
Question Number	Answer	Additional guidance	Mark
3(b)	An answer that combines four of the following points. MP1: Put wire {through card / near card / under card / over card / round rolled up card } (1) MP2: Put iron filings on card / around wire (1) MP3: Connect wire to power pack One wire is acceptable (1) MP4: Switch on or reference to current / charges flowing (in wire) NOT in filings (1) MP5: Filings attracted / moving / see if wire attracts filings (1) MP6: Pattern seen in filings – circles / lines / onion (1)	IGNORE use of apparatus not specified in the list (Iron nails etc)   marking points can be scored from a diagram filings show shape of field	(4)

Question Number	Answer	Additional guidance	Mark
3(c)	 MP1: any (vertical) line from pole to pole (1) MP2: at least two further equidistant straight, (vertical) lines from pole to pole (1) MP3: arrow on any line, north to south (1)	ignore lines outside of the magnets for MP1 and MP2 judge by eye any arrow south to north, no mark awarded for MP3	(3)

(Total for Question 3 = 8 marks)

Question Number	Answer	Mark
4(a)(i)	**B** increase | increase **B** is the only correct answer. **A** is incorrect because as the pressure of the gas increases the number of particles colliding with the walls of the container does not stay the same. **C** is incorrect because as the pressure of the gas decreases the number of particles colliding with the walls of the container does not stay the same. **D** is incorrect because as the pressure of the gas decreases the number of particles colliding with the walls of the container does not increase.	**(1)**

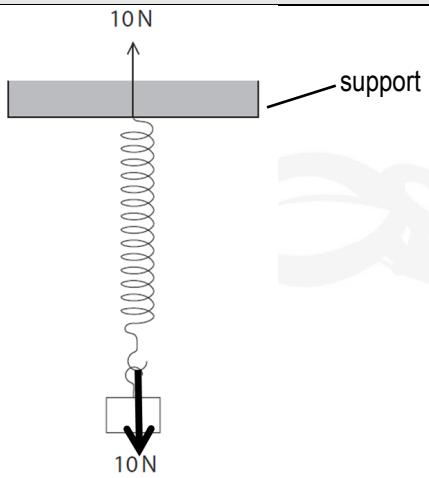
Question Number	Answer	Additional guidance	Mark
4(b)	296 (°C)	accept 23 + 273	**(1)**

Question Number	Answer	Additional guidance	Mark
4(c)			**(2)**
(i)	anomalous point (1)	ringed or other indication	
(ii)	curve touches one part of the cross for each of the points, excluding the anomalous point (1)	ignore curve beyond 260 kPa and beyond 50ml	

Question Number	Answer	Additional guidance	Mark
4(c)(iii)	A description that combines the following points the line will be higher (1) have a similar shape (1)	 Allow for one mark all data will be higher allow the pressure will be higher for the same volume for 2 marks allow the volumes will be higher for the same pressure for 2 marks	**(2)**

Question Number	Answer	Additional guidance	Mark
4(d)	substitute (1) $8.00 \times 14.5 = P_2 \times 1160$ rearrangement (1) $\frac{8.00 \times 14.5}{1160}$ ($=P_2$) evaluation 0.1 (MPa)	Allow $8.00 \times 14.5 = 116$ for one mark award full marks for the correct answer without working	**(3)**

(Total for Question 4 = 9 marks)

Question Number	Answer	Additional guidance	Mark
5(a)	 downwards arrow (1) Plus any one from: the same length as top arrow (1) from the bottom of the spring or from the weight (1)	 Anywhere below the support Judge by eye Judge by eye	**(2)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	substitution (1) 4.0=k x 0.06 rearrangement (1) $\frac{4.0}{0.06}$ (=k) evaluation (1) 67 (N/m)	allow substitution and rearrangement in either order (k=) $\frac{F}{x}$ allow values that round to 67 (N/m) award full marks for the correct answer without working POT error 2 marks maximum	**(3)**

Question Number:	Answer	Additional guidance	Mark
5(b)(ii)	(measurement of) original length (1) (measurement of) final length (1)	Accept measure length of spring for 1 mark	**(2)**

Question Number	Answer	Additional guidance	Mark
5(c)	substitution (1) (E=) ½ x 250 x 0.30(^{2}) evaluation 11 (1) unit (1) joule(s)/J	 accept 37.5, 37, 38 only accept 11.25, 11.2, 11.3 award full marks for the correct answer without working no POT error in evaluation independent mark j , Nm	**(3)**

(Total for Question 5 = 10 marks)

Question Number	Answer	Mark
6(a)	**A** melting **A** is the only correct answer. **B** is incorrect because the change from solid to liquid is not freezing. **C** is incorrect because the change from solid to liquid is not evaporation. **D** is incorrect because the change from solid to liquid is not condensation.	**(1)**

Question Number:	Answer	Additional guidance	Mark
6(b)(i)	29(g)		**(1)**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	25(cm^3)		**(1)**

Question Number	Answer	Mark
6(b)(iii)	**D** density = $\frac{\text{mass}}{\text{volume}}$ **D** is the only correct answer **A** is incorrect because the equation density =mass**+** volume is incorrect **B** is incorrect because the equation density =mass – volume is incorrect **C** is incorrect because the equation density =mass x volume is incorrect	**(1)**

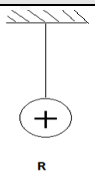
Question Number:	Answer	Additional guidance	Mark
6(b)(iv)	Any two improvements from: use balance that reads to one or more decimal places/more decimal places (1) use tare/zero balance for first measurement (1) use measuring cylinder with smaller divisions (1) use larger volume of liquid (1) repeat <u>and</u> average (1) read measuring cylinder at eye level (1)	 Accept use more accurate/precise balance in this context Allow reset for tare Allow more accurate/ different scale / different divisions / thinner measuring cylinder Allow use more liquid / larger mass of liquid Allow avoid parallax error / read from bottom of meniscus	**(2)**

Question Number:	Answer	Additional guidance	Mark
6(c)(i)	substitution (1) (ΔQ) = 1.5 x 4200 x 50 evaluation (1) 320 000 (J)	 accept 315 000 (J) 310 000 (J) award full marks for the correct answer without working 320 000 000 315 000 000 310 000 000 score 1 mark (mass in grams)	**(2)**

Question Number:	Answer	Additional guidance	Mark
6(c)(ii)	substitution (1) $3500 = \frac{670\,000}{t}$ rearrangement (1) $(t=) \frac{670\,000}{3500}$ evaluation (1) 190(s)	accept substitution and rearrangement in either order accept any answer that round to 190(s) power of ten error award 2 marks maximum award full marks for the correct answer without working	**(3)**

(Total for Question 6 = 11 marks)

Question Number	Answer	Additional guidance	Mark
7(a)(i)	An explanation that combines:- rub the rod with a cloth (1) (so)electrons (1) are moved (from rod to cloth) (1)	 allow clean off the rod or friction (with the rod) allow <u>negative</u> charges for electrons movement of <u>positive</u> charges can only score the first mark 'electrons are positive' can score a maximum of one mark movement of unnamed charges can score third mark	**(3)**

Question Number	Answer	Mark
7(a)(ii)	**B** R  **B** is the only correct answer. **A** is incorrect because ball Q is coated with a conducting material but is uncharged ,a negative charge will be induced on it and it will be attracted not repelled by a positively charged rod. **C** is incorrect because ball S is an insulator and is uncharged and will not be repelled by a positively charged rod. **D** is incorrect because ball T has a negative charge and will be attracted not repelled by a positively charged rod.	**(1)**

Question Number	Answer	Additional guidance	Mark
7(b)	An explanation that includes any three of the following points :- ground is charged (by induction) (1) charge on ground is positive (1) electric field builds up (between cloud and ground) (1) air is ionised (1) electrons travel to the ground/positive ions travel to the cloud (1)	May be seen on diagram Award two marks for 'the ground is positively charged' allow electric charge or voltage or potential difference for electric field air becomes a conductor allow charge for ions	**(3)**

Question Number	Answer	Mark
7(c)*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 6 marks** **dangers** • friction as fuel flows through pipe • build-up of (electrostatic) charge • potential difference between nozzle and plane • causes spark • explosion or fire **use of metal wire** • potential is the same on both objects • no electric field • earths excess charge • constant safe discharge • no imbalance of electrons	**(6)**

Descriptor
• No rewardable material.
• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	<u>Additional guidance</u> Two unlinked statements	<u>Possible candidate responses</u> make a spark/ explosion/fire there is static electricity fuel is flammable metal wires conduct charge(electricity) could get an electric shock
Level 2	3–4	<u>Additional guidance</u> Limited explanation **linking** facts about dangers OR **linking** facts about why using metal wires is safer	<u>Possible candidate responses</u> A spark is produced because there is a build up of static charge (electricity) or build up of static charge prevented(electricity)because the metal wire takes the charge to earth(ground)
Level 3	5–6	<u>Additional guidance</u> Detailed explanation about dangers AND why using metal wires is safer (one may be stronger than the other but both should feature for level 3)	<u>Possible candidate responses</u> Spark is caused by the build up of charge (static electricity) AND the build up is prevented by the metal wire taking the charge to earth (ground)

(Total for Question 7 = 13 marks)

Question Number	Answer	Mark
8(a)	**The only correct answer is B**: work done= force x distance moved in direction of force **A is incorrect** because the equation would be dimensionally inconsistent **C is incorrect** because the equation would be dimensionally inconsistent **D is incorrect** because the direction of the distance moved is incorrect	(1)

Question Number	Answer	Additional guidance	Mark
8(b)(i)	substitution (1) (ΔGPE =) (0.0)46 x 10 x 2.05 evaluation (1) 0.94(3) (J)	allow g=9.8(1) m/s^2 0.9 (J) values that round to 0.92 or 0.93 (from using g = 9.8 or 9.81) do not award for 1(J) no POT error in evaluation award full marks for the correct answer without working.	(2)

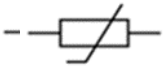
Question Number	Answer	Additional guidance	Mark
8(b)(ii)	recall (1) (KE =) ½ x m x v^2 substitution (1) (KE =) ½ x (0.0)46 x 3.5^2 evaluation (1) 0.28 (J)	 allow answers that round to 0.28 e.g. 0.28175 (J) allow max 2 marks for POT error eg 0.00028 award full marks for the correct answer without working	**(3)**

Question Number	Answer	Additional guidance	Mark
8(b)(iii)	Any value between 0.8 (m) and 0.95 (m) inclusive		**(1)**

Question Number:	Answer	Additional guidance	Mark
8(b)(iv)	An explanation linking (the ball) has lost energy (1) identification of what has happened to that energy (1)	 accept (energy) dissipated **or** (transferred to) surroundings / ground **or** thermal energy **or** heat / sound **or** system is not 100% efficient **or** bounce is not (100%) elastic **or** squashing (the ball or the ground)	**(2)**

Question Number	Answer	Additional guidance	Mark
8(c)	A description to include: as the bounce number increases the height decreases/negative correlation (1) non-linear (1)	 allow not in even steps / not proportional / not a straight line height/it (nearly) halves each time scores 2 marks	**(2)**

(Total for Question 8 = 11 marks)

Question Number	Answer	Mark
9(a)	 **The only correct answer is D** **A is incorrect** because that is the symbol for a diode **B is incorrect** because that is the symbol for a light dependent resistor **C is incorrect** because that is a symbol for a motor	**(1)**

Question Number	Answer	Additional guidance	Mark
9(b)(i)	recall and substitution into V = IR (1) 5.0 = 0.26 x R rearrangement (1) (R =) $\frac{5.0}{0.26}$ evaluation (1) 19 (Ω)	accept substitution and rearrangement in either order (R =) $\frac{V}{I}$ $\frac{5.0}{0.26}$ scores 2 marks accept answers that round to 19 (Ω) (eg 19.23) accept answer written in table if not written on answer line. award full marks for the correct answer without working	**(3)**

Question Number	Answer	Additional guidance	Mark
9(b)(ii)	a comment that includes the following points idea that resistance increases with potential difference (1) idea that doubling the potential difference does not result in doubling of resistance (1) **OR** V = constant x R is not supported by this data (1) correct processing of data from the table to support either of the above mark points (1)	idea that equal increments of potential difference do not cause equal increments of resistance reverse argument e.g. if student was correct then equal increments of p.d. would cause equal increment of resistance if student was correct then current would be constant ignore simple quoting of data for this mark	**(3)**

Question Number	Answer	Mark
9(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • the batteries store energy as chemical energy • the energy is transferred to electrons to make them flow/move • the current is a flow of electrons • the electrons flow through the metal/filament • the electrons collide with the ions in the lattice • the collisions make the ions vibrate more • the increased vibrations makes the lattice/filament hotter • the heat energy is dissipated to the surroundings • the ions give out/emit light	(6)

Descriptor
• No rewardable material.
• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance unlinked statements	Possible candidate responses Particles move through the wire Batteries store energy Lamp gives off heat
Level 2	3–4	Additional guidance Limited explanation **linking** facts about particles OR **linking** facts about energy transfers	Possible candidate responses Electrons move through the wire/lamp OR The particles moving in the wire are electrons OR Particles collide in the wire OR Chemical energy (stored) in battery OR Energy dissipated / {released as light or thermal} energy in surroundings OR Energy is transferred electrically (from battery to lamp)
Level 3	5–6	Additional guidance Detailed explanation about particles AND energy transfers. (one may be stronger than the other but both should feature for level 3)	Possible candidate responses one from electrons move through the wire/lamp OR the charged particles are electrons OR particles collide in the wire AND one from chemical energy (stored) in battery OR energy dissipated / {released as light or thermal} energy in surroundings

(Total for Question 9 = 13 marks)

Question Number	Answer	Mark
10(a)	**The only correct answer is B**: force Q **A is incorrect** because the moment of force P about the axle is zero. **C is incorrect** because moment of force R about the axle is zero. **D is incorrect** because moment of force S about the axle is zero.	**(1)**

Question Number	Answer	Additional guidance	Mark
10(b)(i)	recall of moment = force x distance (1) (moment of force from person =) 600 x 0.5 **and** (moment of weight of rock =) 1800 x 0.2 (1) **moment** of force from person is less than **moment** of weight of rock. (1)	may be implied in a calculation 300 (Nm) 360 (Nm) independent mark accept reverse argument	**(3)**

Question Number	Answer	Additional guidance	Mark
10(b)(ii)	An explanation that links increase distance between person and pivot/ reduce distance between rock and pivot / increase force from person (1) increase the moment of the force from the person / decrease the moment of the weight of the rock (1)	 use longer lever / hold lever nearer the end / move pivot nearer to rock / get someone to help to push value of new distance and calculation of new moment	**(2)**

Question Number	Answer	Additional guidance	Mark
10(c)(i)	(In every second), distance moved by chain around large gear = distance moved by chain around small gear (1) 2 x 48 = turns x 12 rearrangement and evaluation (1) 8 (turns each second)	accept use of gear ratio seen or implied e.g. 4:1 or 4/1 or 48:12 or 48/12 or converse e.g. 1:4 award full marks for the correct answer without working	**(2)**

Question Number	Answer	Additional guidance	Mark
10(c)(ii)	An explanation linking reduces friction/amount of thermal energy transferred (1) extra useful energy is available/less input energy is required (1) efficiency = useful energy transferred (by the bicycle) ÷ total energy supplied (to the bicycle) (1)	(oil provides) lubrication less energy wasted allow for the last **two** mark points; **either** less input energy is required to produce the same output for **2** marks **or** more output energy is available for the same input energy for **2** marks	**(3)**

(Total for Question 10 = 11 marks)

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