



Pearson
Edexcel

Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE
In Science Double Award (4SD0) Paper 1BR

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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	Additional guidance	Mark
1(a)(i)	D is the only correct answer A is incorrect as it is the vacuole B is incorrect as it is cytoplasm C is incorrect as it is the cell membrane		1

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	A is the only correct answer B is incorrect as animal cells have cytoplasm C is incorrect as animal cells have a cell membrane D is incorrect as animal cells have a nucleus		1

Question Number	Answer	Additional guidance	Mark
1 (a)(iii)	D (starch) is the only correct answer A is incorrect as glucose is not a storage molecule B is incorrect as glycerol is not a carbohydrate C is incorrect as plant cells do not have glycogen		1

Question Number	Answer	Additional guidance	Mark
1 (b)	<p>These are calculation steps</p> <ul style="list-style-type: none"> • correct measurement of line as 50 mm • correct conversion of micrometres to millimetres or millimetres to micrometres • correct division of 50 000 μm by 125 or correct division of 50 mm by 0.125 <p>(x) 400 (3)</p>	<p>one mark for correct measurement of line +/- 1 mm i.e. one mark for 50 (mm) or 5 <u>cm</u></p> <p>one mark for length \times 1000 OR 0.125 (mm)</p> <p>one mark for dividing by 125</p> <p>two marks for 50 000 (μm) (measurement and conversion) OR two marks for (X) 0.4 or (x) 4 or (x) 40 or (x) 40 000</p> <p>Allow answer in the range of (x) 392 to (x) 408 for three marks</p> <p>Ignore other units</p>	3

Total for question 1 = 6 marks

Question Number	Answer	Additional guidance	Mark
2 (a)(i)	<p>B (fungi) is the only correct answer</p> <p>A is incorrect as animals are not single celled</p> <p>C is incorrect as plants do not have chitin or are single celled</p> <p>D is incorrect as protoctists do not have chitin</p>		1

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	<p>An answer that makes reference to one of the following:</p> <ul style="list-style-type: none"> • (viruses) do not grow (1) • (viruses) do not respire (1) • (viruses) are not sensitive / have internal control / eq (1) • (viruses) do not move (1) • (viruses) do not excrete (1) • (viruses) do not reproduce (independently) / need a host to reproduce / eq (1) • (viruses) do not feed / have a nutritional need / eq (1) 	<p>Allow do not carry out life processes / do not have all the characteristics of life /do not have MRSGREN(C)</p> <p>Ignore need another living organisms / host to live / survive</p> <p>Ignore need to live inside another cell</p>	1

Question Number	Answer	Additional guidance	Mark
2(b)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> • restriction (enzymes) cut DNA /gene / plasmid / open plasmid / remove gene / eq (1) • ligase joins DNA to plasmid / joins DNA / joins sticky ends / inserts DNA / attaches DNA / eq (1) 	<p>Allow endonuclease</p> <p>Reject lipase</p>	2

Question Number	Answer	Additional guidance	Mark
2 (c)(i)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> • respiration / fermentation / (chemical) reactions, releases heat (energy) (1) • checks / monitor, temperature and lets (cooling) water in / open valve / water is pumped around / eq (1) • lowers temperature / removes heat / prevents over heating / stops temperature getting too high (1) • maintain <u>optimal temperature</u> / <u>optimum temperature</u> (1) • stop <u>enzymes</u> denaturing / stops <u>enzyme</u> shape changing / eq (1) 	Ignore cools it down alone	3

Question Number	Answer	Additional guidance	Mark
2 (c)(ii)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> • (provides) oxygen (1) • for respiration / prevent anaerobic respiration (1) 	Reject for anaerobic respiration	2

Question Number	Answer	Additional guidance	Mark
2 (c)(iii)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> prevent other microbes / bacteria / fungi / pathogens / eq (1) prevents <u>contamination / contaminate</u> (of product) / toxins (being released) / competition (for nutrients) / eq (1) 	<p>Allow remove bacteria / keep sterile Ignore germs / keep clean</p>	2

(Total for Question 2 = 11 marks)

Question Number	Answer	Additional guidance	Mark
3 (a)(i)	<p>A (beavers) is the only correct answer</p> <p>A is incorrect as coyote are secondary consumers</p> <p>B is incorrect as grass is a producer</p> <p>C is incorrect as wolf is a secondary and tertiary consumer</p>		1

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	<p>An answer which makes reference to:</p> <ul style="list-style-type: none"> community and environment / biotic and abiotic parts / <u>all</u> organisms and the environment / <u>all</u> living things and non-living things / the environment and community / eq 	<p>Ignore area Allow habitat</p>	1

Question Number	Answer	Additional guidance	Mark
3(b)	<p>An answer which makes reference to four of the following:</p> <ul style="list-style-type: none"> • fewer elk / coyote were consumed / more elk (present) / more coyote (present) (1) • more consumption of plants / producers (by elk) / fewer producers / less grass / eq (1) • less food for mice (1) • more beavers <u>eaten</u> / more mice <u>eaten</u> (by coyotes) / eq (1) • <u>old</u> trees not removed (1) • younger trees are shaded / less photosynthesis / less energy fixed / enters ecosystem / eq (1) • less food for hawk / fewer mice for hawk / eq (1) • soil erosion (due to loss of plants) (1) • fewer shelters / habitats / nesting places (for organisms) (1) 	<p>Allow fewer elk / coyote hunted (by wolves)</p> <p>Allow fewer trees / fewer smaller plants / loss of plants</p> <p>Ignore no / fewer beavers</p>	4

Question Number	Answer	Additional guidance	Mark
3(c)(i)	<ul style="list-style-type: none"> • $180 - 50 = 130$ • $(130 \div 50) \times 100$ <p style="text-align: center;">260 (%) (2)</p>	<p>two marks for 260 (%)</p> <p>one mark for $180 - 50$ or 130</p>	2

Question Number	Answer	Additional guidance	Mark
3 (c)(ii)	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> • food begins to run out / eq (1) • disease (spread) (1) • hunting (1) • new competitors / (high) competition / new predators (1) • loss of habitat (1) • migration (1) 	<p>Allow coyote / elk numbers fall / eq</p> <p>Allow more bears / cougars</p>	2

Question Number	Answer	Additional guidance	Mark
3(c)(iii)	<p>An description that makes reference to three of the following:</p> <ul style="list-style-type: none"> • grid area / <u>quadrat</u> (1) • random (placement) / eq (1) • calculate / measure / count plants / eq (1) • repeat / calculate mean (1) • scale up for whole area (1) 	<p>Ignore quadrant</p> <p>quadrats = 2 mark</p>	3

(Total for Question 3 = 13 marks)

Question Number	Answer	Additional guidance	Mark
4(a)(i)	<p>B (bronchus) is the only correct answer</p> <p>A is incorrect as bronchioles have no cartilage</p> <p>B is incorrect as oesophagus leads to stomach</p> <p>C is incorrect as there is only one trachea</p>		1

Question Number	Answer	Additional guidance	Mark
4 (a)(ii)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> • (S / (diaphragm)/ it) contracts (1) • flattens / presses down / moves down / less dome shaped / eq (1) • increases volume (1) • decreases pressure / air flows in down pressure gradient / eq (1) 	<p>Ignore more space</p> <p>Allow low pressure</p>	3

Question Number	Answer	Additional guidance	Mark
4(b)(i)	<ul style="list-style-type: none"> • (cycling) speed (1) 		1

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	<ul style="list-style-type: none"> • conversion of dm^3 to cm^3 (65 000) • $65\,000 \div 25$ <p>2600 (cm³) (2)</p>	<p>one mark for 65 000 OR division by 25</p> <p>two marks for 2600</p>	2

Question Number	Answer	Additional guidance	Mark
4(b)(iii)	<p>An answer that makes reference to four of the following:</p> <ul style="list-style-type: none"> • <u>ventilation</u> (rate) increases (1) • (take in) more oxygen / eq (1) • (release) more energy / ATP / high(er) respiration rate (1) • more / faster muscle <u>contraction</u> (1) <ul style="list-style-type: none"> • volume of air breathed <u>per breath</u> increases as speed increases (1) <ul style="list-style-type: none"> • breathing rate increases from 20 / 25 km per hour / breathing rate does not increase between 0 – 20 km per hour (1) <ul style="list-style-type: none"> • increase in volume of air <u>per breath</u> gets less as cycling speed increases / volume of air <u>per breath</u> stops increasing above 30 km per hour (1) 	<p>Allow positive correlation between ventilation rate and speed</p> <p>Allow depth of breathing</p> <p>Allow up to 20 km per hr increase is due to increased volume of air each breath / depth of breathing</p> <p>Allow at over 20 km per hr, increase is due to increased rate of breathing</p>	4

Question Number	Answer	Additional guidance	Mark
4 (b)(iv)	<ul style="list-style-type: none"> • repeat / calculate average / mean / more cyclists / more people / eq (1) 	Allow use other people	1

(Total for Question 4 = 12 marks)

Question Number	Answer	Additional guidance	Mark
5(a)(i)	<ul style="list-style-type: none"> section / length / part / eq, of DNA / chromosome, that codes for a protein / polypeptide (1) 	Ignore strand	1

Question Number	Answer	Additional guidance	Mark
5(a)(ii)	FF <u>and</u> Ff	<p>Allow FF and ff</p> <p>Allow FF, Ff, and ff</p> <p>Allow alternative letters</p>	1

Question Number	Answer	Additional guidance	Mark
5(b)(i)	<p>C (4) is the only correct answer</p> <p>A is not correct as 1, 4, 5 and 6 must be heterozygous</p> <p>B is not correct as 2, 3 and 7 must be homozygous</p> <p>D because only 2, 3 and 7 are not heterozygous</p>		1

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	<p>An answer that makes reference to:</p> <ul style="list-style-type: none"> parental genotypes of Ff and ff (1) gametes as F + f <u>and</u> f (+ f) (1) correct F₁ genotypes (Ff, ff) in correct ratio (1) 0.5 / 50% / ½ (1) 	<p>MP1-3 from Punnet square</p> <p>Allow ecf ONLY for MPs 2 and 3 with incorrect parental genotypes</p> <p>Allow different letters</p>	4

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Question Number	Answer	Additional guidance	Mark
5 (b)(iii)	<p>An answer that makes reference to three from:</p> <ul style="list-style-type: none"> • feather is discontinuous / categoric / height is continuous / eq (1) • height is <u>polygenic</u> (1) • height depends on the combination of many / several, genes / not just one gene / eq (1) • height may have environmental effects (1) <ul style="list-style-type: none"> • feather structure is due to one gene / monogenic (1) • height depends on sex (1) 	<p>Allow named factors e.g. nutrition</p>	3

(Total for Question 5 = 10 marks)

Question Number	Answer	Additional guidance	Mark
6 (a)(i)	<p>C (X and Z) is the only correct answer</p> <p>A is incorrect because the pancreas also produces amylase B is incorrect because the stomach does not produce amylase D is incorrect because the stomach does not produce amylase</p>		1

Question Number	Answer	Additional guidance	Mark		
6(a)(ii)	Enzyme	Molecule	Product		3
	<u>amylase</u>	<u>starch</u>	<u>maltose</u>		
	<u>lipase</u>	<u>lipid</u>	<u>fatty acids / glycerol</u>		
	<u>protease</u>	<u>protein</u>	<u>amino acids / (poly)peptide</u>		
one mark for each correct row (3)					

Question Number	Answer	Additional guidance	Mark
6(b)(i)	<ul style="list-style-type: none"> calculate mass of lentils that has 1 g of protein $100 \div 25 = 4$ g of lentils has 1 g of protein scale up to 46 g of protein 46×4 <p>184 (2)</p>	<p>184 = two marks</p> <p>one mark for $\div 25$ or $\times 4$</p>	2

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	<p>An answer that makes reference to five of the following:</p> <ul style="list-style-type: none"> • excess energy may lead to obesity / eq (1) • (excess energy / obesity) increases risk of diabetes / joint damage / heart disease / eq (1) • enough protein / protein is same as RDA, so growth should be normal (rate) / eq (1) • enough vitamin A / vitamin A is same as RDA so no risk of night blindness / eye problems / vision is normal / eq (1) • vitamin C is low so may be at risk of scurvy / eq (1) • calcium is too low so may be at risk of rickets / osteoporosis / eq (1) • enough iron / iron is same as RDA so no risk of anaemia / can make red blood cells / haemoglobin / no problems carrying oxygen (1) • fibre is low so risk of constipation / can't egest / release faeces / eq (1) • data does not list other named dietary components / eq (1) • no mention of activity levels / sex / age / pregnancy / eq of person (1) 	<p>max three for effects with no link to RDA e.g. they will become obese Allow puts weight on / get fat</p> <p>Allow can build muscle / can grow</p> <p>Allow more risk of gums bleeding / connective tissue problems / collagen /have healthy skin</p> <p>Ignore waste unqualified</p> <p>max three for descriptions of functions of dietary components with no ref to deficiency e.g. vitamin C is for healthy skin</p>	5

Question Number	Answer	Additional guidance	Mark
6(b)(iii)	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> • activity / exercise / active lifestyle / sport / job (may affect energy need) / eq (1) • pregnancy (may affect energy need) (1) • different metabolic rate (1) • age (may affect energy need) (1) • sex (may affect energy need) (1) • body mass / weight / (may affect energy need) (1) 	Ignore size	2

(Total for question 6= 13 marks)

Question Number	Answer	Additional guidance	Mark
7 (a)	<ul style="list-style-type: none"> • different /several group of tissues (1) 	Ignore made of tissues Allow made of different cell types	1

Question Number	Answer	Additional guidance	Mark
7 (b)(i)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> • increased blood flow to skin (surface) / increased blood flow through capillaries / eq (1) • (because) <u>vasodilation</u> occurs (1) • arteriole / blood vessel widens / expands / eq (1) 	<p>Reject movement of blood vessels</p> <p>Reject vasodilation of capillaries / veins</p> <p>Reject capillaries / veins widen</p>	3

	<ul style="list-style-type: none"> • (increased) heat loss (1) • by radiation / convection (1) 	Allow cools Ignore refs to sweat / heat evaporates	
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Question Number	Answer	Additional guidance	Mark
7(b)(ii)	<p>An answer that makes reference to six of the following:</p> <p>C – drinks of different temperatures / warm drink and cold drink / eq (1)</p> <p>O – people of same age / mass / sex / fitness / body temperature / eq (1)</p> <p>R – repeats / several people / groups / eq (1)</p> <p>M1 – mass of sweat / volume of sweat / weigh cotton wool / weigh shirt / area of sweat / colour of cloth on skin / count sweat drops / eq (1)</p> <p>M2 – over <u>stated</u> time period (1)</p> <p>S1 – same exercise / food / water / volume of drink / type of drink / same clothes / material / eq (1)</p> <p>S2 - same room temperature / air conditioned room / humidity / time of day / eq (1)</p>	<p>Allow same person</p> <p>Ignore amount Ignore body mass</p> <p>two marks for time taken to produce set mass / set volume / eq of sweat for M1 and M2</p>	6

(Total for question 7= 10 marks)

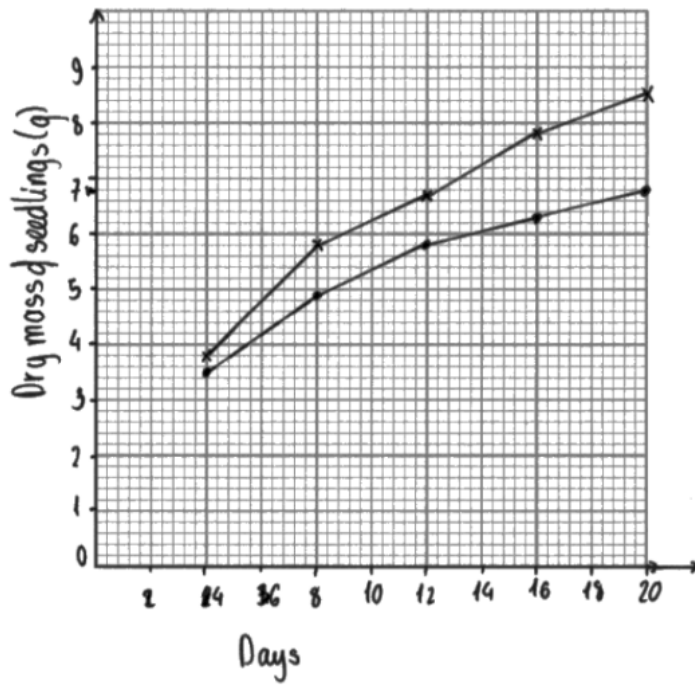
Question Number	Answer	Additional guidance	Mark
8 (a)(i)	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> • light (intensity) / lamp / eq (1) • water <u>volume</u> / watering <u>frequency</u> (1) • mass /weight, of compost (1) 	<p>Ignore amount</p> <p>Ignore fertiliser</p>	2

Question Number	Answer	Additional guidance	Mark
8 (a)(ii)	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> • water (content) would vary / water increases the mass / adds mass / makes seeds heavier / some seeds would absorb more water than others (1) • so comparison is valid / fair comparison (1) • water is not <u>biomass</u> / dry mass is the true <u>biomass</u> / (dry mass is) organic molecules (1) 	<p>Allow water changes mass</p> <p>Ignore accuracy / reliable</p> <p>Ignore fair test alone</p> <p>Allow converse for all MPs</p>	2

Question Number	Answer	Additional guidance	Mark
8(b)(i)	<p>S – <u>linear</u> scale that takes up at least half of grid and right way round (1)</p> <p>L – ruled, straight lines that join points with no extrapolation (1)</p> <p>A – axes fully labelled with units (1)</p>	<p>Allow S, L, A if only one line</p> <p>Bar chart loses L Axes labels are mass (g) and day</p>	5

P – all points correct (1)
K – key for each line / each line
labelled (1)

Day	Dry mass of seedlings in g	
	Without fertiliser	With fertiliser
4	3.5	3.8
8	4.9	5.8
12	5.8	6.7
16	6.3	7.8
20	6.8	8.5



Question Number	Answer	Additional guidance	Mark
8 (b)(ii)	<p>An answer that makes reference to four of the following:</p> <ul style="list-style-type: none"> • magnesium ions (increase) chlorophyll / chloroplasts (1) • (so more) photosynthesis (1) • (which produces) carbohydrates / glucose / starch / cellulose / eq (1) • nitrate ions for amino acids (1) • (nitrate / amino acid) for protein (synthesis for growth) (1) 	<p>If no other marks, award one mark for making chlorophyll <u>and</u> amino acids / protein with no ref to minerals</p> <p>Allow for enzymes</p>	4

(Total for Question 8 = 13 marks)

Question Number	Answer	Additional guidance	Mark
9 (a)(i)	<p>X: stigma (1)</p> <p>Y: anther (1)</p>		2

Question Number	Answer	Additional guidance	Mark
9 (a)(ii)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> • insect (pollination) / bee / eq (1) • (because it has) large petals / eq (1) • (and) Y / anthers / stamen, within the flower / not hanging out / eq (1) • (and) X / stigma within the flower / not feathery / not hanging out / eq (1) 	<p>Ignore colours / scents / bright / nectar(y)</p> <p>Allow the structures given in part (i) are within the petals if they are correct</p>	3

Question Number	Answer	Additional guidance	Mark
9 (b)(i)	<p><i>ungerminated seeds</i>: starch (1)</p> <p><i>germinating seeds</i>: starch and, <u>glucose</u> / <u>sugar</u> / <u>maltose</u> (1)</p>	<p>Reject if additional incorrect substances listed e.g. protein, fats</p> <p>Reject if additional incorrect substances listed e.g. protein, fats</p>	2

Question Number	Answer	Additional guidance	Mark
9 (b)(ii)	<p>An explanation that makes reference to three of the following:</p> <p><i>In ungerminated seeds:</i></p> <ul style="list-style-type: none"> • starch is for (energy) storage (1) • as it is insoluble / does not affect osmosis / eq (1) <p><i>In germinating seeds:</i></p> <ul style="list-style-type: none"> • (water activates) enzymes / amylase / carbohydrase (1) • digests / converts / breaks down starch into maltose / glucose / sugar (1) • (glucose is used in) respiration / for energy (1) 	<p>Allow converse throughout</p> <p>Allow starch is a store</p> <p>Allow starch not broken down into glucose in ungerminated seeds</p> <p>Allow less / no respiration in ungerminated seed</p>	3

Question Number	Answer	Additional guidance	Mark
9 (b)(iii)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> • allows oxygen in (1) • for germination / respiration / eq (1) • allows carbon dioxide to escape / eq (1) 	<p>Ignore oxygen and carbon dioxide</p> <p>Reject if carbon dioxide <u>for</u> respiration</p> <p>Ignore light / references to photosynthesis</p>	2

(Total for Question 9 = 12 marks)

Question Number	Answer	Additional guidance	Mark
10 (a)(i)	<ul style="list-style-type: none"> • nucleus (present) (1) 	Allow converse	1

Question Number	Answer	Additional guidance	Mark
10 (a)(ii)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> • (shape gives) lower surface area (to volume ratio) (1) • less space / nucleus takes up space (in cell) (1) • (less space for) haemoglobin (1) • less diffusion / less oxygen absorbed / less oxygen taken up / eq (1) 	<p>Allow converse for human cells</p> <p>Allow less volume (for oxygen)</p> <p>Ignore gas exchange</p>	2

Question Number	Answer	Additional guidance	Mark
10 (b)	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> • mutation (1) • variation (in haemoglobin / how much oxygen is absorbed) (1) • llamas survive / compete better / eq (1) • reproduce / create offspring / eq (1) • pass on allele / gene / eq (1) 	<p>Pass on allele to offspring / next generation = two marks</p> <p>Ignore pass on characteristic</p>	4

Question Number	Answer	Additional guidance	Mark
10 (c)	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> • engulf / eq (1) • microbes / pathogens / bacteria / viruses / eq (1) • digest / break down (1) • using enzymes (1) 	<p>Allow ingest</p> <p>Digestive enzymes is 2 marks</p>	3

(Total for Question 10 = 10 marks)

