Annotation Form

Anchor Set
Kentucky Science Operational
Grade 7
SC071602_05

Paper	RF Number	Score	Notes
a101	**00010157218 503201706**	**0**	**Anchor Paper 1** **Score Point 0** There is no evidence that the student has an understanding of how to show changes in particle motion using models and explain how the models support the teacher's claim. The response contains a model for the elapsed times of 5 minutes and 10 minutes, but neither depicts any particle motion and/or energy transfer. The attempt to address the teacher's claim summarizes the information given in the prompt regarding the particle motion and, as such, is irrelevant (*The particle motion changed during the time it was on the table*).
a102	**00085149009 815201706**	**0**	**Anchor Paper 2** **Score Point 0** There is no evidence that the student has an understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The model indicates movement of the block itself, not the particles, at 5, 10, and 20 minute intervals. Movement of the block is not correct. There is an attempt to explain using the model, which includes a reference to the teacher; however the explanation only describes the block movement shown in the model and misinterprets the teacher's claim (*It explained how they would put it on the table and move it . . . your teacher wants it to it moves from 5, 10, and to 20 in minutes*).

Paper	RF Number	Score	Notes
a103	**00008563128 605201706**	**0**	**Anchor Paper 3** **Score Point 0** There is no evidence that the student has an understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Three models are shown with particle motion values for both the block and the table. The three models, however, are all identical to one another and the picture in the stimulus. The result is three models that indicate no change in particle motion, which is incorrect. The explanation to support the teacher's claim using the models, while faithful to the models, is incorrect to the teacher's actual claim (*It support the teacher's claim that the temperature stays the same*), indicating no understanding of the material related to the question being asked.
a104	**00008553698 605201706**	**1**	**Anchor Paper 4** **Score Point 1** There is evidence in the response that the student has a minimal understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. A single model is shown indicating points along the table progressing from the block at 2, 5, 10, and 20 minute intervals. The explanation clarifies what the model illustrates (*each 5 min that the block sits there it [table] gets warmer*). Although particle motion is not mentioned, the idea that the block warms the table out to the end as time elapses does indicate minimal knowledge and understanding of the multi-dimensional question being posed.

Paper	RF Number	Score	Notes
a105	**00097349328 215201706**	**1**	**Anchor Paper 5** **Score Point 1** There is evidence in the response that the student has a minimal understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Three models are shown at the 5, 10, and 20 minute intervals, each depicting a metal block on a table with corresponding particle-motion values at two points on each table, giving some indication that the particle motion extends down the table. The block's particle-motion values decrease as the table's particle-motion values increase, indicating minimal understanding of a transfer of energy from the block to the table. In all three models, however, the particle-motion values in the block are less than the values in the table, introducing a major significant flaw since with a transfer of energy from the block to the table, the table's particle motion would not exceed that of the block nor would the respective particle motion values in the block and the table diverge from one another.
a106	**00085117769 815201706**	**1**	**Anchor Paper 6** **Score Point 1** There is evidence in the response that the student has a minimal understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The three models at the 5, 10, and 20 minute intervals depict the block's temperature cooling as the table temperature rises, eventually reaching a point of equilibrium at 20 minutes. However, the models describe temperature values only, not particle motion. While adding heat to an object increases its temperature, it is the heat energy added to the system that increases motion of the particles. The use of temperatures to show the conduction of heat and the responding changes in temperature is not incorrect, but it does not address the model as required by the question. This detracts from the response and indicates a minimal understanding of how to create a model that shows changes in particle motion. There is an attempt to explain how the models support the teacher's claim (*It supports her claim because at five minutes the block is at 120° which starts warming the table*), but nothing in the explanation speaks to particle motion and the remainder of the explanation only restates the temperature information shown in the models.

Paper	RF Number	Score	Notes
a107	**00008097148 611201706**	**2**	**Anchor Paper 7** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The models illustrate the particle motion of the block being greater than the particle motion at three points on the table at 5 minutes. At 10 minutes there is a reduction of particle motion in the block and an increase of motion at three points in the table. The particle motion in the block is shown to be equal to the particle motion in the table at 20 minutes. It is important to note that it is not necessary for the model at 20 minutes to indicate equilibrium, but it is important that none of the models indicate particle motion in the block being <u>less</u> than any of the particle motion values in the table, which would introduce a flaw in logical thinking. In this response, at no time is the particle motion in the block less than the particle motion in the table, which is correct. The response is only partially complete, however, since there is no attempt to explain how the models support the teacher's claim. The model in this response indicates a higher level of understanding than the models in both Anchor paper 5 and Anchor paper 6.
a108	**00087212999 807201706**	**2**	**Anchor Paper 8** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The models show some limited understanding of the principles of this investigation. The model depicts a heated block radiating energy into the table and an arrowed-line labeled "particles" moving left to right and extending farther right for each time interval. Although there are no particle-motion values in the model, the explanation reflects limited synthesis that serves to provide some clarification to the model and speak to the teacher's claim (*The particles are starting to move faster throughout the table as the heat travels . . The longer the block stays there the more the energy will spread and particles will keep moving faster . . . After the heated block has been there for so long, the temperatures will become the same . . . the particle speed will be the same*).

Paper	RF Number	Score	Notes
a109	**00010157578 503201706**	**2**	**Anchor Paper 9** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and two points on each table. The values for the table are increasing as the values for the block decrease, correctly indicating energy is transferred from the block to and through the table. Significant flaws are present in the particle-motion values for the block at 10 minutes and 20 minutes, however. At 10 minutes the block's particle-motion value is less than the table's particle-motion values. At 20 minutes, the block's particle-motion value, although at equilibrium with the table's particle-motion values, is greater than its own initial value at 5 minutes. This indicates that the block is gaining thermal energy, which is a significant error in logical thinking. The explanation does not explicitly speak to the teacher's claim, but does reflect limited synthesis and contains an attempt to clarify the information in the models using accurate information (*As time passes, the particles in the heated metal block cools down, while the heat transfer to the table, the tables particles, move faster*), which aids in the demonstration of limited understanding of the scientific phenomenon. This response indicates a higher level of understanding than Anchor paper 6 since it attempts to show and explain particle motion, rather than only heat conduction as expressed by a temperature reading.

Paper	RF Number	Score	Notes
a110	**00097427198 211201706**	**3**	**Anchor Paper 10** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and the table. The values for each table are shown, at three points along the table, to be increasing as the values for the block decrease, correctly indicating heat energy is transferred from the block to and through the table. The models for 5 minutes and 10 minutes show the particle motion in the block being greater than that in the table, and the values are equal at 20 minutes. As such, there are no flaws in the model. The explanation does not specifically mention the teacher's claim, but does provide appropriate reasoning that reflects a general synthesis, which reinforces the concepts reflected in the model (*The tempature slowly evens out, as the KE or speed of the particles evens out. Which is why the table got warmer*). Note that KE stands for kinetic energy, the energy that an object has because of its motion. Compare the much more accurate models in this response to the models in Anchor paper 9.

Paper	RF Number	Score	Notes
a111	**00008570588 607201706**	**3**	**Anchor Paper 11** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and at the end of the table. Although the values for the table are increasing as the values for the block decrease in all three models, indicating energy being transferred from the block to the table, at the 20 minute mark the particle motion in the block is shown to be less than that in the table. The table cannot gain more energy than the block has, so at 20 minutes the block has a value of 2, the table could be at equilibrium and have a value of 2, but it cannot have a value of kinetic energy greater than the block. This is a flaw that is relevant to the accuracy of the answer and does prevent the response from receiving a higher score. The explanation is generally complete, speaking directly to the teacher's claim, and reflects general synthesis (*the energy transfered from the block throughout the whole table . . . The model supports the teacher's claim because the energy transfers from the block to the table making the tables particals mover faster because the energy is transfereing into the table particals from the block. Therefore the block is loosing energy*). Overall, the strength of the explanation, with a generally correct model, helps the response reflect a general understanding of the scientific concepts related to the question.

Paper	RF Number	Score	Notes
a112	**00009896548 505201706**	**3**	**Anchor Paper 12** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains completely accurate models for the three time intervals, all of which indicate particle-motion values for the block and at four points along the table. The models show a decrease of particle motion in the block and a *graduated* increase in particle motion throughout the table as it warms, which enhances the accuracy of the models. The model accurately uses four points of particle motion to show the heat energy transfer initially as highest directly under the metal block and then moving down the table as the particles of the table get heated up, finally showing a slightly increased particle motion near the edge of the table that allows Suzanne to feel that the table is warm. This is an accurate representation of the kinetic energy transfer of heat energy as it moves throughout the table causing the particle motion to gradually increase. However, the explanation does not speak directly to the teacher's claim and provides little specific information regarding the concept of kinetic energy and energy flow as seen in the models (*with time, the block and table start to become the same tempurature because the block is causing the particles to speed up*). The lack of more detail in the explanation prevents the response from reflecting more than a general synthesis. Compare to Anchor paper 11, also a score point 3, which contains models that are not as accurate, but an explanation that is much more detailed and complete.

Paper	RF Number	Score	Notes
a113	**00010247098 507201706**	**4**	**Anchor Paper 13** **Score Point 4** There is evidence in the response that the student has a complete and thorough understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and at four points along the table. The values for the table increase as the values for the block decrease in all three models, indicating energy is transferred from the block to the table. Although the models do not show graduated increases in particle motion throughout the table, the models are adequate and do not contain flaws. Complete synthesis of the science concepts of this item is reflected with an explanation that speaks directly to the teacher's claim using the models as support (*models support the teacher's claim . . . because they show how as the block's particle motion decreases, the tables particle motion increases. This demonstrates how kinetic energy transfers through particles. Therefore, the model shows how the energy was passed from the heated block, to the table, to Suzanne's hand, through the particles*).

Paper	RF Number	Score	Notes
a114	**00098500008 105201706**	**4**	**Anchor Paper 14** **Score Point 4** There is evidence in the response that the student has a complete and thorough understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. There is evidence in the response that the student has a complete and thorough understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and at three or four points on the table. The values for the table increase as the values for the block decrease in all three models, indicating energy is transferred from the block to the table. Although the models do not show graduated increases in particle motion throughout the table, the models are completely correct and do not contain flaws. The response reflects complete synthesis with an explanation that, although not directly mentioning the teacher, does describe what is shown in the models and fully supports and explains the teacher's claim (*Through conduction the energy traveled from the particles in the heated metal block to Suzanne's hand when she touched the edge of the table. The kinetic energy moved to areas of lower kinetic energy which was the table. When kinetic energy moved from the block to the table to the hand, the temp. of the block moved to the table and then to the hand. Temperature is the average kinetic energy in the particles. The kinetic energy moved which resulted in the change of temperature*). Complete synthesis demonstrating a thorough understanding of the scientific concepts of particle motion and energy transfer as related to this investigation is provided in this explanation.

Paper	RF Number	Score	Notes
a115	**00098494178 113201706**	**4**	**Anchor Paper 15** **Score Point 4** There is evidence in the response that the student has a complete and thorough understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains very complete, thorough and accurate models for the three time intervals, all of which indicate particle-motion values for the block and the table. The models show a decrease of particle motion in the block and a graduated increase in particle motion to and throughout the table as it warms at four points, which enhances the accuracy of the response and demonstrates a complete understanding of the use of the models to show accurate heat transfer and particle motion for this investigation. Complete synthesis is achieved with an explanation that speaks directly to the teacher's claim using the models as support (*they both show the same principle. The teacher is saying that the energy was transferred from the heated block to the table and evantually to her hand through the collision of their particles. The model also shows this transfer . . . the energy filled block transfers energy throughout the table with the collision of their particles*). The student provides a complete and thorough explanation that is well supported by an accurate and complete model, demonstrating a complete understanding of the question.

Practice Set 1
Kentucky Science Operational
Grade 7
SC071602_05

Paper	RF Number	Score	Notes
p101	**0000779224** **8615201706**	**2**	**Practice Set 1, Paper 1** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which show particle-motion values for the block and at three points on the table. The values for the table are increasing as the values for the block decrease, correctly indicating energy is transferred from the block to and through the table. Significant flaws are present in the particle-motion values for the block at 10 minutes and 20 minutes, however. At 10 minutes the block's particle-motion value is slightly less than the table's particle-motion values. At 20 minutes, the block's particle-motion value is much less than the table's particle-motion values; introducing a major significant flaw since with a transfer of energy from the block to the table, the table's particle motion would not exceed that of the block. Note that at 20 minutes the particle-motion value of the table is greater than the block original value at 5 minutes – the table cannot gain more energy than the block originally possessed. Limited synthesis is achieved with an explanation that does speak directly and accurately to the teacher's claim, but only touches on the information broadly with limited elaboration (*The models support the teacher's claim because the partical motion is also kinetic energy. Also, when the heat is transferred to Suzanne's hand it shows the differences between the particale motions*). This explanation aids in the demonstration of limited understanding of all facets of the scientific phenomenon. This response is similar to Anchor paper 9.

Paper	RF Number	Score	Notes
p102	**0008702967** **9805201706**	**4**	**Practice Set 1, Paper 2** **Score Point 4** There is evidence in the response that the student has a complete and thorough understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and at four points in the table. The values for the table increase as the values for the block decrease in all three models, indicating energy is transferred from the block to the table. Although the models do not show graduated increases in particle motion throughout the table, the models are adequate and do not contain flaws. Complete synthesis is achieved with an explanation that, although not specifically mentioning the teacher, does speak directly to the claim using the models as support (*When the heated block was placed on the wooden table, the heat immediatly began conducting to the table ... the block began to lose the heat, and the table gained it. Since the block had the most kinetic energy, it transvered some energy through the particles on to the wood, and then on to Suzanne's hands*). This response is similar to Anchor paper 13.

Paper	RF Number	Score	Notes
p103	**0008753355 9811201706**	**3**	**Practice Set 1, Paper 3** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and at three or four points along the table. Although the values for the table are increasing as the values for the block decrease in all three models, indicating energy being transferred from the block to the table, at the 20-minute mark the particle motion in the block is shown to be less than that in the table. This is a flaw that is relevant to the accuracy of the answer and detracts from the response. The explanation speaks directly to the teacher's claim and demonstrates general synthesis (*The energy is being transferred from the heated metal block to the table ... the table is transfering energy to the hand to make it feel the heat. The reson its warm is because when energy is added to an object the particles move faster and that creates heat. So the teacher claim was right about the transferring energy to the hand*). Overall, the response reflects a general understanding of the complexities related to the question. This response is most similar to Anchor paper 11.
p104	**0009655682 8201201706**	**0**	**Practice Set 1, Paper 4** **Score Point 0** There is no evidence that the student has an understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Three models are shown with particle motion values for both the block and at three points along the table. However, the particle-motion values in the block *increases* at each time interval which would indicate the block is gaining energy. Also, the table values are increasing as well, confusing what is gaining or losing energy. This response is completely incorrect and indicates no understanding that energy is being transferred from one object to the other.

Paper	RF Number	Score	Notes
p105	**0008512824 9815201706**	**2**	**Practice Set 1, Paper 5** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The three models at the 5, 10, and 20 minute intervals depict the block's temperature cooling as the table temperature rises, eventually reaching a point of equilibrium at 20 minutes. However, the models all deal in temperature values only, not particle motion. The explanation, however, indicates limited synthesis since it contains relevant information to explain the models in terms of energy transfer and particle motion (*So the energy transfer is that the block loses more tempeture then what its giving the table; so the particles also travel faster in the table faster each time b/c when a solid is hot, the molecules expand and get faster*). Holistically, the explanation helps to elevate the response to a level that indicates more than a minimal understanding of the multi-dimensional question.
p106	**0009706310 8207201706**	**1**	**Practice Set 1, Paper 6** **Score Point 1** There is evidence in the response that the student has a minimal understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Three models are shown indicating a block on a table and a dark line steadily advancing from underneath the block at 5 minutes in the first model to the end of table at 20 minutes in the third model. The explanation clarifies what the model illustrates (*The shaded part of the table represents how heat is being transferred through the table in a period of 5, 10, 20 minutes*). Although particle motion is not mentioned, the idea that the block warms the table out to the end as time elapses does indicate minimal knowledge and understanding of the multi-dimensional question being posed. This response is similar to Anchor paper 4.

Paper	RF Number	Score	Notes
p107	**0001002255 8511201706**	**3**	**Practice Set 1, Paper 7** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and the table. The values for each table are shown, at two points along the table, to be increasing as the values for the block decrease, correctly indicating heat energy is transferred from the block to and through the table. The models for each time interval show the particle motion in the block being greater than that in the table. As such, there are no flaws in the model. The explanation does not specifically mention the teacher's claim, but does provide appropriate reasoning that reflects a general synthesis of the concepts reflected in the model (*As the temperature goes lower on the block the less energy it transfers. When something is hot, the particles are really fast and then as it cools the particles go slower*). This response indicates a general level of knowledge similar to that found in Anchor paper 10.
p108	**0000872300 8609201706**	**2**	**Practice Set 1, Paper 8** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The models illustrate the particle motion of the block being greater than the particle motion at three points on the table at 5 minutes. At 10 minutes there is a reduction of particle motion in the block and an increase of motion at three points in the table. The particle motion is shown to be equal at 20 minutes. It is important to note that it is not necessary for the model at 20 minutes to indicate equilibrium, but it is important that none of the models indicate particle motion in the block being less than any of the particle motion values in the table. In this response, at no time is the particle motion in the block less than the particle motion in the table, which is correct. Additionally, the model indicates some graduated heating along the table which enhances the accuracy of the model. The response is only partially complete, however, since there is no attempt to explain how the models support the teacher's claim. This response is similar to Anchor paper 7.

Paper	RF Number	Score	Notes
p109	**0008704109 9805201706**	**1**	**Practice Set 1, Paper 9** **Score Point 1** There is evidence in the response that the student has a minimal understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Although three similar models are provided, the only information indicated in the models themselves is the three time intervals. The explanation associated with each model does contain enough relevant information to indicate minimal understanding of the relationship between heat and particle motion (*In this one the particles are starting to move. In this one they are moving fast but have not reached full potential. In this one they are moving fast and making the table hot while slowing the block down and cooling it off*). Additional information is needed for a higher score point.
p110	**0009875600 8103201706**	**3**	**Practice Set 1, Paper 10** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains accurate models for the three time intervals, all of which indicate particle-motion values for the block and at four points along table. The models show a decrease of particle motion in the block and a graduated increase in particle motion throughout the table as it warms, which enhances the accuracy of the models. The explanation speaks directly to the teacher's claim but provides little specific information regarding the concept of kinetic energy and energy flow as mentioned in the teacher's claim (*The model supports the teachers claim by showing that as the partical movement in the block decreased, the movement in the table increased*). While the models are accurate and complete, the lack of detail in the explanation prevents the response from reflecting more than a general synthesis. This response is similar to Anchor paper 12.

Practice Set 2
Kentucky Science Operational
Grade 7
SC071602_05

Paper	RF Number	Score	Notes
p201	**0009824616 8107201706**	**2**	**Practice Set 2, Paper 1** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The three models at the 5, 10, and 20 minute intervals depict the block's temperature cooling as the table temperature rises, eventually reaching a point of equilibrium at 20 minutes. However, the models all deal in temperature values only, not particle motion. The strength of the explanation, however, indicates limited synthesis since it speaks directly to the teacher's claim and contains relevant information to explain the models in terms of energy transfer and particle motion (*This supports the teachers claim because the temperature and the particles of the block are moving fast and are hot so has the block was placed on the table kenetic energy was transferring . . . So has the blocks temperature decreases the tables temperature increase. This is because the kinectic energy is going from the heated box to the table . . . energy is transferred to the table . . . blocks particles to slow down and the tables particles to speed up*). Holistically, the explanation elevates the response to a level that indicates a limited understanding of the multi-dimensional question. This response is similar to Practice paper 1-5.
p202	**0008750677 9811201706**	**0**	**Practice Set 2, Paper 2** **Score Point 0** There is no evidence that the student has an understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Three models are provided which show a block, containing particles, resting on a table. The particles in each successive picture at the 5, 10 and 20 minute intervals are reduced and there is nothing to indicate what is being shown: a reduction in motion, a reduction in heat, or a reduction in the number of particles. There is also no information provided for the table. As such, there is not enough information included in the models to provide evidence of any level of understanding.

Paper	RF Number	Score	Notes
p203	**0008708346** **9801201706**	**3**	**Practice Set 2, Paper 3** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains three models, each showing the heated block. The edges of the table show a changed in the spacing and number of particles along the edge of the table. It is important to note that it is incorrect that the table or the block will lose particles. However, in this case, the explanation reveals that the model is meant to represent increased spacing between the particles as they warm. The lack of representation of movement in particles along with missing particle information of any kind for the block is a relevant flaw and does detract from the response. The explanation is generally complete, speaking directly to the teacher's claim and achieving general synthesis by describing the scientific phenomenon depicted in each of the models along with additional relevant information (*The dots on the edge of this table repersent the molecules. I am going to use the kinetic mulecicular theory to help explain this . . . In the 5 minute block the "molecules" are close together because the engergy from the heat block hasent warmed up the molecules yet . . . in the 10 minute block you see that the molcucles are more spaced out, which means that the heat is starting to conduct and get the molucles moving. In the twenty minute block you can now see the molucles complety spaced out . . . block has completely heated up the table. The teacher stated that the energy went to Suzanns hand because of kinetic energy. Well shes right, when Suzans hand touches the table all of the heat molecules transfer to her hand because of condution*). Overall, the response reflects a general understanding of the complexities related to the question despite some inadequacies in the model.

Paper	RF Number	Score	Notes
p204	**0008750639 9811201706**	**2**	**Practice Set 2, Paper 4** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains models for the three time intervals, all of which indicate particle-motion values for the block and two points on each table. The values for the table are increasing as the values for the block decrease, correctly indicating energy is transferred from the block to and through the table. The particle motion values at the end of the table for each model increase at each time interval and are less than the particle motion in the block in each instance, which is a correct representation. However, significant flaws are present in the particle-motion values for the block at 5, 10, and 20 minutes at the point on the table beneath the block. At those points, each model indicates particle-motion values greater than the particle-motion values in the block, which is incorrect. The explanation helps bolster the response somewhat and reflects limited synthesis as it contains some relevant information (as *the particle motion of the metal block decreased the particle motion of the table increased. this is due to the transferred of energy between the two items in order to eventually reach equallibeum*), which aids in the demonstration of limited understanding of the scientific phenomenon. This response is similar to Anchor paper 9.

Paper	RF Number	Score	Notes
p205	**0009691152 8205201706**	**4**	**Practice Set 2, Paper 5** **Score Point 4** There is evidence in the response that the student has a complete and thorough understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains accurate models for the three time intervals, all of which indicate particle-motion values for the block and the table. The models show a decrease of particle motion in the block and a graduated increase in particle motion to and throughout the table as it warms at four points, which enhances the accuracy of the response. In the final model, the particle motion in both objects has reached a point of equilibrium. In this response, at no time is the particle motion in the block less than the particle motion in the table, which is correct. Complete synthesis is achieved with an explanation that speaks directly to the teacher's claim using the models as support (*Those models support the teachers claim by showing that over time the box begins to loose some particle motion as it spreads across the table. The blocks heat/particle motion is being spread evenly through out time across the table, and because of the movement in particles the heat is moving with it. The movement eventually spreads out over time along with the heat as it begins to even out*).
p206	**0008703714 9809201706**	**3**	**Practice Set 2, Paper 6** **Score Point 3** There is evidence in the response that the student has a general understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains very accurate, complete models for the three time intervals, all of which indicate particle-motion values for the block and at four points along the table. The models show a decrease of particle motion in the block and a graduated increase in particle motion throughout the table as it warms, which enhances the accuracy of the models. Although the explanation speaks directly to the teacher's claim, it provides little specific information regarding the concept of kinetic energy and energy flow as seen in the models (*All of these models support the teachers claim because the energy is being distributed through conduction across the table*). The response is aided by the accuracy of the model since the lack of additional details in the explanation prevents the response from reflecting more than a general synthesis. This response is similar to Anchor paper 12.

Paper	RF Number	Score	Notes
p207	0000872146 8609201706	2	**Practice Set 2, Paper 7** **Score Point 2** There is evidence in the response that the student has a limited understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Although time intervals are not labeled, it can be inferred that the first, second, and third models represent 5, 10, and 20 minutes respectively. The models illustrate the particle motion in the block being greater than the particle motion at three points in the table at 5 minutes. At 10 minutes there is a reduction of particle motion in the block and an increase of motion at three points in the table. The particle motion is then shown to be equal at 20 minutes. It is important to note that it is not necessary for the model at 20 minutes to indicate equilibrium, but it is important that none of the models indicate particle motion in the block being less than any of the particle motion values in the table. In this response, at no time is the particle motion in the block less than the particle motion in the table, which is correct. The response is only partially complete, however, since there is no attempt to explain how the models support the teacher's claim. This response is similar to Anchor paper 7.

Paper	RF Number	Score	Notes
p208	**0008751535** **9811201706**	**1**	**Practice Set 2, Paper 8** **Score Point 1** There is evidence in the response that the student has a minimal understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. Three models are shown at 5, 10, and 20 minute intervals, each depicting a metal block on a table with corresponding particle-motion values at four points along the table, giving some indication that the particle motion extends down the table. At each successive time interval, the particle values in the table increase, In addition, the particle motion values for each individual table shows a graduated increase in values from beneath the block to the end of the table, which is a more accurate depiction of the spread in particle motion. However there are no particle-motion values provided for the metal block, which would serve to clarify energy transfer. The response is only minimally complete since there is no explanation provided to add additional clarification of what the model represents. The response contains enough information to communicate minimal knowledge and understanding of the idea that particle motion in the table will increase from 5 to 20 minutes, and increase through the table. This response demonstrates a similar level of understanding to that in Anchor paper 4.

Paper	RF Number	Score	Notes
p209	**0009876416 8103201706**	**4**	**Practice Set 2, Paper 9** **Score Point 4** There is evidence in the response that the student has a complete and thorough understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. The response contains very accurate, complete models for the three time intervals, all of which indicate particle-motion values for the block and at three points along the table. The models show a decrease of particle motion in the block and a graduated increase in particle motion throughout the table as it warms, which enhances the accuracy of the models. The explanation contains information that speaks indirectly to the teacher's claim with a description of each model, and provides specific information regarding the concept of kinetic energy and energy flow as seen in the models (*energy from the block is slowly transfering to the particles in the table . . . energy from the particles in the block is being transferred to the particles underneath it in the table which then heat particles next to them . . . All of the particles in the block and table now have become equal in energy*). The explanations support each individual model and strengthen the response, especially with the demonstration of a clear understanding of the equilibrium in the final model (*block and table now have become equal in energy*). The response is thorough and correct, reflecting complete synthesis and understanding of the multi-dimensional question.
p210	**0001037393 8515201706**	**1**	**Practice Set 2, Paper 10** **Score Point 1** There is evidence in the response that the student has a minimal understanding of how to show changes in particle motion using three similar models and explain how the models support the teacher's claim. A single model is shown indicating a block with arrows pointing from the bottom of the block to the table. The explanation clarifies what the model illustrates and contains a very small amount of minimally relevant information (*heat going to the table making particles move faster*). Holistically, the model and explanation work together to reflect minimal synthesis of the ideas of energy transfer and particle motion.

Qualification Set 1
Kentucky Science Operational
Grade 7
SC071602_05

Paper	RF Number	Score	Notes
q101	00010019118 511201706	1	Qualification Set 1, Paper 1 Score Point 1
q102	00098495668 113201706	2	Qualification Set 1, Paper 2 Score Point 2
q103	00010237598 501201706	0	Qualification Set 1, Paper 3 Score Point 0
q104	00099524608 109201706	3	Qualification Set 1, Paper 4 Score Point 3
q105	00010212108 501201706	4	Qualification Set 1, Paper 5 Score Point 4
q106	00008736038 609201706	2	Qualification Set 1, Paper 6 Score Point 2
q107	00085136779 815201706	3	Qualification Set 1, Paper 7 Score Point 3
q108	00097338808 115201706	1	Qualification Set 1, Paper 8 Score Point 1
q109	00097351188 215201706	3	Qualification Set 1, Paper 9 Score Point 3
q110	00096559178 201201706	2	Qualification Set 1, Paper 10 Score Point 2

Qualification Set 2
Kentucky Science Operational
Grade 7
SC071602_05

Paper	RF Number	Score	Notes
q201	0008706239 9809201706	3	Qualification Set 2, Paper 1 Score Point 3
q202	0001023854 8501201706	1	Qualification Set 2, Paper 2 Score Point 1
q203	0001015990 8503201706	2	Qualification Set 2, Paper 3 Score Point 2
q204	0009655880 8201201706	4	Qualification Set 2, Paper 4 Score Point 4
q205	0009955626 8109201706	0	Qualification Set 2, Paper 5 Score Point 0
q206	0001002124 8511201706	2	Qualification Set 2, Paper 6 Score Point 2
q207	0009823671 8107201706	1	Qualification Set 2, Paper 7 Score Point 1
q208	0001025650 8507201706	3	Qualification Set 2, Paper 8 Score Point 3
q209	0009737176 8215201706	0	Qualification Set 2, Paper 9 Score Point 0
q210	0000857620 8607201706	2	Qualification Set 2, Paper 10 Score Point 2