ONPAR® Score Report

Content Area: Science
Grade Level: Middle School
Testlet: Forces and Motion

Student Name: _____
Date of Testing: 6/19/2013

Introduction

Thank you for taking the ***ONPAR middle school science testlet*** on forces and motion. Each of the five multi-part science tasks on this testlet includes several test items worth multiple possible points. This score report provides an overall summary of student performance on the testlet as well as scores for each of the five tasks. A summary of what each task is measuring and interpretive scoring information is also provided. Score descriptions are based on combined scores across multiple parts (items) of each task. More information, including answer keys with example responses and detailed scoring rubrics for each task, is available in the ***Interpretive Scoring Guide: ONPAR Middle School Science Testlet*** **(COMING SOON!)**.

Overall Student Performance

TASK	ITEMS	POINTS	STUDENT SCORE
Parachutes	4	6	2
Rolling Balls	3	3	3
Force Box	3	3	0
Ramp	1	2	2
Magnets	6	6	6
TOTAL	17	20	13

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Parachutes Task

Parachutes measures students' understanding of the interaction between the surface areas of falling objects dropped from varying heights, the resulting frictional forces they encounter, and their relative velocity in the context of these variables.

Students who do well on this task can analyze results of the time it takes balls with different parachute sizes to fall from varying heights in relation to each other in order to predict estimated results for future trials of the same experiment. They can also explain the relationship between the independent variables of surface area (parachute size), and ball height, and the dependent variable—the time it takes balls to drop—based on their analysis of the given trial results.

Parachutes Scoring Summary

	ITEMS	POINTS	STUDENT SCORE	Interpretive Scoring Information
Part 1	3	3	**0**	Student does not show that the time it takes balls to drop from varying heights depends on their height relative to each other, the surface area of parachute, and the resulting frictional forces they encounter when falling.
Part 2	1	3	**2**	Student explains that the surface area of the parachutes (small, medium, large) affects both the magnitude of frictional forces generated (small=less friction, larger=more friction) and the time it takes balls to drop (higher balls=longer drop time, lower balls=shorter drop time).
TOTAL	**4**	**6**	**2**	

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Rolling Balls Task

Rolling Balls measures students' understanding of the relationship between the mass of objects and the force required to move them relative to their mass.

Students who do well on this task show that objects with less mass move further than objects with more mass when the same force is exerted on both. Also, when a greater force is exerted on the same two objects, students move both objects a greater distance than when less force is applied, with the less massive object rolling further than the more massive object.

Rolling Balls Scoring Summary

	ITEMS	POINTS	STUDENT SCORE	Interpretive Scoring Information
Part 1	3	3	**3**	Student response shows that objects with less mass (blue ball) require less force to exert a change in their motion than objects with a higher mass (red ball). Student shows that the greater the force (fan-speed) exerted, the more it will affect both objects' motion.
TOTAL	3	3	**3**	

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Force Box Task

Force Box measures students' understanding of the interactions between different types of forces—normal, gravitational, frictional, and applied—and their effect on the movement of objects. This task also measures students' ability to interpret graphical representations of the relationship between forces and movement.

Students who do well on this task can explain that an object will move when the normal force is less than the gravitational force, and when applied force exceeds frictional force. They can also interpret a graph showing the interaction of frictional and applied forces on an object (man pushing box) and explain that the object is motionless because these two forces are equal at the given point (Point A).

Force Box Scoring Summary

	ITEMS	POINTS	STUDENT SCORE	Interpretive Scoring Information
Part 1	2	2	**0**	Student does not show understanding that an inert object (box) moves when normal force is less than gravitational force, or that an object moves when applied force exceeds frictional force.
Part 2	1	1	**0**	Student does not correctly interpret and explain a graph showing the interaction of frictional and applied forces on an object (man pushing box) at a given point (Point A).
TOTAL	**3**	**3**	**0**	

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Ramp Experiment

Ramp Experiment measures students' understanding of the principles of planning a scientifically sound experiment involving testing variables in multiple controlled trials in order to answer a given research question.

Students who do well on this task design scientific experiments in which they 1) plan 3 or more trials, 2) identify the focal independent variable (cart weight), and 3) keep constant (ramp height and wheel size).

Ramp Scoring Summary

	ITEMS	POINTS	STUDENT SCORE	Interpretive Scoring Information
Part 1	1	2	**2**	Student's design of the scientific experiment includes all three of the above components listed above.
TOTAL	**1**	**2**	**2**	

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Magnets Task

Magnets measures students' understanding of the relationship between the mass of an object (big and small paperclips) and the amount of force (number of magnets) required to move the object from varying distances. This task also measures students' ability to interpret data from experiments in making predictions and explaining results.

Students who do well on Part 1 of this task are able to analyze results of an experiment to predict whether different numbers of magnets will lift an object from different distances or if this is indeterminate. Students who do well on Part 2 are able to synthesize results of two related experiments testing the maximum distance from which different numbers of magnets will lift objects of varying mass, and use data from both as evidence to support the given claim that one object has greater mass than the other.

Magnets Scoring Summary

	ITEMS	POINTS	STUDENT SCORE	Interpretive Scoring Information
Part 1	5	5	**5**	Student makes 5 correct predictions about whether different numbers of magnets will lift an object from different distances.
Part 2	1	1	**1**	Student is able to use results from the experiments to construct an argument supporting a given claim (that the big paperclip is heavier than small paperclip).
TOTAL	**6**	**6**	**6**	