



Physics Semester A Review Sheet Final Exam

This final exam review can help you prepare for the final exam by giving you an idea of what you need to study, review, and learn. To succeed, you should be thoroughly familiar with the subject matter before you attempt to take the exam.

Materials Needed

You will need to bring a scientific calculator. The formula sheets at the end of this study guide will be provided during the exam. If you are taking a print exam, you must bring a #2 pencil to complete the exam. You will receive a computer-graded answer sheet when you arrive at the testing center. The proctor will provide scratch paper.

Exam Structure

You will be allowed **3 hours** to complete this exam. The Physics Semester A exam consists of 50 multiple-choice questions worth 2 points each for a total of 100 points. The exam covers a wide variety of topics. To help you study, we have isolated 10 key topics and provided study tips and sample questions for each.

Unit Topic 1: The Scientific Method

Unit Topic 2: Lab Safety

Unit Topic 3: 1D Kinematics and Frames of Reference

Unit Topic 4: 2D Kinematics

Unit Topic 5: Forces and Free Body Diagrams

Unit Topic 6: Graphing

Unit Topic 7: Types of Energy

Unit Topic 8: Conservation of Energy

Unit Topic 9: Momentum and Impulse

Unit Topic 10: Conservation of Momentum

Scholastic Honesty

When you arrive at the testing center, you will be asked to carefully read the exam rules and sign a statement agreeing to take the exam in accordance with the rules. This is called the Examinee's Certification. The following is a copy of these rules:

Examinee's Certification

This certification must be signed *before* the exam is administered and then returned with the completed examination attached, or credit for the exam will not be given.

Scholastic dishonesty is a serious academic violation that will not be tolerated. Scholastic dishonesty encompasses, but is not limited to:

- copying from another student's work;
- using an unauthorized testing proctor or taking the exam at an unauthorized testing location;
- using materials not authorized by a testing proctor;
- possessing materials that are not authorized by a testing proctor, such as lessons, books, or notes;
- knowingly using or soliciting, in whole or topic, the contents of an unadministered test;
- collaborating with or seeking aid from another student without authorization during the test;
- substituting for another person, or permitting another person to substitute for oneself, in taking a course test or completing any course-related assignment;
- using, buying, stealing, or transporting some or all of the contents of an unadministered test, test rubric, homework answer, or computer program.

Evidence of scholastic dishonesty will result in a grade of *F* on the examination and an *F* in the course (if applicable).

At the testing center, you will be asked to sign a statement that says you have read the above and agree to complete the examination with scholastic honesty.

Preparing for the exam

Be aware that the Final Exam covers a full semester's worth of work; be prepared to devote an adequate amount of study and preparation time so that you are ready to take the exam.

Part of your preparation for this exam depends on the work you have done throughout the course. As you worked through each unit of the course, you should have

- completed all guided practice questions;
- completed all additional practice problems;
- completed all practice quizzes;
- completed all graded quizzes; and,
- reviewed online resources or used UT High School's resources for tutorials.

Additional Study Tips

The following information provides direction for your studies. For each part, you will find study tips and sample questions to give you a general idea of the types of questions you can expect to see on the exam.

Unit Topic 1: The Scientific Method

This topic relates to: the nature of scientific procedures; scientific hypotheses; scientific theories, and scientific laws.

Study Tips for Unit Topic 1:

This topic relates to Unit 1, Lessons 1 and 2. Familiarize yourself with those lesson objectives, and then be prepared to demonstrate knowledge of the following topics:

- the definition of scientific hypotheses, scientific theories, and scientific laws
- the uses and limitations of the scientific method
- scientific methods of measurement and experimentation

Sample Questions for Topic 1:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the **BEST** responses to the following questions.

1. For hundreds of years, Sir Isaac Newton's model of gravitation explained the results of numerous hypotheses about gravitation, which had carried their burdens of proof. For centuries, Newton's model was believed to be 100% correct due to its incredible ability to analyze and predict the motion of objects. However, when Albert Einstein came up with relativity, he discovered that Sir Isaac Newton's models only worked properly when dealing with masses that were smaller than celestial bodies, like black holes, or with masses that were moving significantly slower than the speed of light. Therefore, in this context, Newton's model of gravitation constitutes a —
 - A. hypothesis
 - B. fact
 - C. theory
 - D. principle

2. Science has which of the following limitations?
 - A. Science cannot ever be completely certain about its laws or theories.
 - B. Science cannot predict events in the future with great reliability.
 - C. Science cannot reproduce data of experiments disproving theories.
 - D. Science cannot analyze events that happened billions of years ago.

Unit Topic 2: Lab Safety

This topic relates to your knowledge of safely conducting experiments and investigations.

Study Tips for Unit Topic 2:

This topic relates to Unit 1, Lesson 4. Familiarize yourself with those unit objectives and then be prepared to demonstrate knowledge of the following topics:

- safety procedures designed to minimize or avoid physical harm
- equipment that should be used, or be on hand, in order to implement proper lab activities

Sample Questions for Topic 2:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the BEST responses to the following questions.

3. Which of the following is constitutes significantly irresponsible and dangerous behavior while conducting a lab?
 - A. wearing goggles on a hot day when they can fog up
 - B. wearing a lab coat while working with dangerous chemicals
 - C. putting out a fire with a non-flammable fire blanket
 - D. drinking out of laboratory glassware that has been used
4. A student is conducting a science experiment and needs to verify whether or not forces really do come in equal and opposite pairs. Which piece(s) of equipment would best be used for this?
 - A. an electronic scale, in order to measure the normal force exerted on the scale by a given mass
 - B. a pair of spring scales, in order to measure the force exerted by each of the springs as one pulls on the other
 - C. a ruler, stopwatch, and photogates, in order to measure the acceleration of two different objects after they collide
 - D. a magnet and 1 kg of iron filings, in order to see the effect of the magnetic field in causing the iron filings to move

Unit Topic 3: 1D Kinematics and Frames of Reference

This topic relates to your knowledge of formulas used to analyze basic motion in a specific dimension, as well as your ability to perform vector addition based on the frame of reference of an observer.

Study Tips for Unit Topic 3:

This topic relates to Unit 2, Lesson 1 and Lesson 4. Familiarize yourself with those unit objectives and then be prepared to demonstrate knowledge of the following topics:

- the definitions of distance, displacement, speed, velocity, and acceleration
- the formulas required to calculate the variables listed above
- vector analysis relative to frames of reference

Sample Questions for Topic 3:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the BEST responses to the following questions.

5. What is the approximate apex height of a projectile that is launched straight up on Earth with a V_{1Y} of 68 m/s?

A. 6.9 m
B. 68 m
C. 240 m
D. 670 m
6. Two astronauts are on a space ship are traveling through space at 8,800 m/s. How fast will the astronauts appear to be moving to each other?

A. 0 m/s
B. 4,400 m/s
C. 8,800 m/s
D. 17,600 m/s

Unit Topic 4: 2D Kinematics

This topic relates to your knowledge of motion in two dimensions, including objects launched horizontally off of cliffs and diagonally off of the ground. It also relates to your knowledge of parabolic trajectories.

Study Tips for Unit Topic 4:

This topic relates to Unit 4, Lessons 3 and 4. Familiarize yourself with those unit objectives and then be prepared to demonstrate knowledge of the following topics:

- parabolic motion as it relates to kinematics variables
- the equations required to analyze the relationship between those variables in cases of projectile and circular motion

Sample Questions for Topic 4:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the BEST responses to the following questions.

7. A rock is initially at rest on the edge of a cliff that is 185 m tall and then the rock is kicked directly horizontally at a velocity of 17.3 m/s. Approximately how far will the rock traveled horizontally?

A. 2.50 m
B. 106 m
C. 185 m
D. 1,620 m
8. If an archer is standing on a hill and shoots an arrow horizontally at 44.0 m/s and the arrow takes 2.20 s to hit the ground, approximately how high was the archer's arrow before it was released from the bow?

A. 4.92 m
B. 42.5 m
C. 21.6 m
D. 23.7 m

Unit Topic 5: Forces and Free Body Diagrams

This topic relates to Newton's laws and the graphic representation of them.

Study Tips for Unit Topic 5:

This topic relates to Unit 3, Lessons 1-4. Familiarize yourself with those unit objectives, and then be prepared to demonstrate knowledge of the following topics:

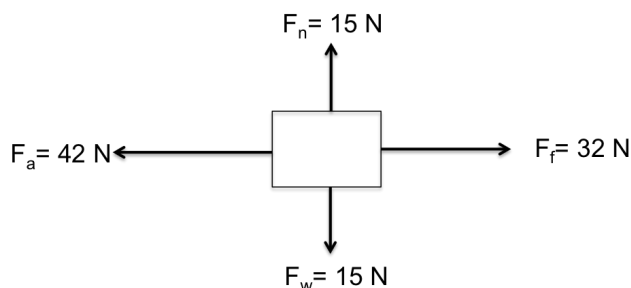
- the nature of force pairs and unbalanced forces
- the formula for Newton's second law
- the formulas for centripetal acceleration and gravitational force
- creating and interpreting free body diagrams

Sample Questions for Topic 5:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the **BEST** responses to the following questions.

9. Using the free body diagram pictured below, calculate the approximate mass of the object if the magnitude of its acceleration is 17.23 m/s^2 .



- A. 0.5804 kg
B. 1.725 kg
C. 172.3 kg
D. 723.7 kg
10. What would the approximate centripetal force be of a 1500 kg car that went around a turn with a radius of 17 m at 22 m/s ?
- A. $1,900 \text{ N}$
B. $25,000 \text{ N}$
C. $33,000 \text{ N}$
D. $43,000 \text{ N}$

Unit Topic 6: Graphing and Data Tables

This topic relates to your knowledge of creating and interpreting graphs of data, as well as organizing the data that you have gathered.

Study Tips for Unit Topic 6:

This topic relates to Unit 1 Lesson 3 and Unit 2 Lesson 2, including:

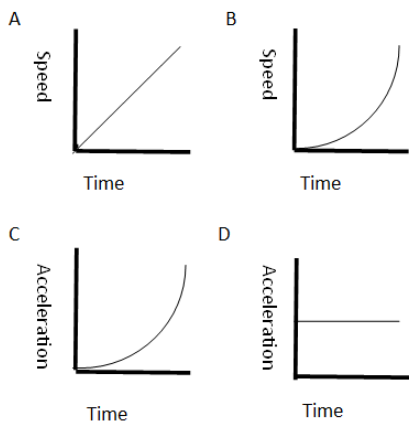
- the importance, and meaning of, the slope of lines on a line graph
- the proper way to label the axes of a graph with independent and dependent variables
- the best ways to organize data

Sample Questions for Topic 6:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

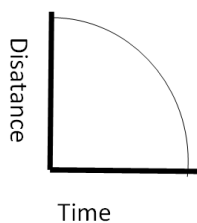
DIRECTIONS: Select the BEST responses to the following questions.

11. Which graphs display acceleration that is not staying constant?



- A. A and D
- B. A and C
- C. C and D
- D. B and C

12. Based on the graph below, what is occurring?



- A. positive distance
- B. positive displacement
- C. negative speed
- D. negative acceleration

Unit Topic 7: Types of Energy

This topic relates to your knowledge of the energy of motion and the energy of position.

Study Tips for Unit Topic 7:

This topic relates to Unit 4 Lesson 1. Familiarize yourself with those unit objectives, and then be prepared to demonstrate knowledge of the following topics:

- the definitions of gravitational potential, elastic potential, and kinetic energy
- the formulas for the above mentioned types of energy

Sample Questions for Topic 7:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the BEST responses to the following questions.

13. A group of students are observing a car moving with a constant velocity on a horizontal, frictionless track. They can change the car's mass, velocity, and the distance it travels. Which of the following changes would provide the greatest increase in potential energy?

- A. doubling the velocity of the car
- B. doubling the mass of the car
- C. halving the distance the car travels
- D. halving the mass and doubling the distance

14. A 15.4 kg weather balloon is 222,000 m above the Earth. What is its approximate gravitational potential energy?

- A. 14,400 J
- B. 2,180,000 J
- C. 3,420,000 J
- D. 33,500,000 J

Unit Topic 8: Conservation Of Energy

This topic relates to your knowledge of energy transformations that are governed by the law of conservation of energy and the relationship between work, energy, and power.

Study Tips for Unit Topic 8:

This topic relates to Unit 4 Lessons 2 and 3. Familiarize yourself with those unit objectives and then be prepared to demonstrate knowledge of the following topics:

- the consequences of the law of conservation of energy on energy transformations
- the effect of work done to a system on its total energy

Sample Questions for Topic 8:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the BEST responses to the following questions.

15. A daredevil uses a bungee cord to jump off a bridge. At which point will the daredevil have the most potential and kinetic energy at the same time?

- A. before the daredevil jumps off the bridge
- B. once the daredevil reaches the lowest point of the jump
- C. when the daredevil is roughly half way between the water and the bridge
- D. the instant after the daredevil reaches the lowest point of the jump and starts to spring back up

16. A bulldozer applies a force of 8,500 N to a boulder that is at rest, pushing it 17 m. Assuming that there is no friction, approximately how many Joules of work energy does the bulldozer give to the rock?

- A. 140,000 J
- B. 8,500 J
- C. -8,500 J
- D. -140,000 J

Unit Topic 9: Momentum and Impulse

This topic relates to your knowledge of momentum and how applied forces can change the momentum of an object.

Study Tips for Unit Topic 9:

This topic relates to Unit 4 Lesson 4. Familiarize yourself with those unit objectives and then be prepared to demonstrate knowledge of the following topics:

- the formula for momentum
- the definition of and formula for impulse
- the effects of impulse on an object's momentum

Sample Questions for Topic 9:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the BEST responses to the following questions.

17. Why do air bags reduce the harm done to passengers in a collision?
- A. because they cancel the force of the impact, thereby applying an equal and opposite force to the passenger's body
 - B. because they extend the time of the collision, thereby reducing the force that the impulse applies to the passenger's body
 - C. because they reduce the time of the collision, thereby reducing the force that the impulse applies to the passenger's body
 - D. because they absorb the force of impact, thereby taking away the energy of the crash that would affect the passenger's body
18. A 0.05 kg bullet is travelling at 200 m/s while a Mack truck is parked in a parking lot. Which one has more momentum and why?
- A. The Mack truck has more momentum because it is much more massive.
 - B. The bullet has more momentum because it is moving much faster than the truck.
 - C. They both have approximately the same momentum because the bullet is much less massive but moving more quickly.
 - D. The bullet has more momentum because the truck has no momentum at all.

Unit Topic 10: Conservation of Momentum

This topic relates to your knowledge of collisions and the total momentum in a closed system.

Study Tips for Unit Topic 10:

This topic relates to Unit 4 Lesson 5. Familiarize yourself with those Unit Objectives and then be prepared to demonstrate knowledge of the following topics:

- the total momentum of a closed system at the beginning and end of an event remains constant
- the nature of, and results of, different types of collisions

Sample Questions for Topic 10:

The following are sample questions. You can find the correct answers listed at the end of this review sheet, but try answering the questions without looking at the answers first to check your comprehension.

DIRECTIONS: Select the BEST responses to the following questions.

19. A stick of dynamite is placed in between two granite blocks. The fuse is then lit and the dynamite explodes, making the two blocks fly away from each other. What is the relationship between the resultant momentum of the granite blocks at the start and end of the event?
- A. The resultant momentum of the two blocks will be greater after they fly apart.
 - B. The resultant momentum of the two blocks will be greater the instant the dynamite explodes.
 - C. The resultant momentum of the two blocks will be the same before and after the explosion.
 - D. The resultant momentum will be greater before the dynamites fuse is lit and it explodes.
20. A 1,000 kg car moving at 17 m/s collides with, and sticks to, a stationary car of the same mass and they both slide down the road locked together. Determine the total velocity of the two cars.
- A. 8.5 m/s
 - B. 17 m/s
 - C. 59 m/s
 - D. 8,500 m/s

Answer Key

Item Number	Correct Answer	TEKS expectation
1	C	2D
2	A	2A
3	D	1A
4	B	2E
5	C	4B
6	A	4B
7	B	4C
8	D	4C
9	A	4D
10	D	4D
11	D	4A
12	D	4A
13	B	6B
14	D	6B
15	C	6D
16	A	6A
17	B	6C
18	D	6C
19	C	6D
20	A	6D