



# Study Guide

For Placement into Physics 20 (PHYS 181)



## Important Information

The Physics Placement test is a free assessment designed for Academic Upgrading placement purposes only. No section of the test may be used for admission to any SAIT program other than Academic Upgrading. The Physics Placement Test is not accepted for admission to any other institution.

- The passing mark required for eligibility to register in PHYS-181 (Physics 20) is 60%.
- We aim to put students' passing marks on our system within 2 business days of successful completion of the test.
- Students who have been accepted into the Academic Upgrading program can register for the course they are placed into once we have granted them permission based on their passing grades.
- Students who have already taken and passed SAIT's Academic Upgrading courses in Math and Physics ARE NOT required to take a placement test.

## Physics Placement Study Guide

This study guide is designed to prepare students for the Academic Upgrading Physics Placement test for entry into PHYS 181 (Physics 20). Please use the following material from Science 10 practice exercises to prepare for your online placement test to meet eligibility for PHYS 181. An answer key is included at the end of this guide.

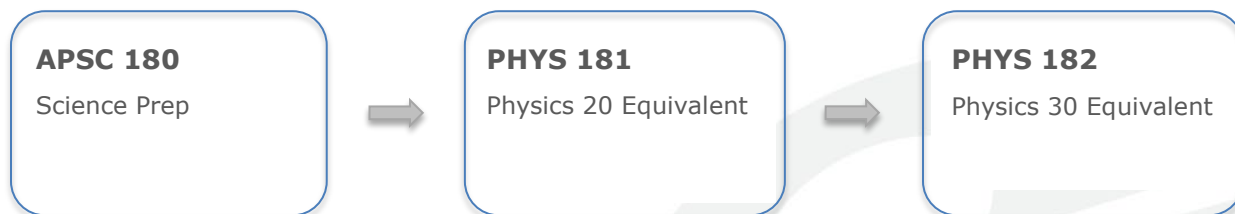
This test is for placement into grade Physics 20 equivalency (PHYS 181):

- The study guide consists of 31 questions for practice. The actual test will consist of 20 questions.
- **You will need to bring a scientific calculator for the test (graphing calculators are not permitted).** You will be provided with a formula sheet, which is also provided in this guide.
- Students should allow for 60 minutes to complete the test. An additional 30 minutes has been added to allow for accommodated time, for a total test time of 90 minutes.
- A passing mark of 60% or greater is required in this test for eligibility to register in PHYS 181.



- This test is to be written in the Testing Centre.
- You may choose to utilize a Science 10 Study Guide from the Calgary Public Library or bookstore for additional review. When using the guide, please focus on the physics sections.

## SAIT Academic Upgrading Course Sequence



## Multiple Choice

Use the following information to answer #1 to 4:

**A bear paces 12.0 m north in 5.00 s, then 16.0 m south in 5.00 s, and then 14.0 m north in 4.00 s.**

1. What is the bear's total distance travelled?

- a.) 42.0 m
- b.) 42.0 m [N]
- c.) 10.0 m
- d.) 10.0 m [N]

2. What is the bear's total displacement?

- a.) 42.0 m
- b.) 42.0 m [N]
- c.) 10.0 m
- d.) 10.0 m [N]

3. What is the bear's average speed?

- a.) 0.714 m/s
- b.) 2.50 m/s
- c.) 3.00 m/s
- d.) 3.03 m/s

4. What is bear's average velocity?

- a.) 0.714 m/s [N]
- b.) 2.50 m/s [N]
- c.) 3.00 m/s [N]
- d.) 3.03 m/s [N]

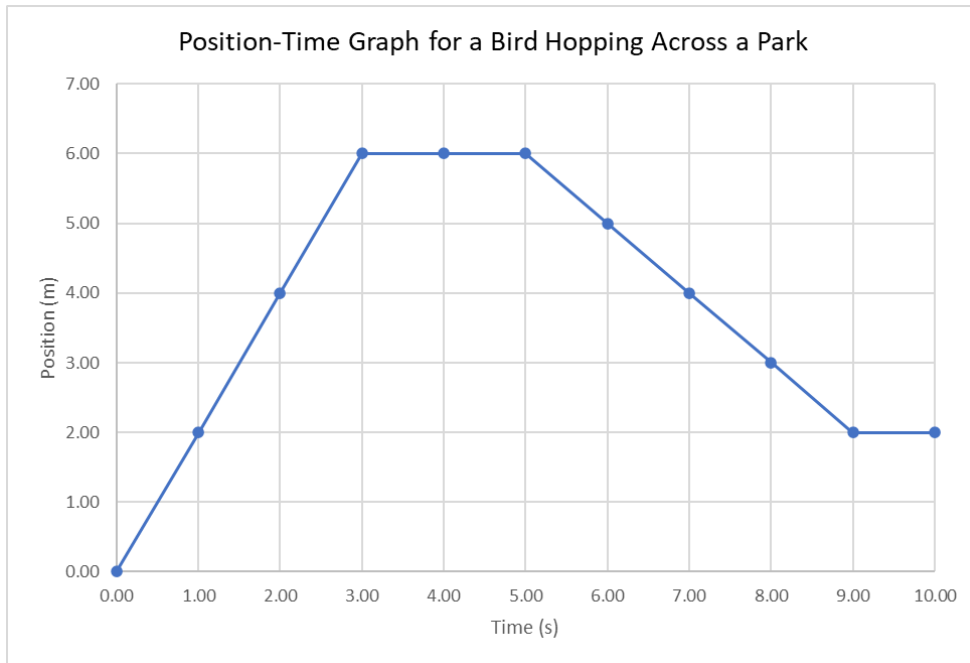
5. A car travels down a gravel road at 45.0 km/h for 35.0 minutes. How far did the car travel?

- a.) 1.36 km
- b.) 1580 km
- c.) 26.3 km
- d.) 15.8 km

6. A car changes its velocity from  $4.00 \text{ m/s [E]}$  to  $8.00 \text{ m/s [E]}$  in  $2.10 \text{ s}$ . The acceleration of the car is:
- a.)  $-1.90 \text{ m/s}^2 \text{ [E]}$
  - b.)  $1.90 \text{ m/s}^2 \text{ [E]}$
  - c.)  $-5.71 \text{ m/s}^2 \text{ [E]}$
  - d.)  $5.71 \text{ m/s}^2 \text{ [E]}$
7. A rabbit accelerates from rest to  $25.0 \text{ km/h [E]}$  at  $1.653 \text{ m/s}^2 \text{ [E]}$ . How many seconds did the rabbit take to accelerate?
- a.)  $41.3 \text{ s}$
  - b.)  $4.20 \text{ s}$
  - c.)  $11.5 \text{ s}$
  - d.)  $15.1 \text{ s}$
8. A person on a skateboard accelerates from rest at  $0.763 \text{ m/s}^2 \text{ [N]}$  over a time period of  $5.46 \text{ s}$ . What was the skateboarder's final velocity in  $\text{m/s}$ ?
- a.)  $4.17 \text{ m/s [N]}$
  - b.)  $0.140 \text{ m/s [N]}$
  - c.)  $7.16 \text{ m/s [N]}$
  - d.)  $3.18 \text{ m/s [N]}$

## Short Answer

Use the following graph to answer #9 to 12.



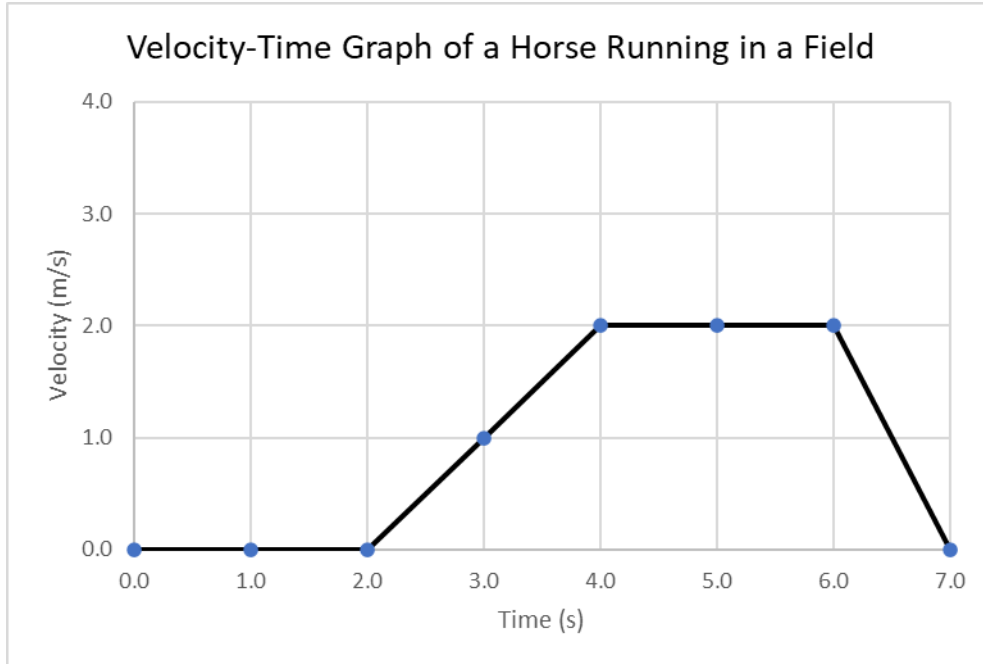
9. During which time interval(s) was the bird at rest?

10. What was the bird's velocity from 5.00 s to 9.00 s?

11. During which time interval(s) was the bird moving the fastest?

12. What was the total distance that the bird travelled?

Use the following graph to answer #13 to 16.



13. What was the horse's velocity from 0.0 s to 2.0 s?

14. At what time period(s) did the horse accelerate?

15. What was the horse's acceleration between 2.0 s and 4.0 s?

16. What distance did the horse travel between 4.0 s and 6.0 s?

## Multiple Choice

17. A student pushes a box a horizontal distance of 8.70 m with a horizontal force of 55.0 N. What was the work done by the student on the box?
- a.) 0.158 J
  - b.) 6.32 J
  - c.) 63.7 J
  - d.) 479 J
18. A rock with a mass of 350.0 g is lifted to a height of 2.00 m. What was the work done on the rock?
- a.)  $7.00 \times 10^2$  J
  - b.) 0.700 J
  - c.) 6870 J
  - d.) 6.87 J
19. A child climbs up the ladder on a slide. At the top of the slide, he has 1518 J of gravitational potential energy. If the child's mass is 45.5 kg, how high is the top of the slide?
- a.) 33.4 m
  - b.) 327.3 m
  - c.) 3.40 m
  - d.) 3.00 m
20. A 15.0 g ball is thrown at 35.0 km/h. What is the kinetic energy of the ball?
- a.) 0.709 J
  - b.) 9.19 J
  - c.) 18.4 J
  - d.) 0.146 J
21. A 57.0 g tennis ball is launched out of a tennis ball machine. If the ball has 0.4617 J of kinetic energy when it leaves the machine, how fast is travelling in m/s?
- a.) 16.9 m/s
  - b.) 4.02 m/s
  - c.) 16.2 m/s
  - d.) 1.57 m/s



22. A 2.00-kg eagle is flying 3.00 m/s horizontally at 1.50 m above the ground. The total mechanical energy of the eagle is:

- a.) 9.00 J
- b.) 20.4 J
- c.) 29.4 J
- d.) 38.4 J

23. A 35.0 g sparrow is flying at 2.54 m/s. If the total mechanical energy of the sparrow is 2.35 J, how high is the sparrow above the ground?

- a.) 6.52 m
- b.) 6.84 m
- c.) 6.59 m
- d.) 3.15 m

24. A pendulum has a bob with mass of 150.0 g. With the string remaining straight, it is raised up and to the side at an angle until the bob is 16.0 cm above its starting position. When the bob is released, what will its maximum velocity be?

- a.) 2.40 m/s
- b.) 3.14 m/s
- c.) 1.77 m/s
- d.) 2.17 m/s

Use the following information to answer #25 and 26.

A ball is placed on top of a compressed spring. The spring is released and the ball flies up into the air.

25. What energy transformation took place the instant the spring was released causing the ball to leave the spring?

- a.) elastic potential energy to kinetic energy
- b.) elastic potential energy to gravitational potential energy
- c.) gravitational potential energy to kinetic energy
- d.) kinetic energy to gravitational potential energy

26. What energy transformation took place from the time the ball started flying into the air until it reached its highest point in the air?

- a.) elastic potential energy to kinetic energy
- b.) elastic potential energy to gravitational potential energy
- c.) gravitational potential energy to kinetic energy
- d.) kinetic energy to gravitational potential energy

27. Which of the following does NOT represent a form of potential energy?

- a.) A paraglider stands at the top of a cliff.
- b.) An elastic which has been stretched is about to be let go.
- c.) Light energy leaves a flashlight and travels to your eyes.
- d.) A charged battery sits on the counter.
- e.) An apple contains sugar.

### Short Answer

Use the following information to answer #28, 29, and 30.

**An archer uses a force of 60.0 N to draw back the string of his bow through a distance of 0.330 m. He then fires a 300.0-g arrow straight up into the air.**

28. How much work did the archer do on the bow?

29. What is the maximum speed of the arrow at the instant it leaves the bow?

30. What is the maximum height reached by the arrow in its flight into the air?

### Multiple Choice:

31. A certain LED (light-emitting diode) lightbulb has an efficiency rating of 90.1%. Over a fairly short period of time, the bulb emits 596 J of light energy. How much electrical energy was put into the light bulb?

- a.) 537 J
- b.) 661 J
- c.) 537 000 J
- d.) 601 J

## Physics 10 Placement Test Study Guide: Answer Key

### Multiple Choice

1. a
2. d
3. c
4. a
5. c
6. b
7. b
8. a

### Short Answer

9. 3.00 s to 5.00 s and 9.00 s to 10.00 s
10. -1.00 m/s
11. 0.00 s to 3.00 s
12. 10.00 m
13. 0.0 m/s
14. 2.0 to 4.0 s (positive acceleration) and 6.0 to 7.0 s (negative acceleration)
15. +1.00 m/s<sup>2</sup>
16. 4.0 m

### Multiple Choice

17. d
18. d
19. c
20. a
21. b
22. d
23. a
24. c
25. a
26. d
27. c

### Short Answer

28. 19.8 J
29. 11.5 m/s
30. 6.73 m

### Multiple Choice

31. b

# Physics 20 Placement Exam

## Formula Sheet

### Kinematics

$$s = \frac{\Delta d}{\Delta t}$$

$$\vec{v} = \frac{\Delta \vec{d}}{\Delta t}$$

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{\vec{v}_f - \vec{v}_i}{\Delta t}$$

### Dynamics

$$\vec{F}_g = m\vec{g}$$

### Work and Energy

$$W = Fd$$

$$E_p = mgh$$

$$E_k = \frac{1}{2}mv^2$$

$$E_m = E_p + E_k$$

$$\% \text{ efficiency} = \frac{\text{useful } E_{\text{out}}}{E_{\text{in}}} \times 100\%$$

### Constants

$$g = 9.81 \text{ m/s}^2$$