

# CCHS Physics 20

## Final Exam

January 23, 2008  
Teacher: Mr. Szeryk

Name: \_\_\_\_\_

/50

Instructions:

- a) For this exam you are allowed to use a calculator, your formula sheet, and the formula sheet that is provided to you.
- b) You have 2.5 hrs to write it.
- c) Find each answer and then fill out the answer on the bubble sheet that is provided.
- d) You should hand in both the bubble sheet and the exam when you are finished.
- e) The test is out of 50 marks and each question is worth one mark.
- f) There is a bonus question at the end worth 2 marks.
- g) Good Luck.

Name: \_\_\_\_\_

1.

Value: 1

The distance travelled by an object is equal to the magnitude of its displacement when the object travels in a

- A. spiral loop
- B. straight line
- C. circular path
- D. elliptical track

Use the information to answer the next 1 question(s).

A student was given the following situations.

- 1. A cold air mass has a temperature  $5^{\circ}\text{C}$ .
- 2. A car increases its velocity to  $90\text{ km/h}$ .
- 3. An airplane changes its position to  $\text{N } 52^{\circ}\text{ W}$ .
- 4. A track contestant runs the  $100\text{ m}$  dash in  $9.89\text{ s}$ .
- 5. A submarine covers a displacement of  $150\text{ km}$ , north.

2.

Value: 1

Which of the given situations are examples of vector quantities?

- A. 1 and 3 only
- B. 1 and 4 only
- C. 2, 3, and 5 only
- D. 2, 4, and 5 only

3.

Value: 1

A bus travels north at  $90.0\text{ km/h}$  for  $1.00\text{ h}$  and then south at  $105\text{ km/h}$  for  $2.00\text{ h}$ . The average speed of the bus is

- A.  $15.0\text{ km/h}$
- B.  $40.0\text{ km/h}$
- C.  $95.0\text{ km/h}$
- D.  $100\text{ km/h}$

4.

Value: 1

A car moving at a constant velocity for two hours travels 215 km. It moves at a different constant velocity for the next hour and travels 115 km. The average velocity for the entire trip is

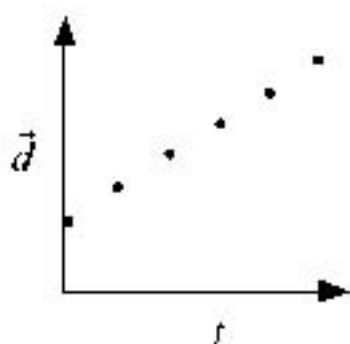
- A. 108 km/h
- B. 110 km/h
- C. 115 km/h
- D. 330 km/h

5.

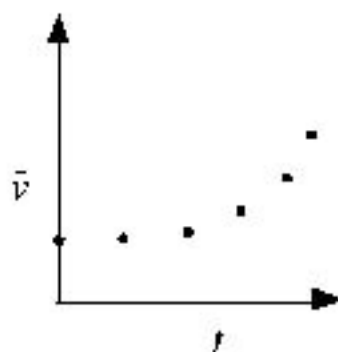
Value: 1

Use the following graphs, which show the results of some motion experiments, to answer the question.

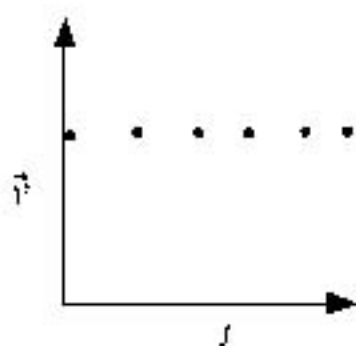
1.



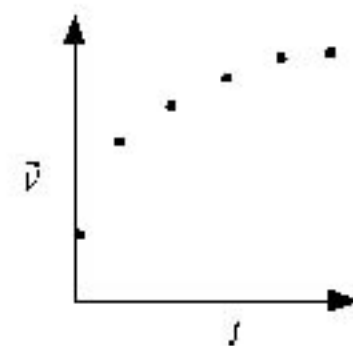
2.



3.



4.



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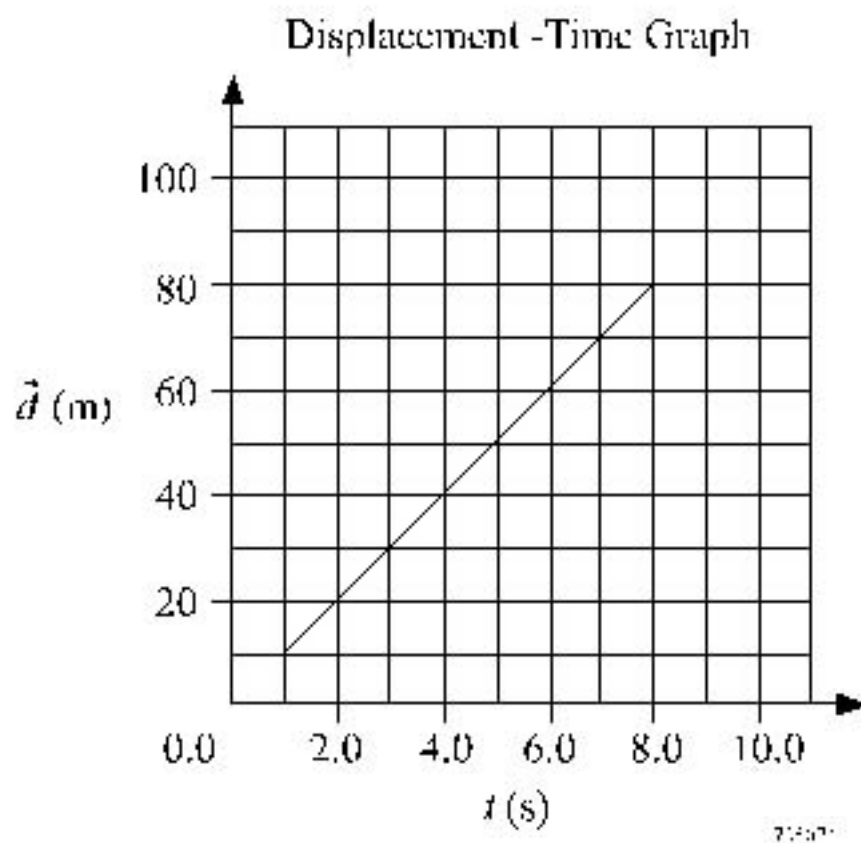
Which graphs illustrate uniform motion?

- A. 1 and 2 only
- B. 1 and 3 only
- C. 2 and 4 only
- D. 3 and 4 only

6.

Value: 1

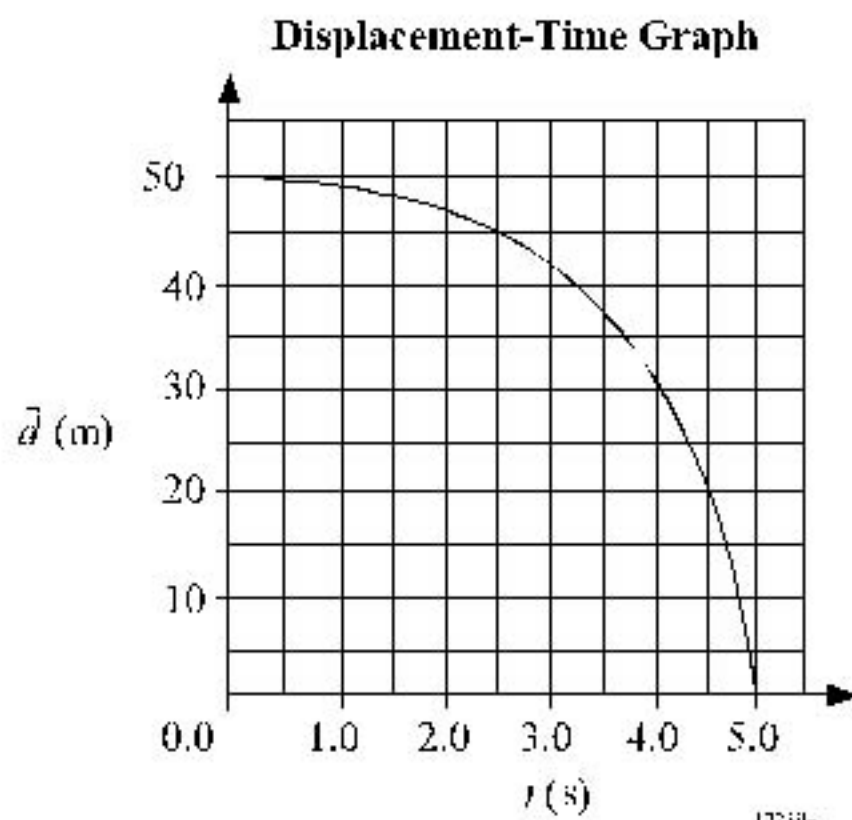
Use the graph to answer the question.



What is the velocity represented by the graph?

- A. 0.114 m/s
- B. 8.75 m/s
- C. 10.0 m/s
- D. 360 m/s

Use the graph to answer the next 1 questions.



7.

Value: 1

According to the graph, at a time of 3.5 s, what is the instantaneous velocity of the object?

- A.  $-10.1 \text{ m/s}$
- B.  $-8.5 \text{ m/s}$
- C.  $+7.3 \text{ m/s}$
- D.  $+8.5 \text{ m/s}$

8.

Value: 1

An earthquake caused several ocean waves to travel at an average velocity of  $7.2 \times 10^2 \text{ km/h}$ , south. The first wave reached an island 4.0 h and 20 min after the start of the earthquake. How far is the island from the origin of the waves?

- A.  $2.2 \times 10^1 \text{ km}$ , south
- B.  $1.7 \times 10^2 \text{ km}$ , south
- C.  $3.0 \times 10^3 \text{ km}$ , south
- D.  $3.1 \times 10^3 \text{ km}$ , south

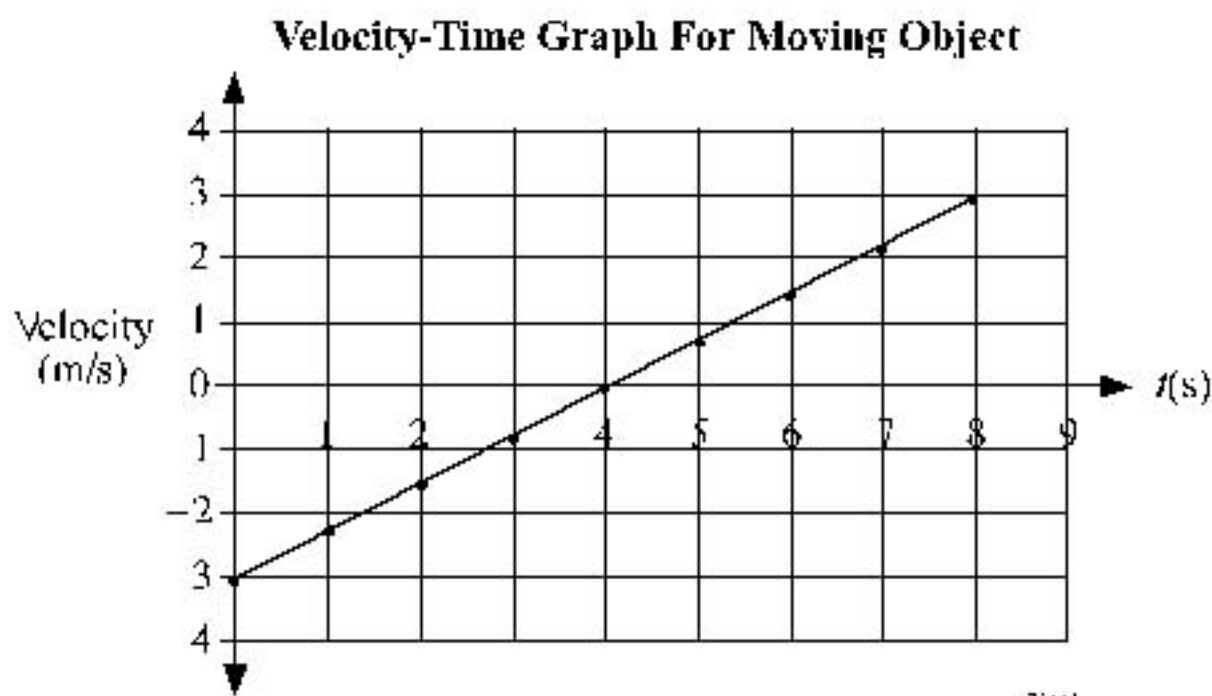
9.

Value: 1

The speed of a bus changes from 3.3 m/s at 2.0 s to 12.3 m/s at 6.5 s. The average acceleration of the bus is

- A.  $1.4 \text{ m/s}^2$
- B.  $2.0 \text{ m/s}^2$
- C.  $2.4 \text{ m/s}^2$
- D.  $3.5 \text{ m/s}^2$

Use the velocity-time graph describing the motion of an object to answer the next 2 question(s).



10.

Value: 1

According to the graph, the acceleration of the object is

- A.  $0.0 \text{ m/s}^2$
- B.  $0.75 \text{ m/s}^2$
- C.  $1.3 \text{ m/s}^2$
- D.  $24 \text{ m/s}^2$

11.

Value: 1

According to the graph, the total displacement of the object during the time interval of 0.0 s to 8.0 s is

- A. -12 m
- B. -6.0 m
- C. 0.0 m
- D. 6.0 m

12.

Value: 1

A hammer falls from the top of a building 50 m high. The time (s) taken for it to fall to the pavement below is

- A. 3.2 s
- B. 5.1 s
- C. 10 s
- D. 100 s

13.

Value: 1

An object is thrown up at 20.6 m/s and falls over the edge of a building. It strikes the ground 5.00 s after being thrown. The height of the building is

- A. 19.5 m
- B. 103 m
- C. 123 m
- D. 226 m

14.

Value: 1

Students throw two rocks (X and Y) from a bridge. Rock X is thrown vertically upward at a velocity of 20 m/s and Rock Y is thrown vertically downward at a velocity of 20 m/s. On reaching the water below, how does the velocity of Rock X compare to the velocity of Rock Y?

- A. Less than Rock Y
- B. One half of Rock Y
- C. Equal to Rock Y
- D. Greater than Rock Y

15.

Value: 1

Inertia may be defined as the tendency of an object to

- A. begin motion in other objects at rest
- B. keep its state of rest or uniform motion
- C. change the motion of other objects in motion
- D. slow down to rest after motion or remain at rest

16.

Value: 1

Newton's first law of motion states that an object will

- A. accelerate when an unbalanced force is applied to it
- B. stay at rest or in motion unless an external force acts on it
- C. create an equal and opposite reaction when a force is exerted on it
- D. attract another object with a force proportional to the force given to it

17.

Value: 1

These observations describe the motion of a car at different times.

1. The car travels south at 90 km/h.
2. The car is stopped at a gas station.
3. The car travels from rest to a velocity of 50 km/h west.
4. The car slows down from a velocity of 100 km/h east and stops.

Which observations lead to the inference that an unbalanced force is acting on the car?

- A. 1 and 2
- B. 2 and 3
- C. 3 and 4
- D. 1, 3, and 4

18.

Value: 1

If a force  $\vec{F}$  causes a mass  $m$  to accelerate at  $\vec{a}$ , then a mass of  $4m$  will be accelerated at  $3\vec{a}$  by a force of

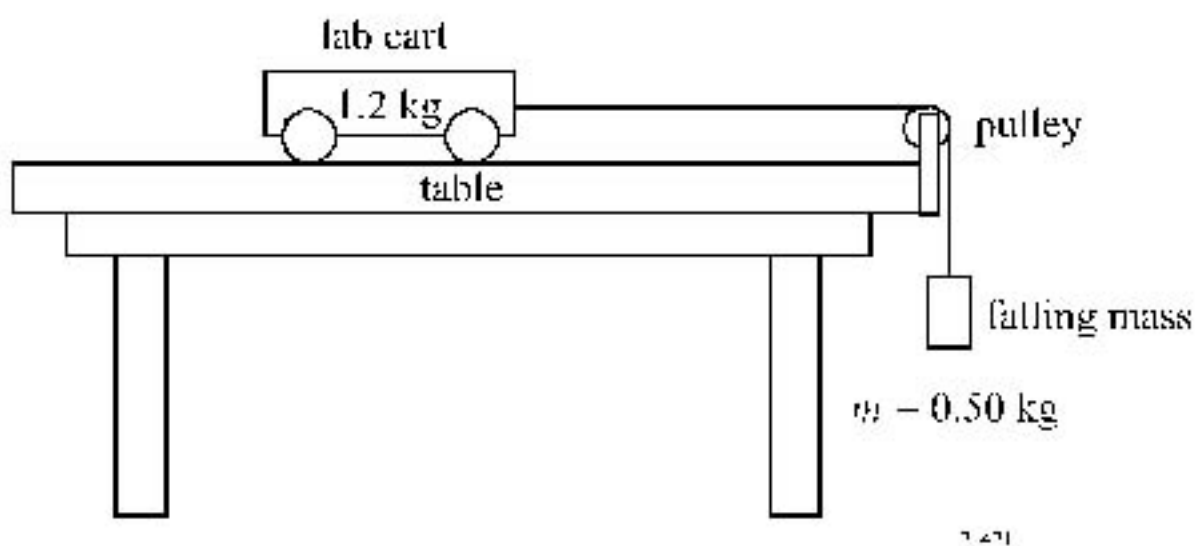
- A.  $\frac{3}{4}\vec{F}$
- B.  $\frac{4}{3}\vec{F}$
- C.  $7\vec{F}$
- D.  $12\vec{F}$

19.

Value: 1

Use the information and diagram to answer the question.

During an experiment, a 1.2 kg lab cart is accelerated on a low-friction table by a 0.50 kg mass moving straight down as shown.



According to the experiment, when the 0.50 kg mass falls vertically, the acceleration of the lab cart is

- A.  $2.9 \text{ m/s}^2$
- B.  $4.1 \text{ m/s}^2$
- C.  $4.9 \text{ m/s}^2$
- D.  $9.8 \text{ m/s}^2$

20.

Value: 1

A  $3.50 \times 10^3 \text{ kg}$  truck starts from rest and accelerates for 32.5 s. If the truck travels with constant acceleration for a distance of 1.15 km, what force is exerted on the truck during this time interval?

- A.  $9.89 \times 10^1 \text{ N}$
- B.  $1.61 \times 10^3 \text{ N}$
- C.  $7.62 \times 10^3 \text{ N}$
- D.  $1.24 \times 10^5 \text{ N}$

21.

Value: 1

Which statement describes the way Newton's third law of motion interprets the behaviour of action-reaction forces?

- A. Action-reaction forces are equal in magnitude and direction.
- B. Action-reaction forces are unequal in magnitude and direction.
- C. Action-reaction forces are equal in magnitude and opposite in direction.
- D. Action-reaction forces are unequal in magnitude and opposite in direction.

22.

Value: 1

A 70 kg astronaut wearing a 50 kg space suit jumps up a total distance of 1.00 m on the barren Planet Murin where the acceleration of gravity is  $8.50 \text{ m/s}^2$ . If this planet has a mass of  $5.00 \times 10^{22} \text{ kg}$ , its downward speed in reaction to the jump is

- A.  $1.6 \times 10^{-21} \text{ m/s}$
- B.  $4.1 \times 10^{-21} \text{ m/s}$
- C.  $5.8 \times 10^{-21} \text{ m/s}$
- D.  $9.9 \times 10^{-21} \text{ m/s}$

23.

Value: 1

A team of four dogs can exert a horizontal force of 400 N on a sled resting on wet snow that has a coefficient of sliding friction of 0.140. What mass of sled and cargo can these dogs drag across this snow?

- A. 47.5 kg
- B. 251 kg
- C. 292 kg
- D. 2860 kg

24.

Value: 1

An elevator with a mass of  $1.0 \times 10^3 \text{ kg}$  accelerates upward at  $4.0 \text{ m/s}^2$ . What is the tension in the cable that pulls the elevator?

- A.  $4.0 \times 10^3 \text{ N}$
- B.  $5.8 \times 10^3 \text{ N}$
- C.  $9.8 \times 10^3 \text{ N}$
- D.  $1.4 \times 10^4 \text{ N}$

25.

Value: 1

A mountain biker travels 5 km east, 2 km south, 7 km east, 3 km north, and finally 12 km west. What is the biker's resultant displacement?

- A. 1 km south
- B. 1 km north
- C. 1 km west
- D. 1 km east

26.

Value: 1

A balloon is rising vertically at a velocity of 4.0 m/s while a west wind is blowing at 10 m/s. Relative to the ground, the angle of ascent of the balloon is

- A.  $22^\circ$
- B.  $24^\circ$
- C.  $66^\circ$
- D.  $68^\circ$

27.

Value: 1

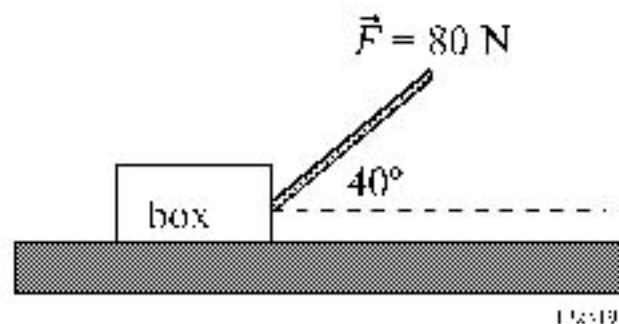
An airplane takes off at 400 km/h at an angle of  $41.0^\circ$  from the runway. The airplane is gaining altitude at a speed of

- A. 164 km/h
- B. 262 km/h
- C. 302 km/h
- D. 348 km/h

28.

Value: 1

A force of 80 N is applied to a box by pulling on a rope at an angle of  $40^\circ$  with a horizontal table as shown.



What is the horizontal component of the force?

- A. 32 N
- B. 51 N
- C. 61 N
- D. 67 N

29.

Value: 1

From the top of a cliff 50 m high, an object is thrown horizontally at a velocity of 20 m/s. What time does it take for the object to hit the ground below?

- A. 2.3 s
- B. 3.2 s
- C. 5.1 s
- D. 10 s

30.

Value: 1

A ball is hit with a velocity of 30.0 m/s at an angle of  $35.0^\circ$  with the ground. What is the maximum height reached by the ball?

- A. 15.1 m
- B. 22.5 m
- C. 30.2 m
- D. 45.9 m

31.

Value: 1

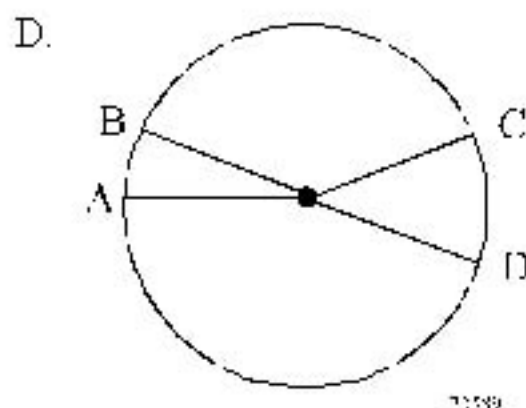
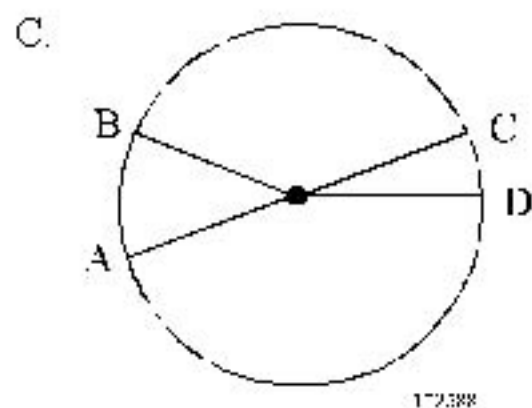
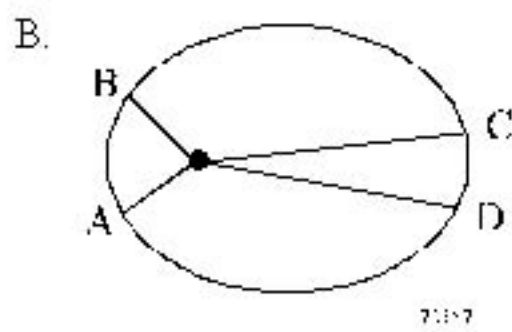
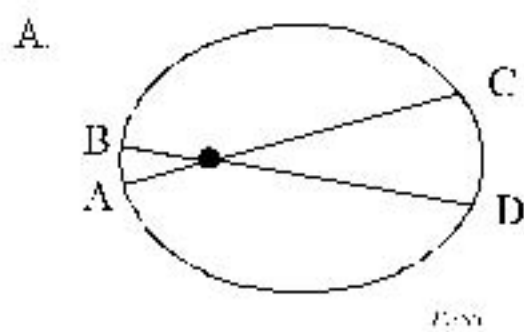
A  $1.00 \times 10^3$  kg car is moving through a flat curve on a road at a velocity of 30.0 m/s. If the coefficient of friction between the road and the tires is 0.600, the radius of the curve is

- A. 55.0 m
- B. 91.8 m
- C. 153 m
- D. 1500 m

32.

Value: 1

If the time taken to go from A to B is the same as the time taken to go from C to D, which diagram represents a geometric example of Kepler's law of areas, where the area described by the motion of a planet revolving around the Sun is proportional to the time intervals?



33.

Value: 1

An asteroid orbiting around the Sun has a period of  $7.0 \times 10^6$  s. If Earth orbits around the Sun at a distance of  $1.5 \times 10^{11}$  m with a period of  $3.2 \times 10^7$  s, what is the asteroid's orbital distance from the Sun?

- A.  $1.0 \times 10^7$  m
- B.  $1.5 \times 10^{10}$  m
- C.  $3.3 \times 10^{10}$  m
- D.  $5.4 \times 10^{10}$  m

34.

Value: 1

The gravitational force of attraction between two objects is  $F_g$ . If the mass of either of these objects is doubled, then the size of the force will be

- A.  $\frac{1}{4}F_g$
- B.  $\frac{1}{2}F_g$
- C.  $2F_g$
- D.  $4F_g$

35.

Value: 1

Suppose a  $1.6 \times 10^{18}$  kg mass is attracted by a  $1.2 \times 10^{14}$  kg mass. The force of gravitational attraction is 5.5 N. What is the separation distance between the two masses?

- A.  $4.8 \times 10^{10}$  m
- B.  $1.1 \times 10^{11}$  m
- C.  $5.9 \times 10^{15}$  m
- D.  $2.3 \times 10^{21}$  m

36.

Value: 1

Suppose a  $4.7 \times 10^2$  kg satellite is orbiting Earth where the gravitational force is  $1.5 \times 10^3$  N. What is the gravitational field strength at this location?

- A. 0.31 N/kg
- B. 3.2 N/kg
- C.  $1.5 \times 10^3$  N/kg
- D.  $7.1 \times 10^5$  N/kg

37.

Value: 1

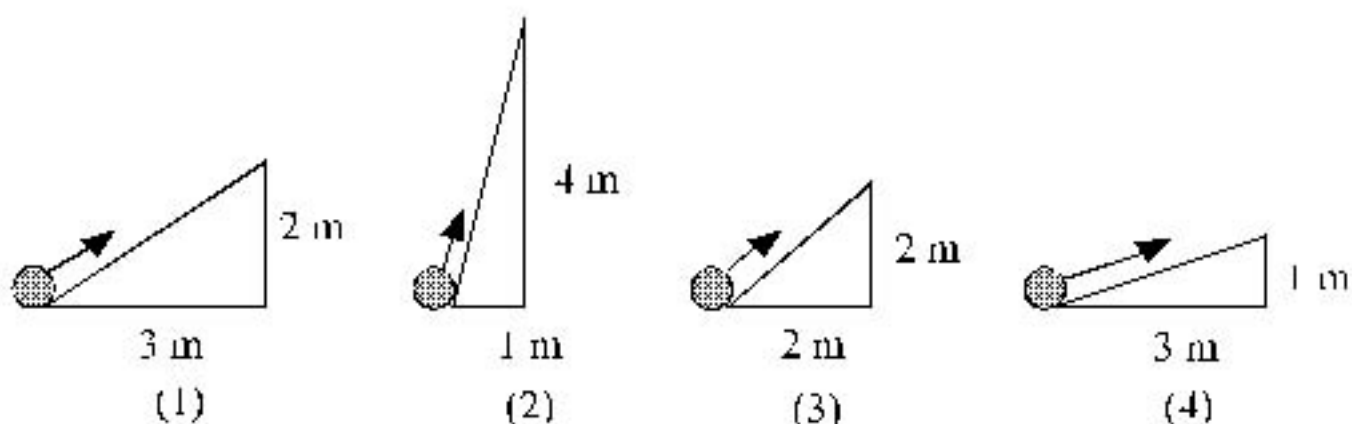
The mass of Mercury is  $3.2 \times 10^{23}$  kg and its radius is  $2.43 \times 10^6$  m. What is the value of  $g$  on this planet?

- A.  $3.6 \text{ m/s}^2$
- B.  $7.6 \text{ m/s}^2$
- C.  $8.8 \times 10^6 \text{ m/s}^2$
- D.  $1.3 \times 10^{17} \text{ m/s}^2$

38.

Value: 1

Use the diagrams to answer the question.



17629

The balls in all situations have equal mass. To lift the ball from the bottom to the top of the incline at a constant speed, which situations result in the same amount of work?

- A. 1 and 3
- B. 1 and 4
- C. 2 and 3
- D. 2 and 4

39.

Value: 1

A carton is pushed on a floor with a force of 25 N through a distance of 15 m. The work done on the carton due to the pushing is

- A.  $1.9 \times 10^2$  J
- B.  $3.8 \times 10^2$  J
- C.  $5.6 \times 10^3$  J
- D.  $9.4 \times 10^3$  J

40.

Value: 1

If a 70.0 kg student runs up a flight of stairs 15.0 m high in 25.0 s, what is the average power?

- A. 27.4 W
- B. 42.0 W
- C. 412 W
- D.  $1.03 \times 10^4$  W

41.

Value: 1

A large electromagnet drops a car from a certain height  $h$ . What is its final velocity just before it hits the ground?

- A.  $gh$
- B.  $mgh$
- C.  $\sqrt{2gh}$
- D.  $\frac{1}{2}mv^2$

42.

Value: 1

A constant force of 15.0 N is applied horizontally to an object giving it an acceleration from rest of  $0.500 \text{ m/s}^2$ . After 5.00 s, what is the object's kinetic energy?

- A. 4.78 J
- B. 9.57 J
- C. 37.5 J
- D. 93.8 J

43.

Value: 1

An object is thrown vertically into the air and reaches a height of 30.0 m. Neglecting air friction, what was the object's initial velocity?

- A. 3.06 m/s
- B. 9.37 m/s
- C. 17.1 m/s
- D. 24.2 m/s

44.

Value: 1

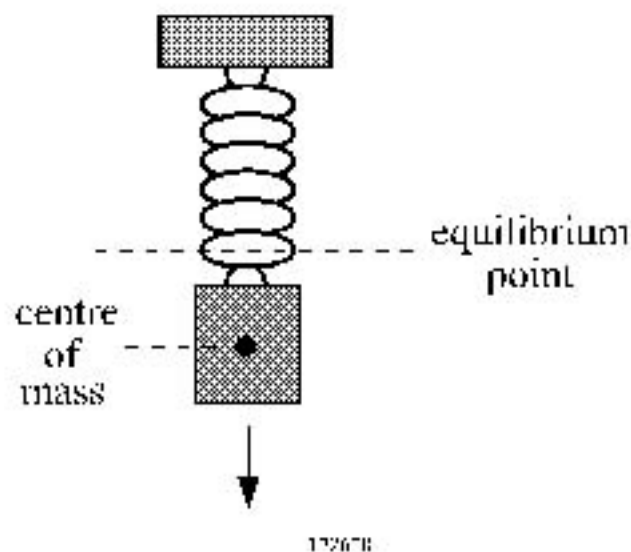
If a pendulum having a period of 1.50 s on the Earth is taken to Planet Physon where its period is 0.75 s, what is the acceleration of gravity on this planet?

- A.  $2.45 \text{ m/s}^2$
- B.  $4.90 \text{ m/s}^2$
- C.  $19.6 \text{ m/s}^2$
- D.  $39.2 \text{ m/s}^2$

45.

Value: 1

The diagram shows a block on a spring moving with simple harmonic motion that has reached its maximum displacement down.



At this point in the block's motion, what factors are at their maximum and minimum values?

- A. Restoring Force = minimum, Kinetic Energy = maximum, Potential Energy = minimum
- B. Restoring Force = minimum, Kinetic Energy = minimum, Potential Energy = maximum
- C. Restoring Force = maximum, Kinetic Energy = maximum, Potential Energy = minimum
- D. Restoring Force = maximum, Kinetic Energy = minimum, Potential Energy = maximum

46.

Value: 1

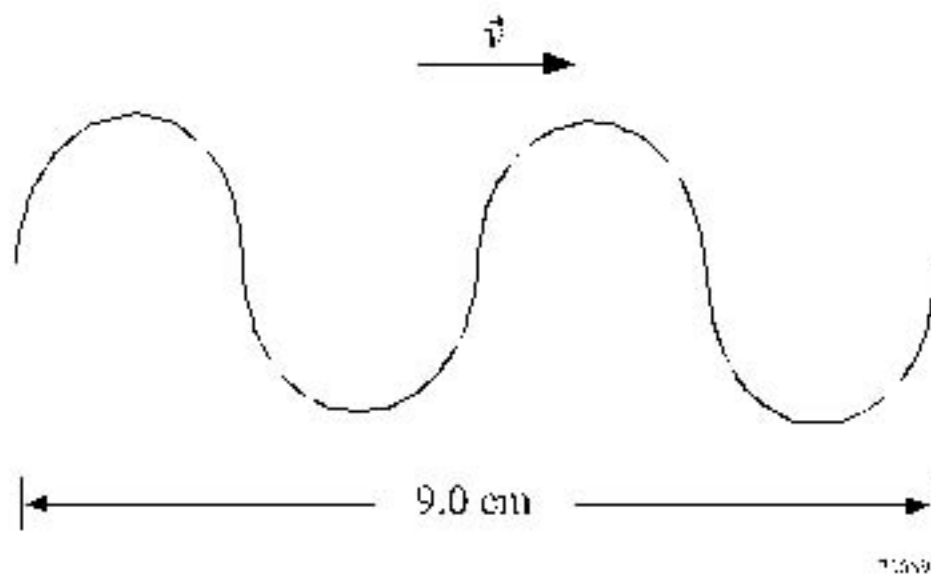
The most common example of a longitudinal wave is the

- A. light wave
- B. water wave
- C. sound wave
- D. gravity wave

47.

Value: 1

The diagram shows wave motion over a distance of 9.0 cm.



What is the wavelength of this wave?

- A. 1.5 cm
- B. 2.3 cm
- C. 4.5 cm
- D. 9.0 cm

48.

Value: 1

During an experiment about wave motion, a student sent a 2.0 m wave down a coil spring. If the period of this wave is 0.40 s, what is the wave's speed?

- A. 0.8 m/s
- B. 2.0 m/s
- C. 5.0 m/s
- D. 8.0 m/s

49.

Value: 1

If the length of a vibrating string is doubled, then its pitch will be

- A. one quarter of the original frequency
- B. one half of the original frequency
- C. equal to the original frequency
- D. twice the original frequency

50.

Value: 1

A clarinet is a musical instrument that acts like an air column with one end closed. If the fundamental frequency is  $f$  for an air column length of  $l$ , what are the frequencies and wavelengths, respectively, for the next three harmonics?

- A.  $2f$  and  $4l$ ,  $3f$  and  $3l$ ,  $4f$  and  $2l$
- B.  $3f$  and  $5l$ ,  $5f$  and  $4l$ ,  $7f$  and  $7l$
- C.  $2f$  and  $l$ ,  $3f$  and  $\frac{2}{3}l$ ,  $4f$  and  $\frac{1}{2}l$
- D.  $3f$  and  $\frac{4}{3}l$ ,  $5f$  and  $\frac{4}{5}l$ ,  $7f$  and  $\frac{4}{7}l$

51. For a bonus 2 marks. Make a multiple choice question of something that you feel was left out on this exam. You should include 4 answers to choose from. (Place question here.)

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

Name: \_\_\_\_\_

- |       |       |
|-------|-------|
|       | 19. A |
| 1. B  | 20. C |
| 2. C  | 21. C |
| 3. D  | 22. D |
| 4. B  | 23. C |
| 5. B  | 24. B |
| 6. B  | 25. B |
|       | 26. A |
| 7. B  | 27. B |
| 8. D  | 28. C |
| 9. B  | 29. B |
| 10. B | 30. A |
| 11. C | 31. C |
| 12. A | 32. B |
| 13. A | 33. D |
| 14. C | 34. C |
| 15. B | 35. A |
| 16. B | 36. B |
| 17. C | 37. A |
| 18. D | 38. A |

39. B

40. C

41. C

42. D

43. D

44. D

45. D

46. C

47. C

48. C

49. B

50. D