

**True/False**

Indicate whether the sentence or statement is true or false.

- \_\_\_1. A sprinter darts from the starting blocks at the sound of the starter's pistol. The position-time graph representing the sprinter's motion during the first few strides would be a straight line.
- \_\_\_2. The force that propels a boat through water is the force that the propeller exerts on the water.
- \_\_\_3. If the supporting cables of an elevator snapped and the elevator began falling, the passengers would become trapped against the ceiling of the elevator provided there is no air resistance or friction in the elevator shaft.
- \_\_\_4. When you use the equation  $E_g = mgh$ , the only condition on  $h$  is that it must be measured in a straight line.
- \_\_\_5. The frequency of the average human voice is below 1000 Hz.
- \_\_\_6. There are some musical instruments that do not need a vibrating source to create sound.
- \_\_\_7. The spreading apart of the colours of light by a prism is called inversion.
- \_\_\_8. Farsightedness can be corrected with diverging lenses.
- \_\_\_9. A Galilean telescope is more useful for studying stars than a reflecting telescope.

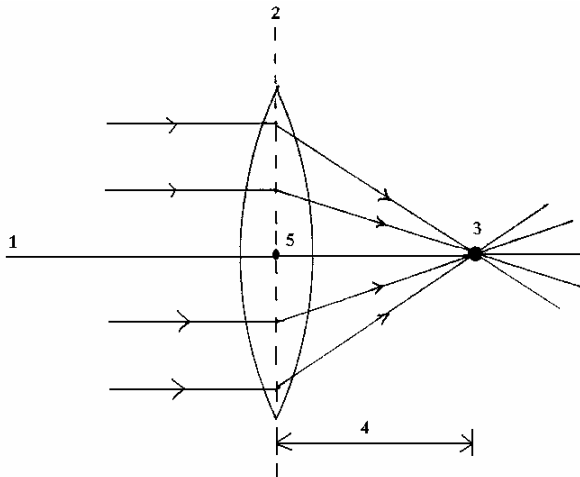
**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question.

- \_\_\_10. You set out in a canoe from the east shore of a south-flowing river. To maximize your velocity relative to the shore you should point your boat
- |          |              |
|----------|--------------|
| a. north | d. south     |
| b. east  | e. southeast |
| c. west  |              |
- \_\_\_11. A car is driving along the highway behind a slower vehicle when it pulls out to pass. If the car's acceleration is uniform at  $2.0 \text{ m/s}^2$  for 4.0 s and it reaches a speed of 28 m/s, what was its speed when it first pulled out to pass the slower vehicle?
- |           |           |
|-----------|-----------|
| a. 18 m/s | d. 24 m/s |
| b. 20 m/s | e. 26 m/s |
| c. 22 m/s |           |
- \_\_\_12. Which of the following speeds is the fastest?
- |                                   |                                      |
|-----------------------------------|--------------------------------------|
| a. $1.4 \times 10^5 \text{ m/h}$  | d. $4.2 \times 10^{-2} \text{ km/s}$ |
| b. $1.4 \times 10^2 \text{ km/h}$ | e. $4.0 \times 10^3 \text{ cm/s}$    |
| c. 40 m/s                         |                                      |
- \_\_\_13. Objects onboard an orbiting space station appear to be "floating" because
- |   |
|---|
| a. they're falling together                       |
| b. they're weightless                             |
| c. they're outside Earth's gravitational pull     |
| d. they're in the vacuum of space                 |
| e. they're in the gravitational field of the Moon |
- \_\_\_14. A 0.500-kg rock, dropped from rest, does 15.0 J of work in 3.00 seconds. How far does the rock travel?
- |             |            |
|-------------|------------|
| a. -30.0 m  | d. -7.50 m |
| b. -90.0 m  | e. -3.06 m |
| c. -0.327 m |            |



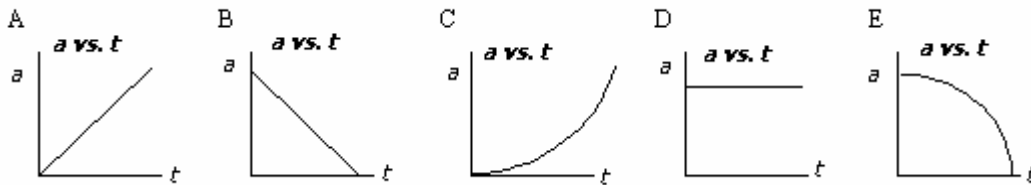
- \_\_\_24. For us to be able to see a secondary rainbow, light must pass through a raindrop. What optical effects (in the correct order) does the light go through?
- refraction, reflection, reflection
  - refraction, reflection, refraction
  - refraction, reflection, reflection, refraction
  - refraction
  - refraction, reflection
- \_\_\_25. The light sensitive pigment in our rod cells is called
- neuronic
  - photopigments
  - rhodopsin
  - photoreceptors
  - choroids



**Figure 1**

- \_\_\_26. In **Figure 1**, the number 2 is the
- principal axis
  - focus
  - optical centre
  - focal length
  - optical axis
- \_\_\_27. Two touching metal spheres, X and Y, are placed on insulated stands. A negatively charged rod is brought close to sphere X. Sphere Y is then removed. As a result,
- Both spheres will have a negative charge.
  - Both spheres will have a positive charge.
  - Both spheres will have neutral charges.
  - Sphere X will have a negative charge. Sphere Y will have a positive charge.
  - Sphere X will have a positive charge. Sphere Y will have a negative charge.
- \_\_\_28. In what type of circuit do electrons follow one path from the source, to a load, and back to the source?
- short circuit
  - open circuit
  - parallel circuit
  - series circuit
  - connected circuit
- \_\_\_29. Two equal bar magnets are placed end-to-end with opposite poles a small distance apart. If a small piece of iron is placed exactly halfway between the magnets, the iron will
- be attracted to the N-pole
  - be attracted to the S-pole
  - stay in the middle
  - move upward
  - move downward

- \_\_\_30. An electromagnet has a lifting force of 3.6 N. If the current through the coil is doubled and the number of coils is tripled, the lifting force will become
- 0.90 N
  - 1.8 N
  - 2.4 N
  - 14 N
  - 22 N
- \_\_\_31. To use the right hand rule to predict the direction of an induced current in a coil, your thumb must point
- To the N-pole of the induced magnetic field.
  - To the S-pole of the induced magnetic field.
  - In the direction of the induced current.
  - In the direction of the inducing field.
  - In the direction of the electron flow.
- \_\_\_32. A ball is thrown vertically upward into the air. Which of the following acceleration-time graphs represents the ball's motion?



- A
  - B
  - C
  - D
  - E
- \_\_\_33. A pilot flies to a destination due north from the departure point. During the flight there is a wind blowing from the west. What direction must the pilot point the plane during the flight?
- due east
  - east of north
  - due north
  - due west
  - west of north

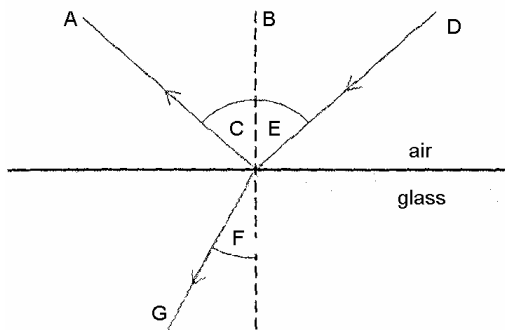
### Completion

Complete each sentence or statement.

- \_\_\_34. Plane A flies from Paris to New York, while plane B makes the same trip via London. Assume that the total time taken for both planes is the same. Considering the two trips, both planes have the same average \_\_\_\_\_ but different average \_\_\_\_\_.
- \_\_\_35. According to Newton's second law, the acceleration of an object is directly proportional to the \_\_\_\_\_ and inversely proportional to the \_\_\_\_\_.
- \_\_\_36. Newton's first law can really be attributed to an earlier man named \_\_\_\_\_.

### Matching

Match each letter to the proper description for a light ray travelling from air into glass.



37. normal

Match each definition with the letter of the term it best describes. A letter may be used more than once, or not at all.

- |                  |                 |
|------------------|-----------------|
| a. diamagnetic   | d. paramagnetic |
| b. ferromagnetic | e. nonmagnetic  |
| c. magnetic      |                 |

38. nickel is an example of this kind of material

### Short Answer

39. Distinguish between the terms "static" friction and "starting" friction.
40. What effect does increasing each of the following have on the wavelength of a wave?  
 (a) amplitude, if speed is constant  
 (b) speed, if frequency is constant  
 (c) frequency, if speed is constant
41. What type of lens is used in a magnifying glass? Explain.
42. Why are loads in a household circuit connected in parallel to the circuit, rather than in series?
43. A boat sets out from the east shore of a river that flows south. If the boat must land at a point directly opposite on the far shore, what direction must the boat point when crossing? Draw a fully labelled diagram to illustrate your answer.
44. Sketch position-time, velocity-time, and acceleration-time graphs for an object which has just begun to "free fall".

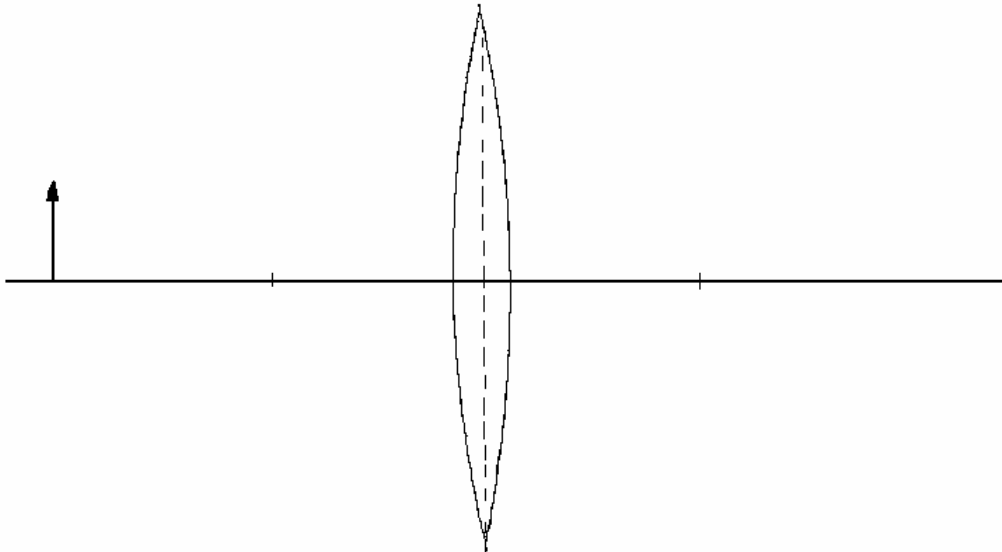
### Problem

45. A car is travelling at 20 m/s when it pulls out to pass a truck that is travelling at only 18 m/s. The car accelerates at  $2.0 \text{ m/s}^2$  for 4.0 s and then maintains this new velocity. (Assume 2 significant digits.)
- What distance does the car travel during the period of acceleration?
  - What is the car's speed at the end of the period of acceleration?
  - If the car was originally 8.0 m behind the truck when it pulled out to pass, how far in front of the truck is the car 10.0 s later?
  - On the same set of axes, sketch what the position-time graph would look like for both the car and the truck.

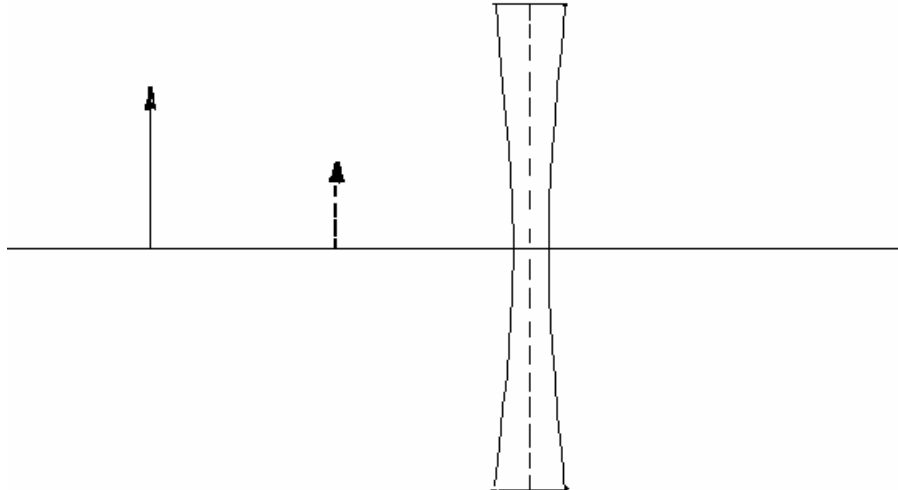
46. If 6.8 N of force are exerted horizontally on a 1.1-kg object and 2.4 N of friction are impeding its slide, what is the object's acceleration? Draw a free-body diagram.
47. A hockey puck of mass 200 g slides along the ice with a speed of 1.2 m/s when it reaches a rough section where the coefficient of kinetic friction is 0.25. How long will it take the puck to stop sliding? Include a free-body diagram. (Assume 2 significant digits.)
48. A person pushes a shovel into the ground to do some spring gardening. He applies force to the shovel over the following displacement.

Force (N)	Distance (cm)
0.0	0.0
4.0	2.0
8.0	4.0
12.0	6.0

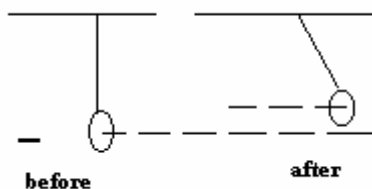
- (a) Draw a graph to represent the situation.
- (b) Calculate the work done by the man on the shovel over the 6.0 cm.
49. A 140-kg barrel that is initially at rest is pushed by a constant net force of 40.0 N. The barrel travels 200 cm in 5.0 s. The acceleration of the barrel is  $0.25 \text{ m/s}^2$ . Calculate the increase in kinetic energy during the 5.0 s.
50. Complete the ray diagram below to locate the image and list the four image characteristics.



51. Complete the ray diagram below to locate the primary and secondary foci.



52. A circuit has a current of 10.0 A. Calculate the number of electrons that pass a point in the circuit in 1 s.
53. In Spain, the standard electric current has a potential difference of 220 V. Canadian appliances, designed for a 120-V current, can be made to work safely if they are first connected to a transformer. If a 1750-W Canadian hair dryer is brought to Spain,
- What ratio of loops is needed in the primary and secondary coils of the transformer for the hair dryer to work properly?
  - How much current will the hair dryer use if it is connected to the transformer?  
How much current would the dryer use if it is plugged directly into the wall outlet in Spain?
54. A 2.0-kg bag is held by a string to the ceiling as shown in the diagram below. A 10-g bullet travelling at 200 m/s strikes the stationary bag. The height of the bag after the collision is 10.0 cm. Assuming there is no friction, determine the speed, in metres per second, of the bag after the collision.



55. A car sounds its horn as it approaches a pedestrian by the side of the road. The pedestrian has perfect pitch and determines that the sound from the horn has a frequency of 520 Hz. If the speed of sound that day was 340 m/s and the horn's frequency is 510Hz, how fast was the car travelling.
56. A tuning fork with a frequency of 400 Hz is struck with a second fork, and 20 beats are counted in 5.0 s. What are the possible frequencies of the second fork?
57. A sonar device is used in a lake, and the interval between the production of a sound and the reception of the echo is found to be 0.40 s. The speed of sound in water is 1500 m/s. What is the water depth?

58. A boat at anchor is rocked by waves whose crests are 30 m apart and whose speed is 8.0 m/s. What is the interval of time between crests striking the boat?
59. An open organ pipe has a fundamental frequency of 262 Hz at room temperature (20°). What is the length of the pipe?
60. A formula One car is moving at Mach 0.16 when the temperature of the air is 20° C. What is the speed of the car in kilometers per hour?
61. Diamond has a critical angle of 24°. Crown glass has a critical angle of 42°. Why does a piece of diamond sparkle more in bright light than a piece of crown glass, even if the two pieces are of the same shape?
62. A lens of focal length 20 cm is held 12 cm from a grasshopper that is 7.0 mm tall. Find the size, position, and type of the image of the grasshopper.
63. You are given a sample of four liquids. Describe how you would apply the concept of internal reflection to experimentally determine the identity of each liquid.
64. Light incident in water ( $n = 1.33$ ) strikes a layer of ice ( $n = 1.31$ ) that has formed on top of the water. What is the critical angle in the water?
65. A fully dressed astronaut, weighing  $1.2 \times 10^3$  N on Earth, is about to jump down from a space capsule which has just landed safely on Planet X. The drop to the surface of X is 2.8 m, and the astronaut's gravitational potential energy relative to the surface is  $1.1 \times 10^3$  J.
- What is the magnitude of the gravitational field strength on Planet X?
  - How long does the jump take?
  - What is the astronaut's maximum speed?