



“FUTURE LEADERS OF EURASIA” Competition
October 06-13, 2019

Physics {demo}

Time: 2 hours
20 Problems

Directions:

Each of the problem or statements below is followed by five suggested answers. Select the one that is best in each case and then fill in the corresponding space on the answer sheet.

Problem 1. Choose the statements:

An object that's moving with constant speed travels once around a circular path. True statements about this motion include which of the following?

- I. The displacement is zero.
- II. The average speed is zero.
- III. The acceleration is zero.

- A. III only
- B. I and II only
- C. I and III only
- D. I only
- E. II and III only

Your answer:

Problem 2. Solve the problem:

How long would it take a car starting from rest and accelerating uniformly in a straight line at 5 m/s^2 , to cover a distance of 250 m ?

- A. 9.0 s
- B. 10 s
- C. 12.0 s
- D. 15.5 s
- E. 20.0 s

Your answer:

Problem 3. Solve the problem:

If the distance between two-point particles is doubled, then the gravitational force between them

- A. decreases by a factor of 2
- D. increases by a factor of 4

B. decreases by a factor of 4

E. Cannot be determined without knowing the masses

C. increases by a factor of 2

Your answer:

Problem 4. Solve the problem:

A man who weighs 1000 N stands on a scale that is on the floor of an elevator car. If the elevator accelerates upward at a rate of 5 m/s^2 , what will the scale read?

A. 200 N

D. 1500 N

B. 500 N

E. 1600 N

C. 1000 N

Your answer:

Problem 5. Solve the problem:

There are three points of positive charges as shown in the figure. If the net electric force on the center charge is zero, what is the value of $\frac{y}{x}$?

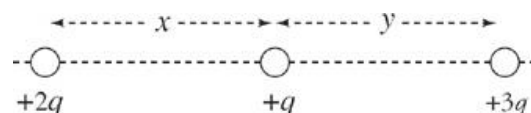
A. $\frac{4}{9}$

D. $\frac{3}{2}$

B. $\sqrt{\frac{2}{3}}$

E. $\frac{9}{4}$

C. $\sqrt{\frac{3}{2}}$



Your answer:

Problem 6. Solve the problem:

While a person lifts a book of mass 1 kg from the floor to a tabletop, 1.5 m above the floor, how much work does the gravitational force do on the book?

A. -30 J

D. 15 J

B. -15 J

E. 30 J

C. 0 J

Your answer:

Problem 7. Solve the problem:

What the fraction of the volume of an iceberg is under the water line? The density of ice is 900 kg/m^3 , the density of water is 1000 kg/m^3 .

Your answer:

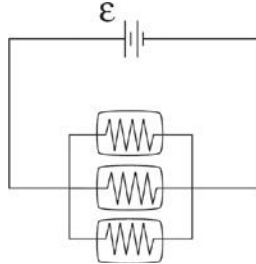
Problem 8. Solve the problem:

If a 100-watt light bulb operates at a voltage of 220 V, what is the resistance of the light bulb?

Your answer:

Problem 9. Choose the statements:

Three identical light bulbs are connected to a source of emf as shown in the figure. What will happen if the middle bulb burns out?



- A. All the bulbs will go out.
- B. The light intensity of the other two bulbs will remain the same.
- C. The light intensity of the other two bulbs will decrease (but they won't go out).

- D. The light intensity of the other two bulbs will increase.
- E. More current will be drawn from the source of emf.

Your answer:

Problem 10. Solve the problem:

A soccer ball, at rest on the ground, is kicked with an initial velocity of 20 m/s at a launch angle of 30° . Calculate its total flight time (s) assuming that air resistance is negligible.

Your answer:

Problem 11. Choose the statements:

Which of the following must always be true?

- I. If an object's acceleration is constant, then it must move in a straight line.
- II. If an object's acceleration is zero, then its speed must remain constant.
- III. If an object's speed remains constant, then its acceleration must be zero.

- A. I and II only
- B. I and III only
- C. III only
- D. II only
- E. II and III only

Your answer:

Problem 12. Solve the problem:

A stone is dropped off a cliff and strikes the ground with an impact velocity of 10 m/s. What is height of this cliff? Ignore air resistance.

- A. 5 m
- B. 20 m
- C. 30 m
- D. 50 m
- E. 60 m

Your answer:

Problem 13. Solve the problem:

If the distance between two-point particles is halved, then the gravitational force between them

- A. decreases by a factor of 4
- B. decreases by a factor of 2
- C. increases by a factor of 2
- D. increases by a factor of 4
- E. Cannot be determined without knowing the masses

Your answer:

Problem 14. Solve the problem:

A person who weighs 1000 N steps onto a scale that is on the floor of an elevator car. If the elevator accelerates downward at a rate of 5 m/s^2 , what will the scale read?

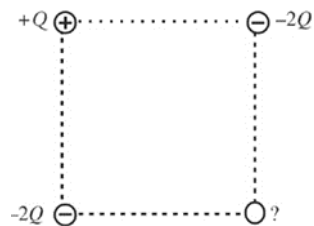
- A. 1500 N
- B. 1000 N
- C. 800 N
- D. 200 N
- E. 500 N

Your answer:

Problem 15. Solve the problem:

There are four points of charges fixed in position at the corners of a square as shown in the figure. What charge would have to be present at the bottom right location for the electric field at the center of the square to be zero?

- A. $+4Q$
- B. $+Q\sqrt{2}$
- C. $+2Q$
- D. $+3Q$
- E. $+Q$



Your answer:

Problem 16. Solve the problem:

While a person lifts a book of mass 3 kg from the floor to a tabletop, 2 m above the floor, how much work does the gravitational force do on the book?

- A. -60 J
- B. -15 J
- C. 0 J
- D. 15 J
- E. 60 J

Your answer:

Problem 17. Solve the problem:

What the fraction of the volume of an iceberg is above the water line? The density of ice is 900 kg/m^3 , the density of water is 1000 kg/m^3 .

Your answer:

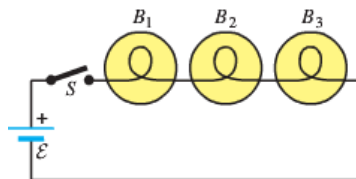
Problem 18. Solve the problem:

If a 60-watt lightbulb operates at a voltage of 120 V, what is the current through the bulb?

Your answer:

Problem 19. Solve the problem:

Three identical light bulbs are connected to a source of emf as shown in the figure. After the switch is closed, what will happen if the middle bulb burns out?



- A. All the bulbs will go out.
- B. The light intensity of the other two bulbs will decrease (but they won't go out).
- C. The light intensity of the other two bulbs will increase.
- D. The light intensity of the other two bulbs will remain the same.
- E. More current will be drawn from the source of emf.

Your answer:

Problem 20. Solve the problem:

A stone is thrown horizontally with an initial speed of 108 km/hr from a bridge. Find the stone's total speed when it enters the water 4 seconds later (ignore air resistance).

Your answer:

[illegible]