

TBAT Physics

Sample Questions

1

If the momentum of an object is tripled, by what factor does its kinetic energy increase?

- A. 3
- B. 6
- C. 9
- D. $\sqrt{3}$
- E. Insufficient information

2

A spherical ball is dropped into a highly viscous fluid. The viscous drag force exerted by the fluid on the ball is directly proportional to the ball's velocity. Which of the following best describes the change in the ball's acceleration?

- A. The acceleration will be constant throughout the motion.
- B. The acceleration will gradually increase.
- C. The ball will stop immediately upon contact with the fluid.
- D. The acceleration will gradually decrease until it becomes zero.
- E. The acceleration is always zero.

3

Two satellites, A and B, are in circular orbits around the Earth. Let R be the radius of the Earth. Satellite A orbits at an altitude of R above the Earth's surface, while satellite B orbits at an altitude of $3R$ above the Earth's surface. What is the ratio of the orbital speed of satellite A to that of satellite B?

- A. 2
- B. $1/2$
- C. $\sqrt{3}$
- D. $1/\sqrt{2}$
- E. $\sqrt{2}$

4

An object is released from rest and falls vertically under the influence of Earth's gravity, neglecting air resistance. Which of the following correctly describes the relationship between the object's momentum (p) and the elapsed time (t)?

- A. Momentum is directly proportional to the square of time ($p \propto t^2$).
- B. Momentum is constant.
- C. Momentum is directly proportional to time ($p \propto t$).
- D. Momentum is directly proportional to the square root of time ($p \propto \sqrt{t}$).
- E. Momentum is inversely proportional to time ($p \propto 1/t$).

5

Two speakers, A and B, emit sound isotropically. Speaker A is at position $x = -d/2$ and speaker B is at $x = 0$. A microphone is placed at $x = d$. The sound intensity measured at the microphone from each speaker individually is found to be the same. What is the ratio of the power of speaker A to the power of speaker B ?

- A. 1
- B. $4/9$
- C. $3/2$
- D. $9/4$
- E. $2/3$

6

You are standing still by the side of a straight road. An ambulance travels down the road at a high, constant speed. You observe that as it approaches its point of closest passage, its loudness is increasing, but at the same time, its pitch is decreasing. Which statement best explains this observation?

- A. The ambulance is moving away from you.
- B. The ambulance is moving directly towards you at a constant speed.
- C. The ambulance is approaching your general location but is not moving directly towards you.
- D. The ambulance is slowing down as it approaches you.
- E. This combination of observations is physically impossible.

7

A $10\ \Omega$ resistor and a $5\ \Omega$ resistor are connected in parallel to a battery.

If the current flowing through the $5\ \Omega$ resistor is $4\ \text{A}$, what is the voltage of the battery?

- A. $20\ \text{V}$
- B. $40\ \text{V}$
- C. $13.3\ \text{V}$
- D. $60\ \text{V}$
- E. $10\ \text{V}$

8

A square loop of wire with side length a lies in the xy -plane. A uniform magnetic field of magnitude B makes an angle of 30° with the z -axis. What is the magnetic flux through the loop?

- a) Ba^2
- b) $\frac{1}{2}Ba^2$
- c) $\frac{\sqrt{3}}{2}Ba^2$
- d) Zero
- e) not enough information

9

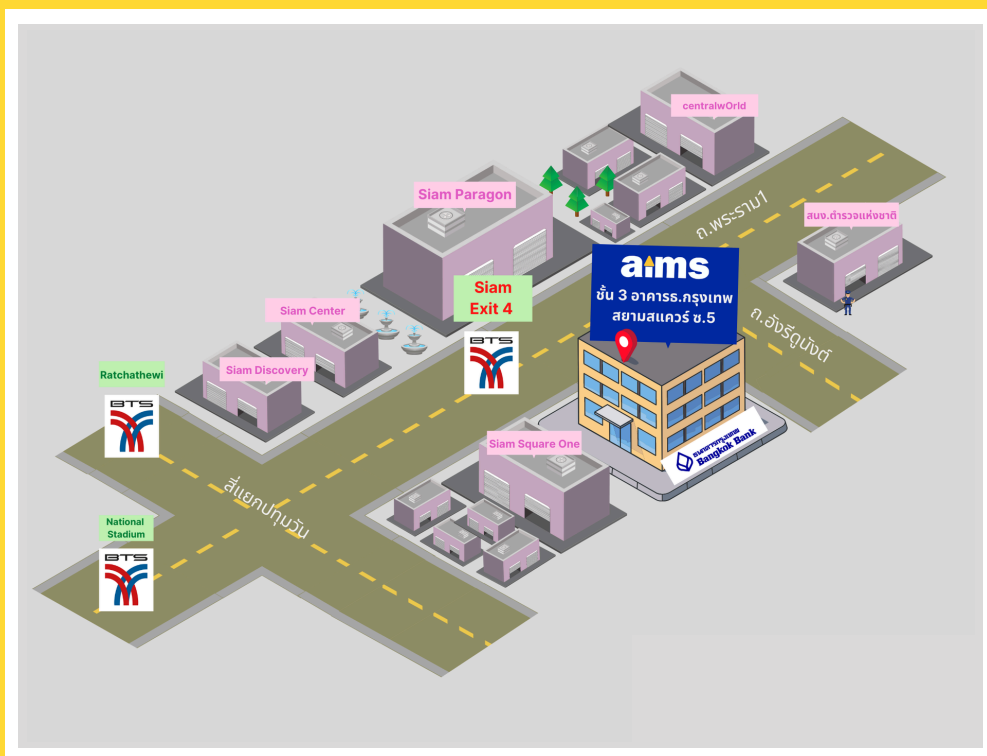
Which of the following correctly compares the speed of different electromagnetic waves in a vacuum?

- A. Gamma rays > Ultraviolet > Infrared > Radio waves
- B. Radio waves > Infrared > Ultraviolet > Gamma rays
- C. Ultraviolet > Gamma rays > Infrared > Radio waves
- D. Their speeds depend on their respective frequencies.
- E. Gamma rays = Ultraviolet = Infrared = Radio waves

10

A radioactive sample initially contains 180 grams of a substance. After 24 days, only 22.5 grams of the original substance remain. What is the half-life of this substance?

- A. 3 days
- B. 6 days
- C. 8 days
- D. 12 days
- E. 24 days




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