

Final: Physics 10-2021

1. Imagine sitting on a merry-go-round and riding along as it spins. Assuming you are not grabbing it anywhere and are not moving with respect to the platform,
 - A) you are not accelerating because you aren't moving on the platform.
 - B) static friction (directed outwards) causes you to accelerate.
 - C) static friction (directed inwards) causes you to accelerate.
 - D) sliding friction makes you accelerate inwards.
2. Suppose the moon's angular velocity is halved. By what factor will its rotational kinetic energy change?
 - A) It will double.
 - B) It will quadruple.
 - C) It will decrease to $\frac{1}{4}$ its original value.
 - D) It will decrease to $\frac{1}{2}$ its original value.
3. You are camping in the breathtaking mountains of Colorado. You spy an unopened diet soda can floating motionless below the surface of a lake. What is the direction and amount of force the water exerts on it?
 - A) Zero
 - B) Down, equal to the can's weight
 - C) Up, equal to the can's weight
 - D) Not enough information is given
4. Which temperature scale has 373 as the boiling point of water?
 - A) Fahrenheit
 - B) Celsius
 - C) Centigrade
 - D) Kelvin
5. "The entropy of an isolated system never decreases." Which Law of Thermodynamics is this?
 - A) Zeroth
 - B) First
 - C) Second
 - D) Third
6. Which of the following quantities is not conserved?
 - A) Energy
 - B) Angular momentum
 - C) Entropy
 - D) Momentum

7. When you blow gently across the top of a particular soda bottle, it emits a tone. The column of air in the bottle is vibrating up and down in its fundamental mode. If you replace the air in the bottle with helium and then blow gently across the top of the bottle, it will emit

- A) a higher pitched tone.
- B) a tone at the same pitch as before.
- C) no sound at all.
- D) a lower pitched tone.

8. How are standing waves and traveling waves different?

- A) A particle riding a standing wave has no motion.
- B) Traveling waves have troughs and crests.
- C) A particle riding a traveling wave has a nonzero average velocity perpendicular to the wave displacement.
- D) A standing wave is bigger.

9. An object pivoting about its center of mass is

- A) Free of net torque
- B) Motionless
- C) Always in motion
- B) Experiencing a torque about its center of mass.

10. You and a friend are spending the weekend making up missed lab experiments. You are on to second – semester material and are studying the electrostatic interaction of two charges. You notice that two charges are exerting a certain force on one another. If the distance between two electric charges doubles, then the force they exert on each other changes by how much?

- A) 4 times as large
- B) 2 times as large
- C) $\frac{1}{2}$ as large
- D) $\frac{1}{4}$ as large

11. You have just pulled your clothes from the dryer and find that a sock is clinging to your jeans with static electricity. You hold the jeans in one hand and the sock in the other and pull the two apart. As jeans and sock move apart, the forces between them become weaker because the

- A) electric charge on each garment increases as they move apart.
- B) electric current passing through each garment diminishes as they move apart.
- C) electric charge on each garment diminishes as they move apart.
- D) distance between the garments increase.

12. A power line carries current 10 A and has resistance 2.0 Ω . What is the voltage drop across the line?

- A) 200 V

- B) 20 V
- C) 10 V
- D) 5 V

13. You are working with a magnet and it breaks in half. You then end up with
- A) One north and one south pole
 - B) Two south poles only
 - C) Two north poles only
 - D) Two magnets, each with a south and a north pole.
14. Electricity and magnetism are different because
- A) There are no electric monopoles.
 - B) There are no magnetic monopoles.
 - C) Electrical forces decrease with increasing separation.
 - D) Only magnetism has to do with electrons.
15. Around high tension power lines there are
- A) electric, but no magnetic fields.
 - B) neither electric nor magnetic fields.
 - C) both electric and magnetic fields.
 - D) magnetic, but no electric fields.
16. Light passing from air into a denser transparent medium will
- A) speed up.
 - B) slow down.
 - C) not change speed.
 - D) Not enough information is given to determine.
17. Which answer has the colors in order from the shortest wavelength to the longest?
- A) Red Green Blue
 - B) Red Blue Green
 - C) Blue Red Green
 - D) Blue Green Red
18. What effect causes rainbows?
- A) Rayleigh scattering
 - B) Dispersion and total internal reflection
 - C) Impedance mismatch
 - D) Destructive Interference
19. In his special theory of relativity, Einstein stated that the laws of physics are
- A) different in different situations.

- B) common sense applied to microscopic and macroscopic
- C) the same in all frames of reference
- D) the same in all uniformly moving reference

20. General relativity predicts that

- A) light leaving the sun is slowed by gravity
- B) light passing the sun is deflected
- C) a clock on the Sun's surface runs faster than on Earth
- D) All of these

21. A 60 watt, 120 volt light bulb is designed to operate at a $1/2$ A current. If you screw this bulb into a fixture that is powered by very long thin wires it will glow more dimly than intended because the voltage drop across the bulb will be

- A) less than 120 V and the current through the bulb will be less than $1/2$ A.
- B) 120 V, but the current through the bulb will be less than $1/2$ A.
- C) 120 V and the current through the bulb will be $1/2$ A.
- D) less than 120 V, but the current will still be $1/2$ A.

22. After running a plastic comb through your hair several times you hold it above a small scrap of paper. The paper jumps off the table and sticks to the comb because the paper becomes

- A) magnetic.
- B) electrically charged.
- C) conducting.
- D) electrically polarized.

23. Electric fields come from

- A) electric charge only.
- B) electric charge or changing magnetic fields.
- C) changing magnetic fields only.
- D) electric charge or any magnetic field.

24. You fill two identical mugs with coffee, but the coffee in one mug is at a higher temperature than that in the other mug. You place the two mugs simultaneously in a microwave oven and turn it on briefly. As a result, you add 1 joule of thermal energy to each mug. Which mug experiences the larger increase in entropy (if any)?

- A) The two mugs experience equal increases in entropy.
- B) The mug containing the colder coffee experiences the larger increase in entropy.
- C) Neither mug experiences any increase in entropy.
- D) The mug containing the hotter coffee experiences the larger increase in entropy.

25. Ultraviolet light causes damage to your skin while infrared light does not because
- A) ultraviolet light has a longer wavelength than infrared light.
 - B) ultraviolet light has more photons than infrared light.
 - C) a photon of ultraviolet light carries much more energy than a photon of infrared light.
 - D) ultraviolet light is more intense than infrared light.
26. Astronauts in a space shuttle accelerating uniformly in a straight line far away from any planet or star would
- A) feel weightless.
 - B) feel just like there is local gravity
 - C) feel like they are moving very rapidly.
 - D) feel nothing
27. The maximum speed a rocket can achieve is
- A) the speed of light
 - B) the speed of sound.
 - B) equal to the speed of its exhaust plume.
 - C) less than the speed of its exhaust plume.
 - D) greater than the speed of its exhaust plume but less than the speed of light.
28. Suppose the time it takes for the moon to rotate doubles. By what factor will its rotational kinetic energy change?
- A) It will double.
 - B) It will quadruple.
 - C) It will decrease to $\frac{1}{4}$ its original value.
 - D) It will decrease to $\frac{1}{2}$ its original value.
29. An engineer at the company you are working for has just reported finding an unusual electromagnetic wave. This wave consists only of an electric field, with no magnetic field accompanying it. You are certain that the engineer is mistaken because
- A) an electromagnetic wave must have a magnetic field that changes with time to produce its electric field.
 - B) electromagnetic waves always contain both electric charges and magnetic poles, and magnetic poles are accompanied by magnetic fields.
 - C) electromagnetic waves contain moving electric charges and charges produce magnetic fields when they move.
 - D) while waves consisting only of electric fields are common and travels indefinitely through space, they are known as "electric waves," not "electromagnetic waves."
30. The principal advantage of sending electric power across country on very high voltage transmission lines is that

- A) they carry less energy per charge than low voltage transmission lines.
- B) electric power lost in the wires is greatly reduced.
- C) these transmission lines are less likely to get in the way than low voltage transmission lines—which are much closer to the ground.
- D) they carry much more current than low voltage transmission lines.