

**Final Review**  
Due on final exam day

Key

**How to study for your final:**

Read the multiple choice question. Find the equation that relates to the question. Identify the terms in the equation. Look in your notes the topic that relates to that equation. **Read your notes.** Answer the question.

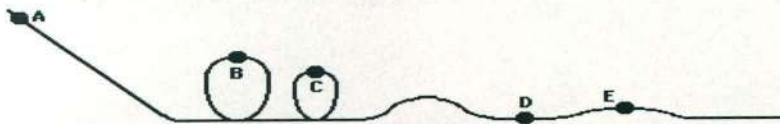
*If you simply choose answers without looking back at your notes you will not be prepared for the final exam.*

- 1) In physics, work is defined as
- force times time.
  - force divided by time.
  - c force times displacement.
  - force divided by displacement.
  - distance divided by time.

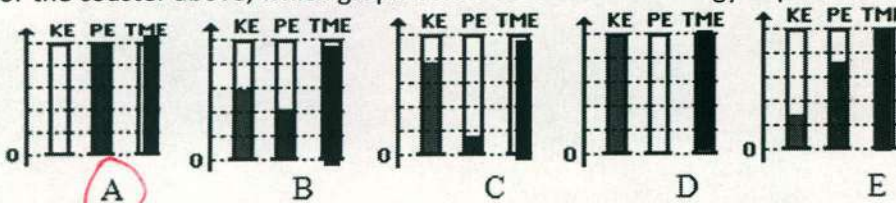
- 2) Energy is defined as
- Power
  - The effort required to perform work
  - c the ability of an object to produce change in the environment or itself
  - motion

$W = Fd$	$P = W/t$
$W = \Delta E$	$V = d/t$
$PE = mgh$	$v = f\lambda$
$KE = \frac{1}{2}mv^2$	$TE = KE + PE$

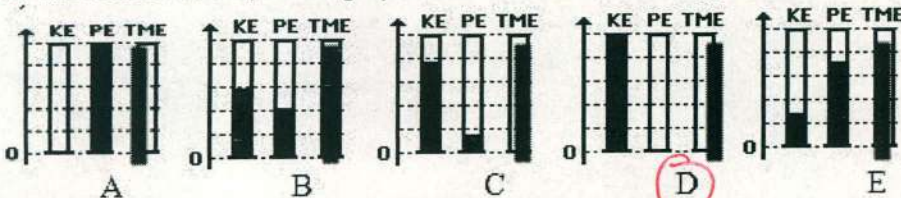
Use the graphs below to answer questions relating to the rollercoaster diagram.



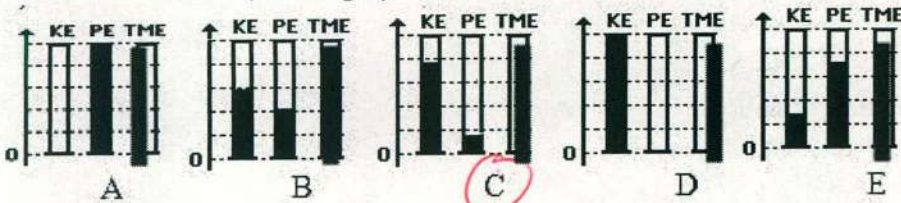
- 3) For the coaster above, which graph below describes the energy at position A (top of the hill)



- 4) For the coaster above, which graph best describes the energy at the bottom of the hill



- 5) For the coaster above, which graph best describes the energy at E

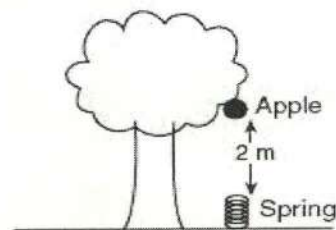


- 6) If you lift two loads up one story, how much work do you do compared to lifting just one load up one story?
- a) Four times as much
  - ☒ b) Twice as much
  - c) The same amount
  - d) One half as much
  - e) One quarter as much
- 7) If you lift one load up two stories, how much work do you do compared to lifting one load up only one story?
- a) Four times as much
  - ☒ b) Twice as much
  - c) The same amount
  - d) One half as much
  - e) One quarter as much
- 8) How many joules of work are done on an object when a force of 10 N pushes it 5 m?
- ☒ a) 50 J
  - b) 10 J
  - c) 5 J
  - d) 2 J
  - e) 1 J
- 9) The unit of work is the
- a) newton.
  - b) watt.
  - c) meter.
  - ☒ d) joule.
  - e) second.
- 10) How much power is required to do 100 J of work on an object in 2 seconds?
- a) 200 W
  - b) 100 W
  - ☒ c) 50 W
  - d) 2 W
  - e) 0 W
- 11) An object that has kinetic energy must be
- ☒ a) moving.
  - b) falling.
  - c) elevated.
  - d) at rest.
- 12) In a vacuum, electromagnetic radiation of short wavelengths....
- a) Can travel both faster and slower than radiation of long wavelengths
  - ☒ b) Travels as fast as radiation of long wavelengths
  - c) Travels faster than radiation of long wavelengths
  - d) Travels slower than radiation of long wavelengths
- 13) If a light ray strikes a flat mirror at an angle of 30 degrees from the normal, the ray will be reflected at an angle of
- ☒ a) 60 degrees from the mirror's surface
  - b) 90 degrees from the normal
  - c) 30 degrees from the mirror's surface
  - d) 60 degrees from the normal



- 14) If light waves change speed when they pass from one medium into another, the light will be...
- a) Reflected
  - ☒ b) Refracted
  - c) Diffused
  - d) Separated
- 15) If light waves change speed when they pass from one medium to another, the:
- a) Frequency will change, but the wavelength will stay the same
  - b) Frequency and wavelength will both change
  - ☒ c) Wavelength will change, but frequency will stay the same
  - d) Neither frequency nor wavelength will change
- 16) Part of a pencil that is placed in a glass of water appears bent in relation to the part of the pencil that extends out of the water. What is this phenomenon called?
- a) Reflection
  - b) Interference
  - ☒ c) Refraction
  - d) Diffraction
- 17) The amount of work done against friction to slide a box in a straight line across a uniform, horizontal floor depends most on the
- a) direction of the box's motion
  - b) speed of the box
  - c) time taken to move the box
  - ☒ d) distance the box is moved
- 18) Which action would require no work to be done on an object?
- a) pushing the object along a horizontal floor against a frictional force
  - b) lifting the object from the floor to the ceiling
  - ☒ c) holding the object stationary above the ground
  - d) decreasing the speed of the object until it comes to rest
- 19) A student does 300. joules of work pushing a cart 3.0 m due east and then does 400. joules of work pushing the cart 4.0 m due north. The total amount of work done by the student is
- a) 500. J
  - b) 2500 J
  - ☒ c) 700. J
  - d) 100. J
- 20) A 0.10-kilogram ball dropped vertically from a height of 1.00 meter above the floor bounces back to a height of 0.80 meter. The mechanical energy lost by the ball as it bounces is
- ☒ a) 0.20 J
  - b) 0.78 J
  - c) 0.080 J
  - d) 0.30 J

- 21) The diagram below shows a 0.1-kilogram apple attached to a branch of a tree 2 meters above a spring on the ground below. The apple falls and hits the spring, compressing it 0.1 meter from its rest position. If all of the gravitational potential energy of the apple on the tree is transferred to the spring when it is compressed, what energy is stored in this compressed spring?

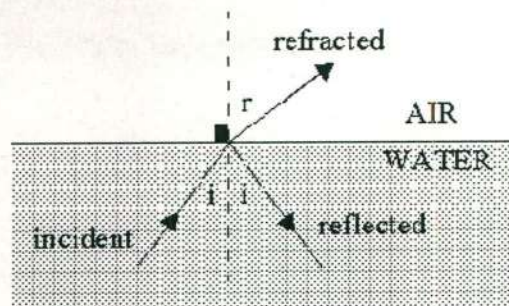


- a) 10J
  - b) 5J
  - ☒ c) 2J
  - d) 0.2J
- 22) A 1-kilogram rock is dropped from a cliff 70 meters high. After falling 30 meters, the kinetic energy of the rock is approximately
- a) 700 J
  - b) 400 J
  - c) 30 J
  - ☒ d) 300 J
- 23) A 45.0-kg diver falls freely from a diving platform that is 4.00 meters above the surface of the water in a pool. When she is 1.00 meter above the water, what are her gravitational potential energy and kinetic energy with respect to the water's surface?
- a) PE = 882 J and KE = 882 J
  - ☒ b) PE = 441 J and KE = 1343 J
  - c) PE = 1764 J and KE = 0 J
  - d) PE = 1343 J and KE = 441 J
- 24) A guitar string playing a note creates a wave in the string. These waves are best classified as
- a) transverse, because the string molecules are vibrating parallel to the direction of wave motion
  - ☒ b) transverse, because the string molecules are vibrating perpendicular to the direction of wave motion
  - c) longitudinal, because the string molecules are vibrating parallel to the direction of wave motion
  - d) longitudinal, because the string molecules are vibrating perpendicular to the direction of wave motion
- 25) When driving your car, you notice that the dashboard vibrates when your speakers emit a certain frequency note. This phenomenon illustrates
- a) Diffraction
  - b) Refraction
  - ☒ c) Resonance
  - d) reflection
- 26) A vibrating tuning fork is located in a glass container. When the air is removed from the container, why can the tuning fork be seen vibrating but not be heard?
- ☒ a) Light waves can travel through a vacuum, but sound waves cannot.
  - b) Sound waves have greater amplitude than light waves.
  - c) Light waves travel slower than sound waves.
  - d) Sound waves have higher frequency than light
- 27) A reflection off of a smooth surface like a mirror can produce a clear image because of
- a) diffuse reflection
  - ☒ b) specular reflection
  - c) refraction
  - d) resonance



- 28) The diagram at right shows a light ray passing into air ( $n = 1$ ) from water ( $n = 1.33$ ). If the incident ray hits the surface at an angle of  $25^\circ$  from the normal line, what is the angle between the reflected ray and the normal line?

a)  $34^\circ$   
☒ b)  $25^\circ$   
 c)  $19^\circ$   
 d)  $1.33^\circ$



- 29) In the diagram above, if the incident ray hits the surface at an angle of  $25^\circ$  from the normal line, what is the angle between the normal line and the refracted light ray in the air?

☒ a)  $34^\circ$   
 b)  $25^\circ$   
 c)  $19^\circ$   
 d)  $1.33^\circ$

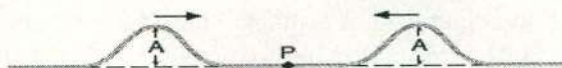
$$1.33 \sin(25) = 1 \sin \theta_2$$

- 30) As an object is moved closer to a plane (flat) mirror, what happens to the position of its image?

☒ a) It gets closer to the mirror  
 b) It gets farther from the mirror  
 c) It stays in the same position  
 d) It disappears

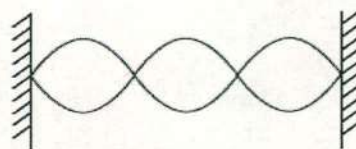
- 31) The diagram below represents a rope along which two pulses of equal amplitude,  $A$ , approach point  $P$ . As the two pulses pass through point  $P$ , the maximum vertical displacement of the rope at point  $P$  will be

a)  $A$   
 b)  $0$   
☒ c)  $2A$   
 d)  $A/4$



- 32) 6. How many nodes are represented in the standing wave diagram below?

a) 1  
 b) 6  
☒ c) 4  
 d) 3



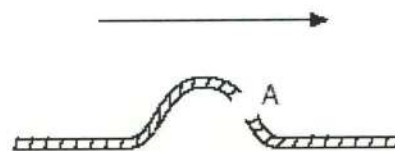
- 33) A wave completes one vibration as it moves a distance of 4 meters at a speed of 40 m/s. What is the frequency of the wave?

a) 2 Hz  
 b) 40 Hz  
☒ c) 10 Hz  
 d) 20 Hz

- 34) What is the period of a wave if 40 crests pass an observer in 2 seconds?

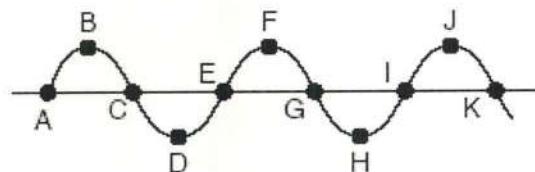
a) 80 s  
 b) 20 s  
 c) 10 s  
☒ d) 0.05 s

- 35) The diagram below shows a pulse moving to the right in a rope. A is a point on the rope. Which arrow best shows the direction of movement of point A at this instant?



- 36) The diagram below represents a periodic wave. Which two points on the wave are in phase?

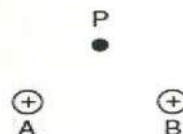
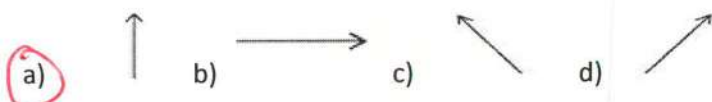
- a) C and K  
b) D and I  
c) A and D  
d) A and G



- 37) As a pulse travels along a rope, the pulse loses energy and its amplitude

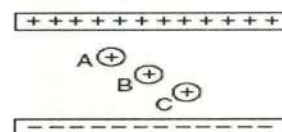
- a) Increases  
b) remains the same  
c) decreases

- 38) In the diagram below, two identical spheres, A and B, have equal net positive charges. Which arrow best represents the direction of their resultant electric field at point P?



- 39) Identical charges A, B, and C are located between two oppositely charged parallel plates, as shown in the diagram below. The magnitude of the force exerted on the charges by the electric field between the plates is

- a) the same for A, B, and C  
b) least on A and greatest on C  
c) the same on A and C, but less on B

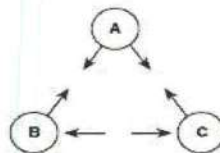


- 40) A rubber rod becomes negatively charged when it is rubbed with fur. This net negative charge accumulates because the rubber rod

- a) gains protons  
b) loses protons  
c) gains electrons  
d) loses electrons

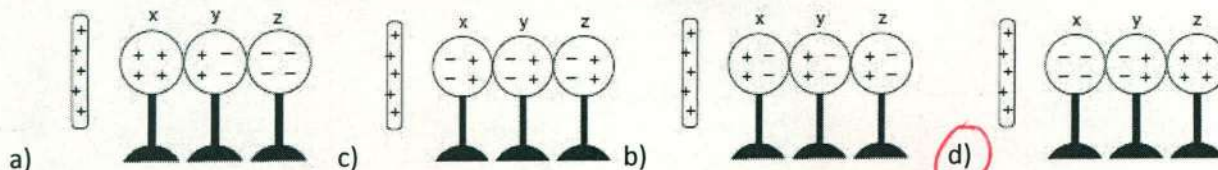
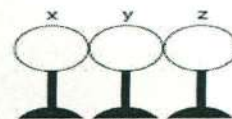
- 41) The diagram below shows the arrangement of three charged hollow metal spheres, A, B, and C. The arrows indicate the direction of the electric forces acting between the spheres. At least two of the spheres are positively charged. Which sphere, if any, could be negatively charged?

- a) sphere C  
b) sphere B  
c) sphere A  
d) no sphere





- 42) The diagram on the left shows three neutral metal spheres, x, y, and z, in contact and on insulating stands. Which diagram best represents the distribution of excess charges (i.e. not all charges are shown, just unbalanced charges) on the spheres when a positively charged rod is brought near sphere x, but does not touch it?



- 43) A balloon is charged by friction so that it is positively charged. It is placed near another balloon, and the two balloons are attracted to each other. The second balloon's charge:

- a) must be positive
- b) must be negative
- c) could be either positive or neutral
- ☒ d) could be either negative or neutral

- 44) Magnetic field lines always:

- ☒ a) point from North to South poles
- b) point from South to North poles
- c) point away from all parts of a magnet
- d) point toward all parts of a magnet

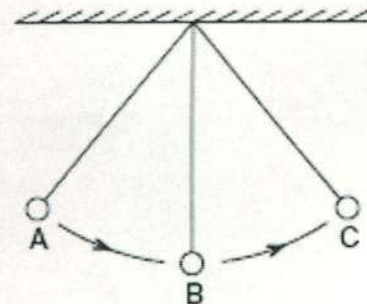
- 45) Electromagnetic radiation is another term for:

- a) sound waves
- ☒ b) light waves
- c) ocean waves
- d) string waves

- 46) All light waves have the same:

- a) frequency
- b) period
- ☒ c) speed
- d) wavelength

- 47) A pendulum (at right) is pulled back to position A and released from rest. Describe the changes in its energy as it goes through one complete swing, from A, to B, to C, then back to B and A.



a) At A: *All Potential Energy*

b) At B: *All Kinetic Energy*

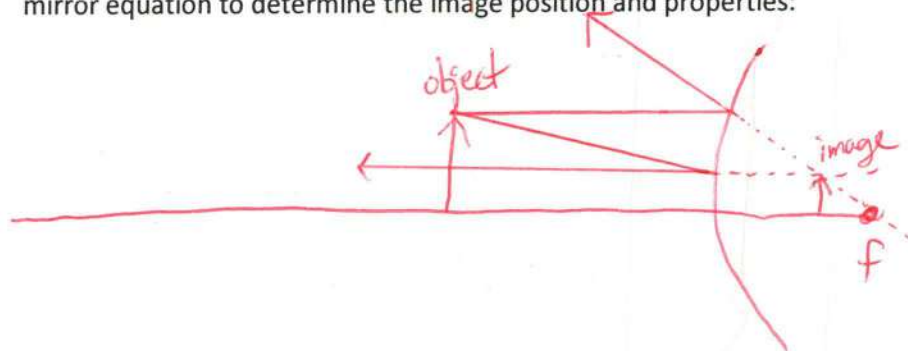
c) At C: *All PE*

d) Back at B: *All KE*

e) Back at A: *All PE*

*Always same Total Energy*

- 48) A convex mirror has a focal length of -12 cm. If a pen is placed 18 cm in front of the mirror, use a ray diagram and mirror equation to determine the image position and properties:



$$\frac{1}{-12} = \frac{1}{18} + \frac{1}{d_i}$$

$$d_i = -7.2 \text{ cm}$$

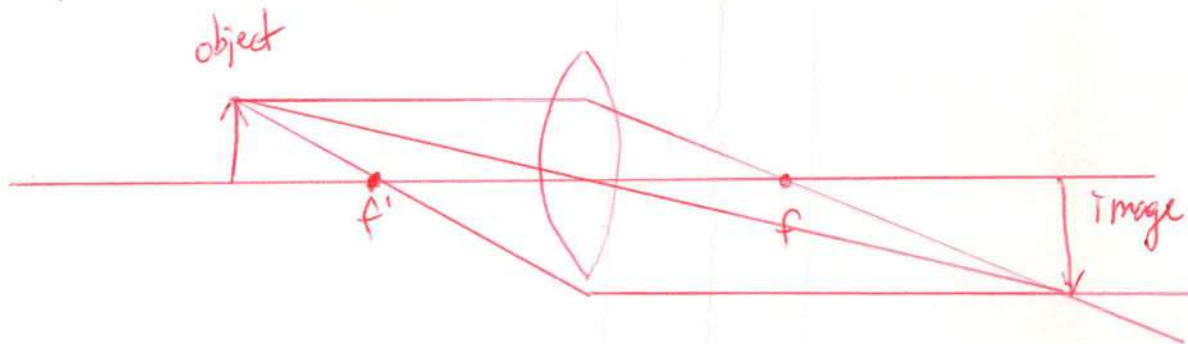
Image position: -7.2 cm

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- 49) A convex lens has a focal length of 22 cm. If a pencil is placed 36 cm in front of the mirror, use a ray diagram and lens equation to determine the image position and properties:



$$\frac{1}{22} = \frac{1}{36} + \frac{1}{d_i}$$

Image position: 56.6 cm

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