

## Energy

- 1) If you push for a half hour or a whole hour against a stationary wall,
- A) no work is done in either case.
  - B) half as much work is done during the half hour.
  - C) twice as much work is done during the half hour.
  - D) it is impossible to determine how much work is done.

Answer: A

- 2) If you push an object a given distance, while applying twice the force, you do
- A) twice as much work.
  - B) four times as much work.
  - C) the same amount of work.
  - D) half as much work.

Answer: A

- 3) A job is done slowly, while an identical job is done quickly. Both jobs require the same amount of work, but different amounts of
- A) energy.
  - B) power.
  - C) effort.
  - D) none of these

Answer: B

- 4) The power required to exert 1 N force, over a distance of 1 m in 1 second is
- A) 1 W.
  - B) 2 W.
  - C)  $\frac{1}{3}$  W.
  - D) 3 W.
  - E) none of these.

Answer: A

- 5) If an object is raised twice as high, its potential energy will be
- A) half as much
  - B) twice as much.
  - C) four times as much.
  - D) impossible to determine unless the time is given.

Answer: B

- 6) A 1000-kg car and a 2000-kg car are hoisted the same distance. Raising the more massive car requires
- A) less work.
  - B) as much work.
  - C) twice as much work.
  - D) four times as much work.
  - E) more than four times as much work.

Answer: C

- 7) An object may have potential energy because of its
- A) speed.
  - B) acceleration.
  - C) momentum.
  - D) location.
  - E) none of these

Answer: D

- 8) A clerk can lift containers a vertical distance of 1 meter or can roll them up a 2 meter-long ramp to the same elevation. With the ramp, the applied force required is about
- A) half as much.
  - B) twice as much.
  - C) the same.
  - D) four times as much.

Answer: A

- 9) When a car is braked to a stop, its kinetic energy is transformed to
- A) stopping energy.
  - B) potential energy.
  - C) energy of motion.
  - D) energy of rest.
  - E) heat.

Answer: E

- 10) A hydraulic press, like a wheel and axle, is capable of multiplying force input.
- A) always true
  - B) always false
  - C) sometimes true
  - D) sometimes false

Answer: A

Diff: 1

Topic: Energy

- 11) The ball rolling down an incline has its maximum potential energy at
- A) the top.
  - B) a quarter of the way down.
  - C) halfway down.
  - D) the bottom.

Answer: A

- 12) A block of ice sliding down an incline has its maximum speed at
- A) the top.
  - B) the bottom.
  - C) halfway down.
  - D) difficult to predict without knowing the slope of the incline
  - E) difficult to predict without knowing the coefficient of friction

Answer: B

- 13) A light aluminum ball and a heavy lead ball of the same size are allowed to roll down an incline. When they are halfway down the incline, they will have identical
- A) kinetic energies.
  - B) potential energies.
  - C) momentum.
  - D) inertias.
  - E) none of the above choices

Answer: E

- 14) No work is done by gravity on a bowling ball that rolls along a bowling alley because
- A) no force acts on the ball.
  - B) no distance is covered by the ball.
  - C) the force on the ball is at right angles to the ball's motion.

D) no potential energy is being converted to kinetic energy.

E) its kinetic energy remains constant.

Answer: C

15) Both A 50-kg sack is lifted 2 meters from the ground and a 25-kg sack is lifted 4 meters in the same time. The power expended in raising the 50-kg sack is

A) twice as much.

B) half as much.

C) the same.

D) impossible to predict without further information

Answer: C

16) It takes 40 J to push a large box 4 m across a floor. Assuming the push is in the same direction as the move, what is the magnitude of the force on the box?

A) 4 N

B) 10 N

C) 40 N

D) 160 N

E) none of these

Answer: B

17) A 2 kg mass has 40 J of potential energy with respect to the ground. Approximately how high is it above the ground?

A) 1 m

B) 2 m

C) 3 m

D) 4 m

E) none of these

Answer: B

18) Using 1000 J of work, a toy elevator is raised from the ground floor to the second floor in 20 seconds. The power needed to do this job was

A) 20 W.

B) 50 W.

C) 100 W.

D) 1000 W.

E) 20,000 W.

Answer: B

19) Two identical arrows, one with twice the kinetic energy of the other, are fired into a hay bale. The faster arrow will penetrate

A) the same distance as the slower arrow.

B) twice as far as the slower arrow.

C) four times as far as the slower arrow.

D) more than four times as far as the slower arrow.

E) none of these

Answer: B

20) A ball is projected into the air with 100 J of kinetic energy which is transformed to gravitational potential energy at the top of its trajectory. When it returns to its original level after encountering air resistance, its kinetic energy is

A) less than 100 J.

B) more than 100 J.

- C) 100 J.
- D) not enough information given

Answer: A

- 21) A machine puts out 100 Watts of power for every 1000 Watts put into it. The efficiency of the machine is
- A) 10%.
  - B) 50%.
  - C) 90%.
  - D) 110%.
  - E) none of these

Answer: A

- 22) A woman carries a heavy box across a room at a constant speed. How much work does she do on the box while walking ?
- A) none
  - B) More information is needed about the weight of the box.
  - C) More information is needed about the distance walked.
  - D) More information is needed about the speed and the distance.
  - E) More information is needed about the weight, distance, and her speed.

Answer: A

- 23) Which has greater kinetic energy, a car traveling at 30 km/hr or a car of half the mass traveling at 60 km/hr?
- A) the 30 km/hr car
  - B) the 60 km/hr car
  - C) Both have the same kinetic energy.
  - D) More information is needed about the distance traveled.

Answer: B

- 24) Consider a hydraulic press. When the input piston is depressed 20 cm, the output piston is raised 1 cm. On the same press, an input force of 1 N can lift a load of
- A) 1 N.
  - B) 10 N.
  - C) 15 N.
  - D) 20 N.
  - E) All of the above are correct.

Answer: E

- 25) A pulley system raises a 1000-N load 2 meters with 100 N of input force. The efficiency of the system is
- A) 10%.
  - B) 90%.
  - C) 100%.
  - D) Not enough information is given.

Answer: D

- 26) Which requires the most amount of work by the brakes of a car?
- A) slowing down from 100 km/h to 70 km/h
  - B) slowing down from 70 km/h to a stop
  - C) equal amounts for either

Answer: A

- 27) Two identical arrows, one with twice the speed of the other, are fired into a hay bale. The faster arrow will penetrate
- A) the same distance as the slower arrow.

- B) twice as far as the slower arrow.
- C) four times as far as the slower arrow.
- D) more than four times as far as the slower arrow.
- E) none of these

Answer: C

- 28) If a power plant is 30% efficient, and the transmission system that delivers power to consumers is 60% efficient, then the overall efficiency is
- A) 90%.
  - B) 60%.
  - C) 30%.
  - D) 18%.
  - E) none of these

Answer: D

- 29) A car's engine is 20% efficient. When cruising, the car encounters an average retarding force of 1000 N. If the energy content of gasoline is 40 megajoules per liter, how many kilometers per liter does the car get?
- A) 14
  - B) 12
  - C) 10
  - D) 8
  - E) none of these

Answer: D

- 30) On a sunny day about 500 watts of solar power are received by each of the four solar cells on the roof of a solar-powered automobile.. If the solar cells were 100 % efficient, they would deliver
- A) 0.27 hp.
  - B) 2.7 hp.
  - C) 27 hp.
  - D) 270 hp.

Answer: B

## Energy and Momentum

- 31) Whereas impulse involves the time that a force acts, work involves the
- A) distance that a force acts.
  - B) time and distance that a force acts.
  - C) acceleration that a force produces.

Answer: A

- 32) A moving object has
- A) speed.
  - B) velocity.
  - C) momentum.
  - D) energy.
  - E) all of these

Answer: E

- 33) If an object has kinetic energy, then it also must have
- A) impulse.
  - B) momentum.
  - C) acceleration.
  - D) force.
  - E) none of these

Answer: B

- 34) An object at rest may also have
- A) speed.
  - B) velocity.
  - C) momentum.
  - D) kinetic energy.
  - E) potential energy.

Answer: E

- 35) A heavy and a light object released from the same height in a vacuum have equal
- A) weights.
  - B) momenta.
  - C) kinetic energies.
  - D) accelerations.
  - E) none of the above

Answer: D

36) Compared to the recoiling rifle, the bullet fired has

- A) a greater momentum.
- B) a greater kinetic energy.
- C) a smaller speed.
- D) all of the above

Answer: B

37) An open freight car rolls friction free along a horizontal track in a pouring rain that falls vertically. As water accumulates in the car, the car's speed

- A) increases.
- B) decreases.
- C) doesn't change.
- D) cannot be determined with the information given

Answer: B

38) If a ping pong ball and a golf ball are both moving in the same direction with the same amount of kinetic energy, the speed of the ping pong ball must be

- A) less than the golf ball.
- B) more than the golf ball.
- C) the same as the golf ball.
- D) impossible to predict without additional information

Answer: B

39) A golf ball is thrown at and bounces backward from a massive bowling ball that is initially at rest. After the collision, compared to the golf ball, the bowling ball has

- A) more momentum, but less kinetic energy.
- B) more kinetic energy, but less momentum.
- C) more momentum and more kinetic energy.
- D) less momentum and less kinetic energy.
- E) Not enough information is given to say.

Answer: A

40) Two identical freight cars roll without friction (one at 1 m/s, the other at 2 m/s) toward one another on a level track. They collide, couple together, and roll away in the direction that

- A) the slower car was initially going.
- B) the faster car was initially going.
- C) neither of these — they stop.

Answer: B

- 41) Two identical objects in outer space have a head-on collision and stick together. If, before the collision, one had been moving at 2 m/s and the other at 1 m/s, their combined speed after the collision would be
- A) 0.5 m/s.
  - B) 0.33 m/s.
  - C) 0.67 m/s.
  - D) 1.0 m/s.
  - E) none of these

Answer: A

- 42) A motorcycle with a mass of 100 kilograms, slowly rolls over the edge of a cliff and falls for three seconds before it reaches the bottom of a gully. Its momentum ( in units of kilogram meters per second) just before it hit bottom and became burned rubber and scrap metal was
- A) 1,000.
  - B) 2,000.
  - C) 3,000.
  - D) 4,000.
  - E) 9,000.

Answer: C

- 43) A 1-kg ball dropped from a height of 2 m rebounds only 1.5 m after hitting the ground. The amount of energy converted to heat is about
- A) 0.5 J.
  - B) 1.0 J.
  - C) 1.5 J.
  - D) 2.0 J.
  - E) more than 2.0 J.

Answer: E

- 44) If several balls are thrown straight up with varying initial velocities, the quantity that will have the same value for each trial is the ball's
- A) initial momentum.
  - B) maximum height.
  - C) time of travel.
  - D) acceleration.
  - E) None of the above choices are correct.