Work and Energy Test Review

1. Analyze the following graphs:





2. Diagram a pendulum swing and describe the energies at each point in the swing of the pendulum.

3) Person X pushes twice as hard against a stationary brick wall as person Y. Which one of the following statements is correct?

- A) Both do positive work, but person X does four times the work of person Y.
- B) Both do positive work, but person X does twice the work of person Y.
- C) Both do the same amount of positive work.
- D) Both do zero work.
- E) Both do positive work, but person X does one-half the work of person Y.

4) If the force on an object is in the negative direction, the work it does on the object must be A) negative.

B) positive.

C) The work could be either positive or negative, depending on the direction the object moves.

5) A 35-N bucket of water is lifted vertically 3.0 m and then returned to its original position. How much work did gravity do on the bucket during this process?
A) 180 J
B) 90 J
C) 45 J
D) 0 J
E) 900 J

6) Which one has larger kinetic energy: a 500-kg object moving at 40 m/s or a 1000-kg object moving at 20 m/s?

A) The 500-kg object

B) The 1000-kg object

C) Both have the same kinetic energy.

7) Three cars (car F, car G, and car H) are moving with the same speed and slam on their brakes. The most massive car is car F, and the least massive is car H. If the tires of all three cars have identical coefficients of kinetic friction with the road surface, which car travels the longest distance to skid to a stop?

A) They all travel the same distance in stopping.

B) Car F

C) Car G

D) Car H

8) A stone is held at a height h above the ground. A second stone with four times the mass of the first one is held at the same height. The gravitational potential energy of the second stone compared to that of the first stone is

A) one-fourth as much.

B) one-half as much.

C) twice as much.

D) four times as much.

E) the same.

9) You and your friend, who weighs the same as you, want to go to the top of the Eiffel Tower. Your friend takes the elevator straight up. You decide to walk up the spiral stairway, taking longer to do so. Compare the gravitational potential energy of you and your friend, after you both reach the top.

A) It is impossible to tell, since the times you both took are unknown.

B) It is impossible to tell, since the distances you both traveled are unknown.

C) Your friend's gravitational potential energy is greater than yours, because he got to the top faster.

D) Both of you have the same amount of gravitational potential energy at the top.

E) Your gravitational potential energy is greater than that of your friend, because you traveled a greater distance in getting to the top.

10) When you throw a pebble straight up with initial speed V, it reaches a maximum height H with no air resistance. At what speed should you throw it up vertically so it will go twice as high?

A) 16V

B) 8V

C) 4V

D) 2<u>V</u>

E) $\sqrt{2}V$

11) When you drop a pebble from height *H*, it reaches the ground with speed *V* if there is no air resistance. From what height should you drop it so it will reach the ground with twice speed? A) $\sqrt{2}H$

 \dot{B} 2H

C) 4*H*

D) 8*H*

E) 16H

12) Swimmers at a water park have a choice of two frictionless water slides, as shown in the figure. Although both slides drop over the same height h, slide 1 is straight while slide 2 is curved, dropping quickly at first and then leveling out. How does the speed v_1 of a swimmer reaching the bottom of slide 1 compare with v_2 , the speed of a swimmer reaching the end of slide 2?



A) $v_1 > v_2$

B) $v_1 < v_2$

C) $v_1 = v_2$

D) The heavier swimmer will have a greater speed than the lighter swimmer, no matter which slide he uses.

E) No simple relationship exists between v_1 and v_2 .

13) Two frisky otters slide down frictionless hillsides of the same height but different slopes. The slope of the hill of otter 1 is 30° , while the slope of the hill of otter 2 is 60° . If both start from rest, which otter is moving faster when she reaches the bottom of her hill?

A) Otter 1 is moving faster.

B) Otter 2 is moving faster.

C) The heavier otter is moving faster, no matter which hill she used.

D) Both otters have the same speed at the bottom.

E) The otter that took the shorter time is moving faster.

14) A stone can slide down one of four different frictionless ramps, as shown in the figure. For which ramp will the speed of the ball be the greatest at the bottom?



C) Ramp Z

D) The speed of the ball will be the same for all ramps.

15) Two identical grasshoppers jump into the air with the same initial speed and experience no air resistance. Grasshopper A goes straight up, but grasshopper B goes up at a 66° angle above the horizontal. Which of the following statements about these grasshoppers are correct? (There could be more than one correct choice.)

A) At their highest point, both of them have the same amount of gravitational potential energy.

B) At their highest point, both of them have the same amount of kinetic energy.

C) At their highest point, both of them have the same amount of mechanical energy.

D) At their highest point, grasshopper B is moving faster than grasshopper A.

E) At their highest point, grasshopper A has more gravitational potential energy than grasshopper B.

16) Jill does twice as much work as Jack does and in half the time. Jill's power output is

A) the same as Jack's power output.

B) one-fourth as much as Jack's power output.

C) one-half as much as Jack's power output.

D) twice Jack's power output.

E) four times Jack's power output.

17) A force produces power *P* by doing work *W* in a time *T*. What power will be produced by a force that does six times as much work in half as much time?

A) 12P B) 6P C) P D) $\frac{1}{6}P$ E) $\frac{1}{12}P$ 18) An egg falls from a bird's nest in a tree and feels no effects due to the air. As it falls,

A) only its kinetic energy is conserved.

B) only its momentum is conserved.

C) both its kinetic energy and its momentum are conserved.

D) only its mechanical energy is conserved.

E) both its mechanical energy and its momentum are conserved.

19) A rubber ball bounces off of a wall with an initial speed v and reverses its direction so its speed is v right after the bounce. As a result of this bounce, which of the following quantities of the ball are conserved? (There could be more than one correct choice.)

A) the kinetic energy of the ball

B) the momentum of the ball

C) both the momentum and the kinetic energy of the ball

D) None of the above quantities are conserved.

20) You carry a 7.0-kg bag of groceries 1.2 m above the ground at constant speed across a 2.7 m room. How much work do you do on the bag in the process?

A) 0.00 J

B) 82 J

C) 185 J

D) 157 J

21) A 500-kg elevator is pulled upward with a constant force of 5500 N for a distance of 50.0 m.

(a) What is the work done by the 5500-N force?

(b) What is the work done by gravity?

(c) What is the net work done on the elevator?

22) Find the net work done by friction on a box that moves in a complete circle of radius 1.82 m on a uniform horizontal floor. The coefficient of kinetic friction between the floor and the box is 0.25, and the box weighs 65.0 N.

A) 190 J

B) 0 J

C) 1800 J

D) 370 J

23) What is the minimum energy needed to change the speed of a 1600-kg sport utility vehicle from 15.0 m/s to 40.0 m/s?

A) 1.10 MJ B) 10.0 kJ C) 20.0 kJ

D) 40.0 kJ

E) 0.960 MJ

24) A tennis ball bounces on the floor three times, and each time it loses 23.0% of its energy due to heating. How high does it bounce after the third time, if we released it 4.0 m from the floor? A) 180 cm

B) 18 cm

C) 180 mm

D) 240 cm

25) An ideal spring has a spring constant (force constant) of 2500 N/m. is stretched 4.0 cm. How much work is required to stretch the spring by 4.0 cm?

A) 4.0 J

B) 0.00 J

C) 1.0 J

D) 3.0 J

E) 2.0 J

26) If 4.0 J of work are performed in stretching an ideal spring with a spring constant (force constant) of 2500 N/m, by what distance is the spring stretched?

A) 3.2 cm

B) 3.2 m

C) 0.3 cm

D) 5.7 m

E) 5.7 cm

27) A rock falls from a vertical cliff that is 4.0 m tall and experiences no significant air resistance as it falls. At what speed will its gravitational potential energy (relative to the base of the cliff) be equal to its kinetic energy?

A) 3.1 m/s B) 4.4 m/s

C) 6.3 m/s

D) 8.9 m/s

E) 13 m/s

28) A block slides down a frictionless inclined ramp and experiences no significant air resistance. If the ramp angle is 17.0° above the horizontal and the length of the surface of the ramp is 20.0 m, find the speed of the block as it reaches the bottom of the ramp, assuming it started sliding from rest at the top.

A) 10.7 m/s B) 114 m/s C) 7.57 m/s D) 19.6 m/s 29) If a spring-operated gun can shoot a pellet to a maximum height of 100 m on Earth, how high could the pellet rise if fired on the Moon, where $g = 1.6 \text{ m/s}^2$?

- A) 17 m
- B) 160 m
- C) 3.6 km
- D) 100 m
- E) 610 m

30) An object with a mass of 10 kg is initially at rest at the top of a frictionless inclined plane that rises at 30° above the horizontal. At the top, the object is initially 8.0 m from the bottom of the incline, as shown in the figure. When the object is released from this position, it eventually stops at a distance *d* from the bottom of the inclined plane along a horizontal surface, as shown. The coefficient of kinetic friction between the horizontal surface and the object is 0.20, and air resistance is negligible. Find the distance *d*.

D 8.0 m *d* . 30° A) 5.0 m B) 10 m

C) 15 m

D) 20 m

E) 25 m

3) D, 4) C, 5) D, 6) A, 7) A, 8) D, 9) D, 10) E, 11) C, 12) C, 13) D, 14) D, 15) CDE, 16) E, 17) A, 18) D 19) A, 20) A, 21) 275 kJ, -245 kJ, 30.0 kJ, 22) A, 23) A, 24) A, 25) E, 26) E, 27) C, 28) A, 29) E, 30) D