**Physics 11 POP Quiz on Heat Capacity n Such**

1. A spring is compressed over a distance of 0.25 meters. The force required to hold the compressed spring is 64 newtons. Explain why the work done on the spring is not 50 N  0.25 m = 16 joules. (1)

2. In a tug-of-war, each side pulls with a force of 500 newtons, but the rope does not move. How much work is done? (1)

3. State the law of conservation of energy. (1)

4. A pendulum bob swings back and forth at the end of its cable. Where is the pendulum moving the fastest? (1)

5. A skier travels down a slope toward the bottom of the hill. At what point(s) on the slope will gravitational potential energy and kinetic energy be equal? Ignore the effects of friction. (1)

6. Four identical insulated containers hold equal masses of different liquids at 0°C. Identical immersion heaters supply heat at the same rate to all liquids. The specific heats and the boiling points of the liquids are provided below. Which liquid will boil first? (1)

|  |  |  |
| --- | --- | --- |
| **Liquid** | **Specific heat** | **Boiling point** |
| A | 900 J/kgK | 45C |
| B | 2500 J/kgK | 70C |
| C | 400 J/kgK | 75C |
| D | 150 J/kgK | 500C |

7. Carol and Bruno drag a box of mass 58.0 kg along a frictionless floor. Carol pushes the box with a force of 11.4 N at an angle of 40.0 downward from the horizontal. Bruno pulls the box from the other side with a force of 11.0 N at an angle of 40.0 above the horizontal. What is the net work done on the box if the displacement of the box is 14.5 m? (4)

8. Pushing a stranded dolphin back to sea requires a constant force of 600 N over a distance of 30 meters. How much work is done on the dolphin? (3)

9. In a dream, you find yourself pushing a huge boulder up a very steep (35) hill that is 75 meters high. The boulder weighs 22,000 N. Assume that the force needed on flat ground is zero.

a) What work must you do to push the boulder up the hill? (3)

b) Is this a reasonable dream? (1)

10. Two identical 2200 kg cars, traveling at 11 m/s, collide head-on and stop.

a) What is the change in momentum for each car? (3)

b) What is the change in kinetic energy for each car? (3)

11. What is the kinetic energy of a 0.145 kg baseball moving at 42 m/s? (3)

12. Andrew throws a 0.11-kg ball toward Donald, who is standing on a ledge. The ball leaves Andrew’s hands at a height of 0.24 m and Donald catches it at a height of 0.82 m. Calculate the gravitational potential energy of the ball relative to the ground before being thrown.(3)

13. 0.2000 kg of water at 20.00C is contained in a 0.1000-kg copper container. The container is shaken vigorously for 10.00 minutes to cause the temperature to rise to 22.00C. Calculate the work done on the system and the heat supplied to the system. The specific heat of copper is 385.0 J/kgK and of water is 4200.0 J/kgK.(3)

**Physics 11 Quiz on Heat Capcity n Such**

**Answer Section**

**SHORT ANSWER**

1. ANS:

The force needed to compress the spring is not constant over the entire distance. For a non-compressed spring, the force needed starts at zero and increases as the spring is compressed.

PTS: 1 DIF: Bloom's Level 4 REF: p. 263

NAT: B.5 | B.6

2. ANS:

No work is done, because displacement is zero.

PTS: 1 DIF: Bloom's Level 2 REF: p. 258

NAT: B.5 | B.6

3. ANS:

In a closed, isolated system, energy can neither be created nor destroyed.

PTS: 1 DIF: Bloom's Level 1 REF: p. 293

NAT: B.5 | B.6

4. ANS:

at the bottom of its swing

PTS: 1 DIF: Bloom's Level 2 REF: pp. 294-295

NAT: B.5 | B.6

5. ANS:

At any point along the path where the vertical distance is halfway between the top and the bottom, gravitational potential energy and kinetic energy will be equal.

PTS: 1 DIF: Bloom's Level 2 REF: p. 294

NAT: B.5 | B.6

6. ANS:

Liquid C will boil first.

PTS: 1 DIF: Bloom's Level 3 REF: Page 318

OBJ: 12.1.3 Define specific heat and calculate heat transfer.

TOP: Define specific heat and calculate heat transfer. KEY: Specific heat

MSC: 3

**PROBLEM**

7. ANS:

 J

PTS: 1 DIF: Bloom's Level 3 REF: Page 260

OBJ: 10.1.2 Calculate work. TOP: Calculate work.

KEY: Work MSC: 3

NOT: Work is equal to the product of force and displacement times the cosine of the angle between the force and the direction of the displacement.

8. ANS:

18,000 joules

PTS: 1 DIF: Bloom's Level 3 REF: p. 258

NAT: B.5 | B.6

9. ANS:

a) 1.7  106 J

b) No. The force required to keep the boulder moving up a 35 hill is

22,000 N  sin 35 = 1.3  104 N, or almost 3,000 lbs.

PTS: 1 DIF: Bloom's Level 4 REF: pp. 259-260

NAT: B.5 | B.6

10. ANS:

a) For each car, loss of momentum is 2.4  104 kg m/s, one positive and the other negative, depending on the reference frame.

b) For each car, loss of kinetic energy is 1.3  10-5 J. Kinetic energy is always positive.

PTS: 1 DIF: Bloom's Level 3 REF: pp. 258, 249

NAT: B.5 | B.6

11. ANS:

130 J

PTS: 1 DIF: Bloom's Level 3 REF: p. 258

NAT: B.5 | B.6

12. ANS:



PTS: 1 DIF: Bloom's Level 2 REF: Page 285

OBJ: 11.1.3 Determine the gravitational potential energy of a system.

TOP: Determine the gravitational potential energy of a system. KEY: Gravitational potential energy

MSC: 3

NOT: The gravitational potential energy of an object is equal to the product of its mass, the acceleration due to gravity, and its height from the reference level.

13. ANS:

Work done = 1757 J

Heat supplied = 0

PTS: 1 DIF: Bloom's Level 3 REF: Page 328

OBJ: 12.2.3 Distinguish between heat and work. TOP: Distinguish between heat and work.

KEY: Work MSC: 3

NOT: Work done is the sum of the products of the masses, the specific heat capacities, and the temperature changes for water and the copper vessel.