## Specific Heat and Energy Practice Quiz Questions

1. A 550 g rock is thrown 7.5 m in the air at a speed of 25 m/s. What is the mechanical energy of the rock?

$P = mgh$ $.55 \times 9.8 \times 7.5 = 40\text{J}$ $\quad K = .5mv^2$ $.5 \times 5.5 \times 25^2 = 170\text{J}$ $= 210\text{J}$

2. A truck weighing 4500 kg speeds at 75 km/h. What is its kinetic energy?

$\frac{75 \times 1000}{3600} = 21$ $\quad K = .5mv^2$ $.5 \times 4500 \times 21^2$

$= 990\,000\text{J}$ or $9.9 \times 10^5\text{J}$

3. What is the specific heat of oil if 500.0 g is heated from 10°C to 70°C and 45 000 J of heat was absorbed?

$C = \frac{Q}{m\Delta T}$ $\quad \frac{45000}{(500.0 \times (70-10))} = 2\text{J/g}\cdot°\text{C}$

4. What is the heat energy of 60 g of water with a change in temperature of 25°C?

$Q = mC\Delta T$ $\quad 60 \times 4.19 \times 25 = 6000\text{J}$

5. What is the speed of a rock when it reaches the water if it dropped 45.0 m from a mountain and it weighs 7.5 kg?

$V^2 = \frac{K}{.5m}$ $\quad K = P = mgh$ $\quad \frac{7.5 \times 9.8 \times 45.0}{(.5 \times 7.5)}$ $= 30\text{m/s}$ or $3.0 \times 10^1\text{m/s}$

6. What is the potential energy of a ball if it is 7.0 m high and weighs 700 g?

$P = mgh$ $\quad .7 \times 9.8 \times 70 = 50\text{J}$

7. What is the final temperature of water if 450 ml absorbs 17 600 J of heat and has an initial temperature of 60.0°C?

$FT = IT + \Delta T$

$60.0 + 9.3$

$= 69.3\,°\text{C}$

$\Delta T = \frac{Q}{mC}$ $\quad \frac{17600}{(450 \times 4.19)} = 9.3\,°\text{C}$

8. What is the height of a ball which weighs 7.5 kg and has a potential energy of 5 500 J?

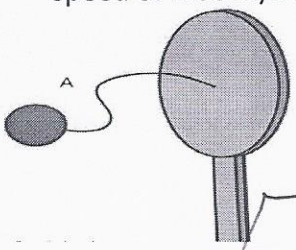
$h = \frac{P}{mg}$ $\frac{5500}{(7.5 \times 9.8)} =$ 75 m

9. What is the maximum speed the ball below can reach if the ball weighs 620 g is found at a height of 150 cm?

$v^2 = \frac{K}{.5m}$ $K = P = mgh$

$\sqrt{\frac{.62 \times 9.8 \times 1.5}{(.5 \times .62)}} =$ 5.4 m/s

10. What is the maximum speed the ball can reach if at point A the height is 8 cm, travelling at a speed of 2.00 m/s and the ball weighs 120 g?




$v^2 = \frac{K}{.5m}$ $K = .5mv^2$ $P = mgh$

$.5 \times .12 \times 2.00^2$ $.12 \times 9.8 \times .08$

.24 J + 0.09 J

.335

$\sqrt{\frac{.33}{(.5 \times .12)}} =$ 2.3 m/s

11. Three beakers each containing 50.0 g of a different solution are placed on a hot plate. The substances are identified by the letters *X*, *Y* and *Z* each absorbed 2 500 J of heat. After heating the beakers for two minutes, the following results are obtained:

| Substance | Mass (g) | Initial temperature (°C) | Final temperature (°C) |
|---|---|---|---|
| X | 50.0 | 20.0 | 80.0 |
| Y | 50.0 | 20.0 | 68.0 |
| Z | 50.0 | 20.0 | 45.0 |

a) Which of these substances has the greatest specific heat capacity? Justify your answer.

$C = \frac{Q}{m\Delta T}$

X: $\frac{2500}{(50.0 \times (80-20))} = .83$ J/g·°C

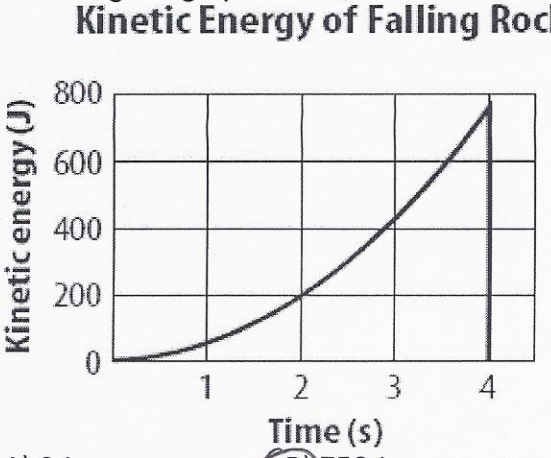
Y: $\frac{2500}{(50.0 \times (68-20))} = 1.0$ J/g·°C

Z: $\frac{2500}{50.0 \times (45-20.0)} = 2.0$ J/g·°C

b) Which of these substances absorbed the most heat? Explain your answer.

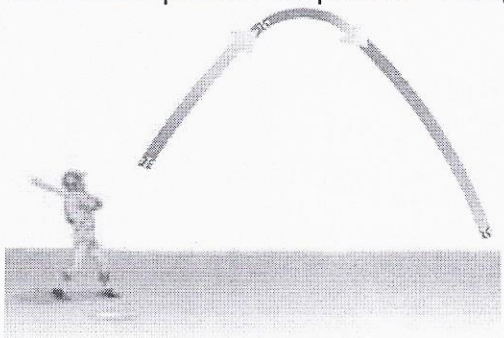
All the same because all reached 2500 J of energy at the same time.

12. Using the graph below, determine the mechanical energy when the rock has fallen for 2 s?




A) 0 J  B) 750 J  C) 200 J  D) 550 J

13. At what point is the potential energy of the ball at its maximum?



A) At the top of the arc
B) Just before hitting the ball
C) Just before the ball hits the ground
D) Just after the bat strikes the ball

14. Using the same picture and answers as number 13, ignoring friction, at what point in its motion is the kinetic energy of the ball at a maximum? C

15. A quarterback throws a football weighing 315 g at a speed of 12.7 km/h at a height of 12 m. What is the football's mechanical energy?

$K = .5mv^2$

$.5 \times .315 \times 3.53^2$

$1.96\,J$

$P = mgh$

$.315 \times 9.8 \times 12$

$37\,J$

$+$

$39\,J$

$\frac{12.7 \times 1000}{3600} =$

$3.53$