1. What is the kinetic energy of a 2 kg ball moving at 3 $\frac{\text{m}}{\text{s}}$, in joules?

   _____ J

2. A rope pulls a sled 5 m with 20 N at 60° ($\cos 60° = 0.5$). How much work is done, in joules?

   _____ J

3. Lift a 2 kg book to a 1.5 m shelf ($g = 9.8\ \frac{\text{N}}{\text{kg}}$). How much gravitational PE is stored, in joules?

   _____ J

4. A ball is dropped from rest at 5 m ($g = 10\ \frac{\text{m}}{\text{s}^2}$, no air resistance). What is its speed at the bottom, in $\frac{\text{m}}{\text{s}}$?

   _____ m/s

5. A motor does 600 J of work in 3 s. What is its power, in watts?

   _____ W

6. If a car doubles its speed, its kinetic energy becomes:

   ☐ the same

   ☐ half as large

   ☐ twice as large

   ☐ four times as large

7. A force acts at 90° to an object's motion. How much work does it do?

   ☐ a negative amount

   ☐ the maximum possible

   ☐ half the force times distance

   ☐ zero

8. Gravitational potential energy mgh increases when you increase which of these?

   ☐ the height h

   ☐ the object's colour

   ☐ the mass m

   ☐ the gravitational field strength g

   Tick every correct option.

exercises.lol exercises.com.cn

10. What is the SI unit of power?

    ☐ newton

    ☐ pascal

    ☐ watt

    ☐ joule

1. **9 J**

   $E_k = \frac{1}{2}mv^2 = \frac{1}{2}(2)(9) = 9$ J.

2. **50 J**

   $W = Fd\cos\theta = 20 \times 5 \times 0.5 = 50$ J.

3. **29.4 J**

   $E_p = mgh = 2 \times 9.8 \times 1.5 = 29.4$ J.

4. **10 m/s**

   $mgh = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{2gh} = \sqrt{2 \times 10 \times 5} = 10\ \frac{\text{m}}{\text{s}}$.

5. **200 W**

   $P = W/t = 600/3 = 200$ W.

6. **four times as large**

   $E_k \propto v^2$, so doubling v gives $2^2 = 4$ times the kinetic energy.

7. **zero**

   $\cos 90° = 0$, so $W = Fd\cos 90° = 0$. A perpendicular force does no work.

8. **the height h; the mass m; the gravitational field strength g**

   $E_p = mgh$ grows with mass, height and g. Colour is irrelevant.

9. **potential**

   Mechanical energy $= E_k + E_p$ – kinetic plus **potential**.

10. **watt**

    Power is measured in **watts**, where 1 W $= 1\ \frac{\text{J}}{\text{s}}$.

exercises.lol exercises.com.cn