Work, energy and Power – 2023 Nov AS Physics 9702

1. Nov/2023/Paper_ 9702/11/No.15

A crate of mass 50 kg is pushed a distance of 6.0 m along a horizontal surface against a constant resistive force of 70 N. The crate moves at a constant speed. It is then lifted, at a constant speed, through a vertical distance of 1.2 m onto the back of a lorry.

What is the total work done in this process?

A 420 J **B** 480 J **C** 590 J **D** 1000 J

2. Nov/2023/Paper_ 9702/11/No.16

The input power to a television is P_{in}. The useful sound and light power emitted by the television is P_{out}.

What is the efficiency of the television?

A $\frac{P_{out}}{P_{in}}$ **B** $\frac{P_{in} - P_{out}}{P_{in}}$ **C** $\frac{P_{in}}{P_{out}}$ **D** $\frac{P_{out}}{P_{in} - P_{out}}$

3. Nov/2023/Paper_ 9702/11/No.17

A builder holding a brick of mass 3000 g drops the brick on his foot.

What is a reasonable estimate of the change in gravitational potential energy of the brick?

A 30 J **B** 300 J **C** 3000 J **D** 30 000 J

4. Nov/2023/Paper_ 9702/12/No.15

An electric car travels at a constant speed of 70 km h^{-1} for 80 km on a straight horizontal road and uses energy E from its battery.

The total resistive force acting on the car is proportional to (speed)^2. Assume that the electric motor is 100% efficient.

How much energy is used from the battery when the car travels at a constant speed of 60 km h^{-1} for 80 km on the straight horizontal road?

A 0.73E **B** 0.86E **C** 1.2E **D** 1.4E

5. Nov/2023/Paper_ 9702/12/No.16

What is meant by the efficiency of a system?

A the total energy input to the system divided by the useful energy output by the system

B the useful energy output from the system divided by the energy wasted by the system

C the useful energy output from the system divided by the total energy input to the system

D the energy wasted by the system divided by the total energy input to the system

6. Nov/2023/Paper_ 9702/12/No.17

When an object of mass m is raised through a vertical height Δh, the gain of its gravitational potential energy is ΔE_P.

ΔE_P and Δh are related by the equation

$$\Delta E_P = mg\Delta h,$$

where g is the acceleration of free fall.

The definition of which physical quantity is needed to derive this equation?

A acceleration

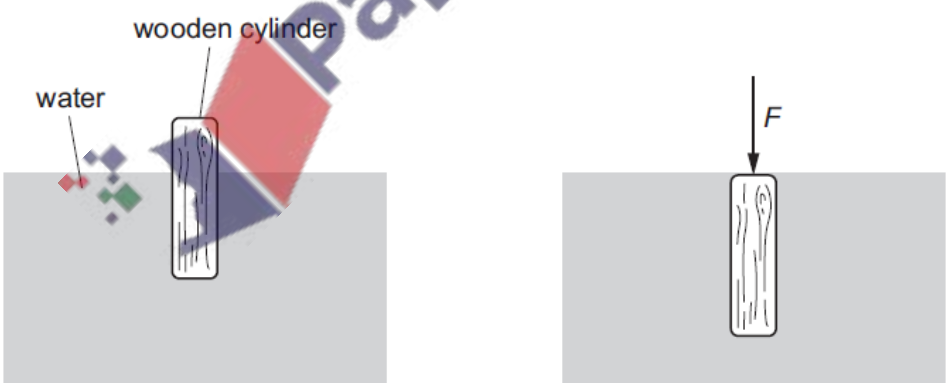
B momentum

C power

D work done

7. Nov/2023/Paper_ 9702/13/No.15

A wooden cylinder floats partially submerged in a bath of water. A force F is applied to the cylinder until it is just fully submerged.



Which statement is **not** correct?

A Some of the water gains gravitational potential energy.

B The cylinder loses gravitational potential energy.

C Work is done by force F on the cylinder.

D Work is done by the upthrust on the cylinder.

8. Nov/2023/Paper_ 9702/13/No.16

A system has a useful power output of 4.0 W and a wasted power of 16 W.

What is the efficiency of the system?

A 5.0% **B** 20% **C** 25% **D** 80%

9. Nov/2023/Paper_ 9702/13/No.17

A parachutist is falling towards the ground at a constant speed v. The rate at which she is losing gravitational potential energy is R.

The acceleration of free fall is g.

What is the mass of the parachutist?

A $\frac{gv}{R}$ **B** $\frac{R}{gv}$ **C** $\frac{2R}{v^2}$ **D** $\frac{v^2}{2R}$