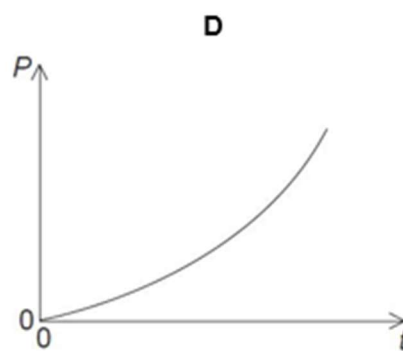
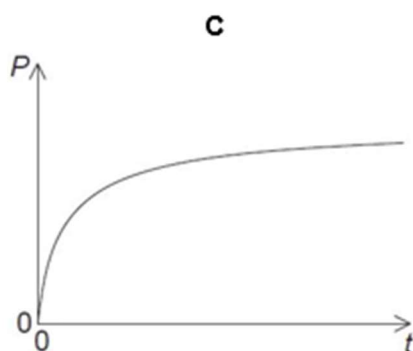
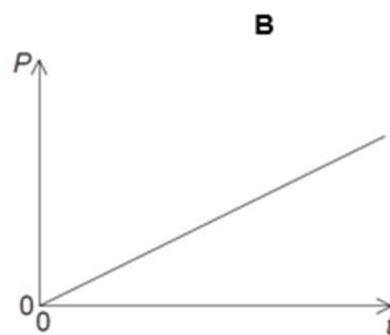
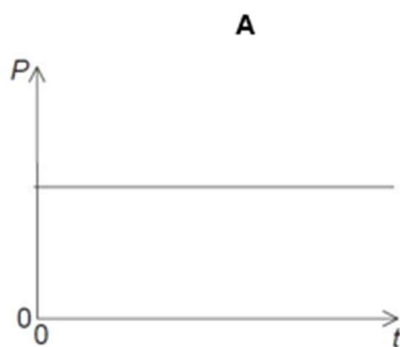


1

A train on a straight horizontal track moves from rest at constant acceleration. The horizontal forces on the train are the driving force exerted by the engine and a resistive force which increases with speed.

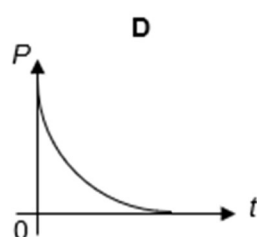
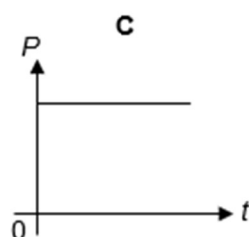
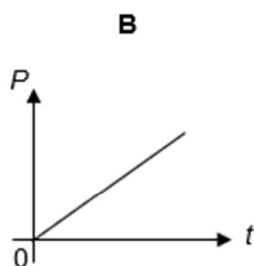
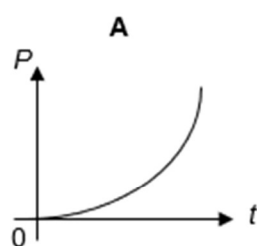
Which graph represents the variation with time t of the power P developed by the engine?



2

An object resting on a horizontal frictionless surface is accelerated from rest by a constant force from a motor.

Which of the following graphs shows the variation of the motor power P with time t ?



3

Two ice boats, of masses m and $2m$, are made to compete in a race on a frictionless frozen lake. The boats have identical sails so that the wind pushes them forward with the same force. The two boats start from rest and travel the same distance.

Which of the following statements is correct?

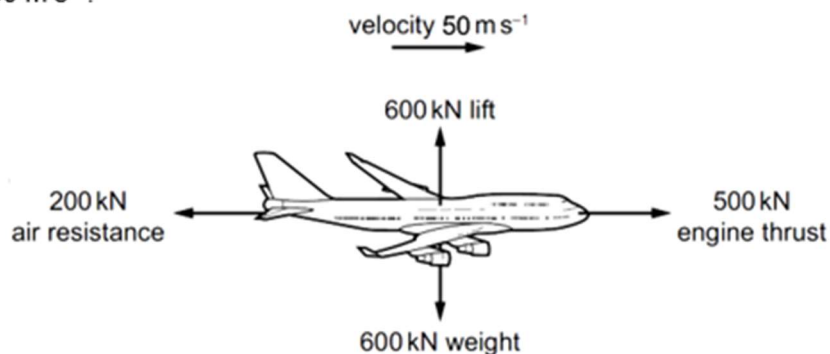
- A** The boat of mass m will win the race but the two boats will have the same final speed.
- B** The boat of mass m will win the race but it will have a lower final kinetic energy.
- C** The boat of mass m will win the race and it will have a higher final kinetic energy.
- D** The boat of mass m will win the race but the two boats will have the same final kinetic energy.

- 4 A wooden cylinder floats in a bath of water as shown. 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 Positive work is done by force F on the cylinder.
D Positive work is done by the upthrust on the cylinder.
- 5 The force diagram shows an aircraft accelerating. At the instant shown, the velocity of the aircraft is 50 m s^{-1} .



At which rate is its kinetic energy increasing?

- A** 2.4 MW **B** 12 MW **C** 15 MW **D** 25 MW

6

A hydroelectric power station uses the gravitational potential energy of water to generate electrical energy.

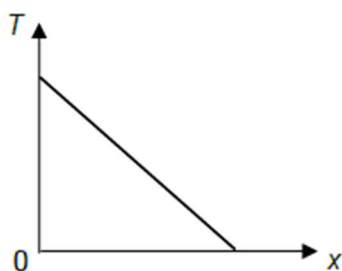
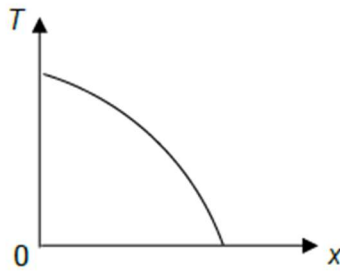
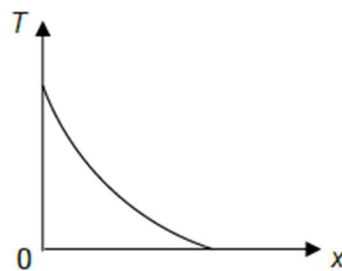
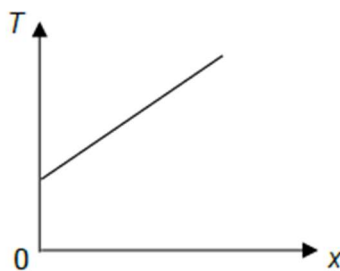
In one particular power station, the mass of water flowing per unit time is $1.5 \times 10^5 \text{ kg s}^{-1}$. The water falls through a vertical height of 140 m.

The electrical power generated is 100 MW. What is the efficiency of the power station?

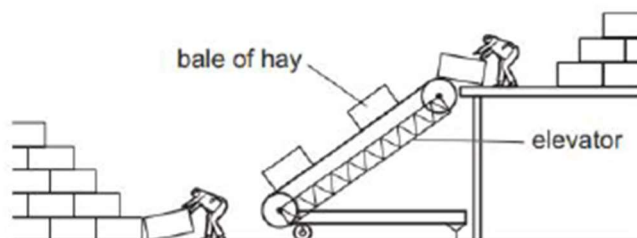
A 5.6%**B** 4.3%**C** 49%**D** 77%

7

A body moves with a constant acceleration opposite in direction to its initial velocity. Which one of the following graphs represents the variation of its kinetic energy T with the distance travelled x from its initial position?

A**B****C****D**

- 8 Two farmers use an electrically powered elevator to lift bales of hay. All the bales of hay have the same mass.



As sunset approaches, they increase the speed of the elevator so that more bales are lifted up in a given time.

How does this affect the work done in lifting each bale and the useful power output of the elevator?

	work done in lifting each bale	useful output power of the elevator
A	increases	decreases
B	increases	increases
C	no change	decreases
D	no change	increases

- 9 A crane is used to raise a weight of 200 N at a constant speed through a vertical height of 8.0 m in 4.0 s.

The efficiency of the crane is 20%. What is the electrical power needed to be supplied to the crane?

- A 80 W B 400 W C 1600 W D 2000 W

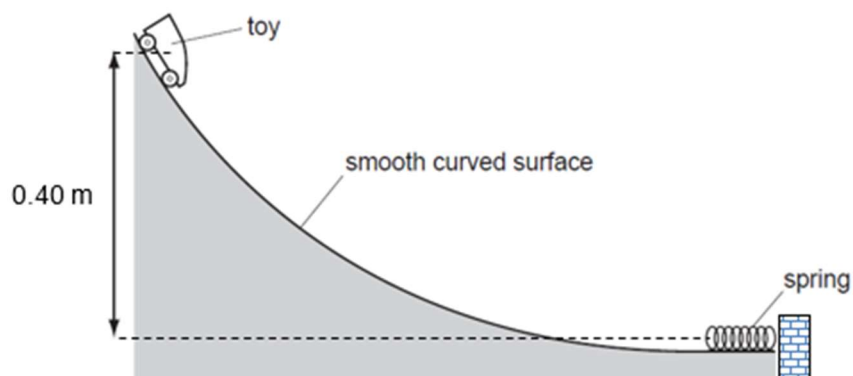
- 10 A motor is used to lift a load of mass 0.80 kg vertically upward at an acceleration of 1.0 m s^{-2} for a distance of 2.0 m. The efficiency of the motor is 60%.

What is the electrical energy supplied to the motor in performing this task?

- A 2.7 J B 17 J C 26 J D 29 J

11

A toy car of mass 0.22 kg is released from rest and runs down a smooth curved surface through a vertical distance of 0.40 m , as shown. It strikes a horizontal spring of force constant 350 N m^{-1} and compresses it by a distance x before coming to rest.



Assuming no losses in mechanical energy, what is the value of x ?

- A** $4.9 \times 10^{-3} \text{ m}$ **B** $6.2 \times 10^{-3} \text{ m}$ **C** $3.5 \times 10^{-2} \text{ m}$ **D** $7.0 \times 10^{-2} \text{ m}$

12

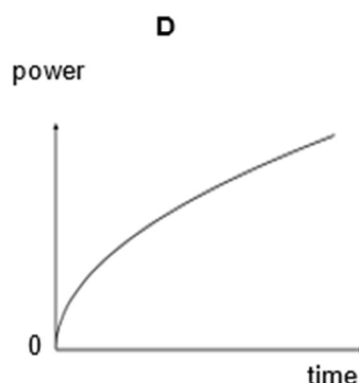
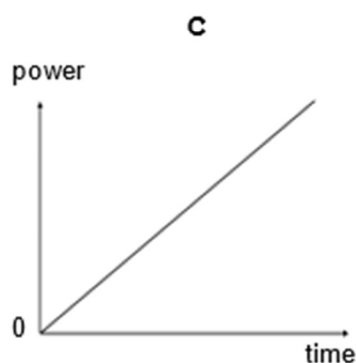
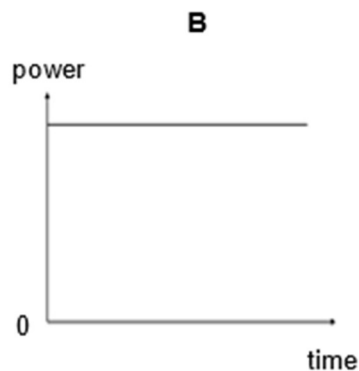
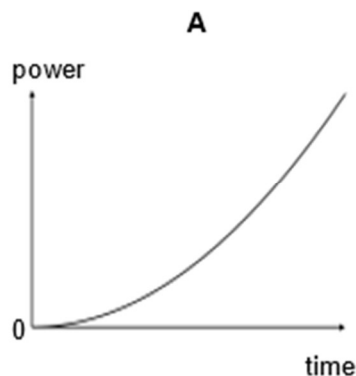
A 2.0 kg block slides down a plane that is inclined at 25° with the horizontal, at a uniform speed of 2.0 m s^{-1} . What is the rate of frictional force doing work on the block?

- A** 17 W **B** 22 W **C** 36 W **D** 46 W

13

A constant force is applied on a box resting on a frictionless surface. (Assuming air resistance is negligible)

Which of the following graphs best represents the variation of power supplied with time?



14

When a horizontal force F is applied to a trolley over a smooth horizontal surface of distance x , its kinetic energy changes from 2 J to 6 J.

If a force $2F$ is applied to the trolley over a distance of $2x$, what will be the final kinetic energy of it? Assume the original kinetic energy of the trolley is 2 J.

A 12 J**B** 16 J**C** 18 J**D** 24 J