6.3 Power

Question Paper

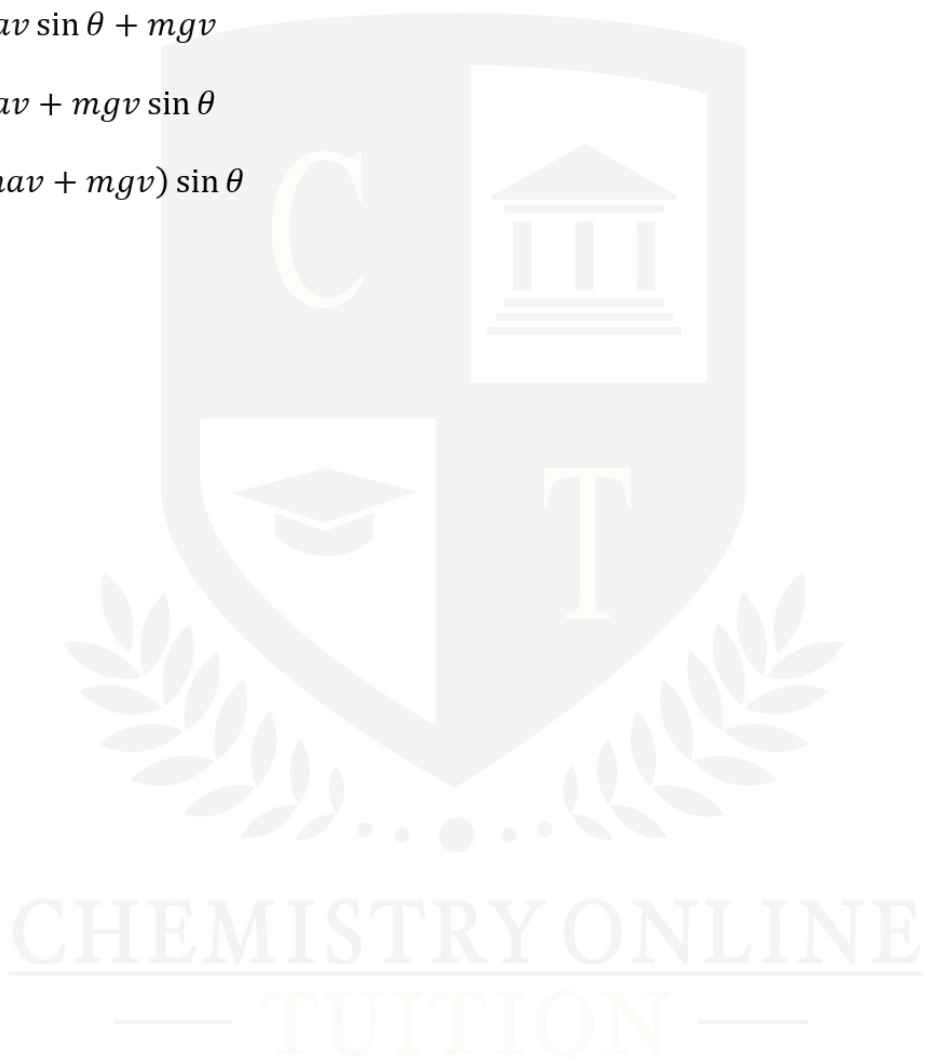|	
Course	CIE A Level Physics (9702) 2019-2021
Section	6. Work, Energy & Power
Topic	6.3 Power
Difficulty	Hard

Time allowed: 10

Score: /5

Percentage: /100

Question 1

What is the power required to give a body of mass *m* a forward acceleration *a* when it is moving with velocity *v* up a frictionless track inclined at an angle *θ* to the horizontal?
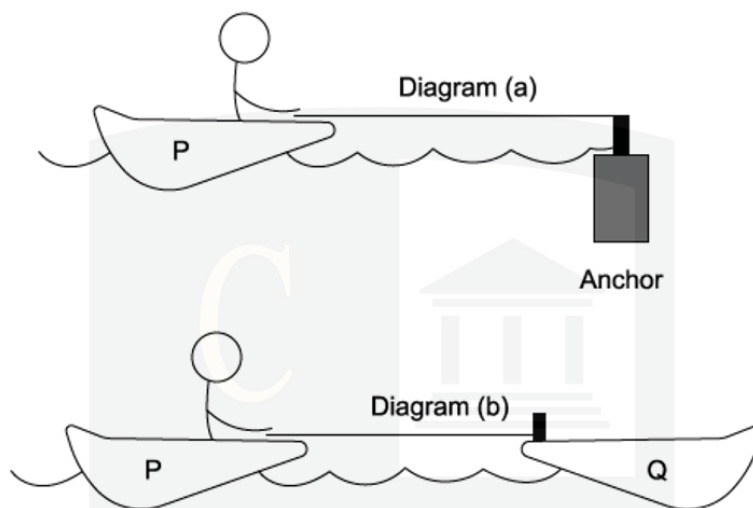
    A $mavg \sin \theta$

    B $mav \sin \theta + mgv$

    C $mav + mgv \sin \theta$

    D $(mav + mgv) \sin \theta$

[1 mark]

Question 2

A boy on a boat P pulls on a rope with a constant force F over a duration of time t. The other end of the rope is either tied to an anchor on the pier (Diagram a) or a freely floating boat Q (Diagram b) of equal mass as shown in the figures shown.

Diagram (a)

Anchor

Diagram (b)

W_a and W_b represent the total work done by the boy during the time t and P_a and P_b represent the average power output of the boy in diagrams (a) and (b) respectively.

Which of the following statements is correct?

A $W_a > W_b$ and $P_a > P_b$

B $W_a = W_b$ and $P_a = P_b$

C $W_a < W_b$ and $P_a < P_b$

D $W_a < W_b$ and $P_a = P_b$

[1 mark]

Question 3

The diagram shows a wheel of circumference 0.30 m. A rope is fastened at one end to a force meter. The rope passes over the wheel and supports a freely hanging load of 100 N. The wheel is driven by an electric motor at a constant rate of 50 revolutions per second.

When the wheel is turning at this rate, the force meter reads 20 N.
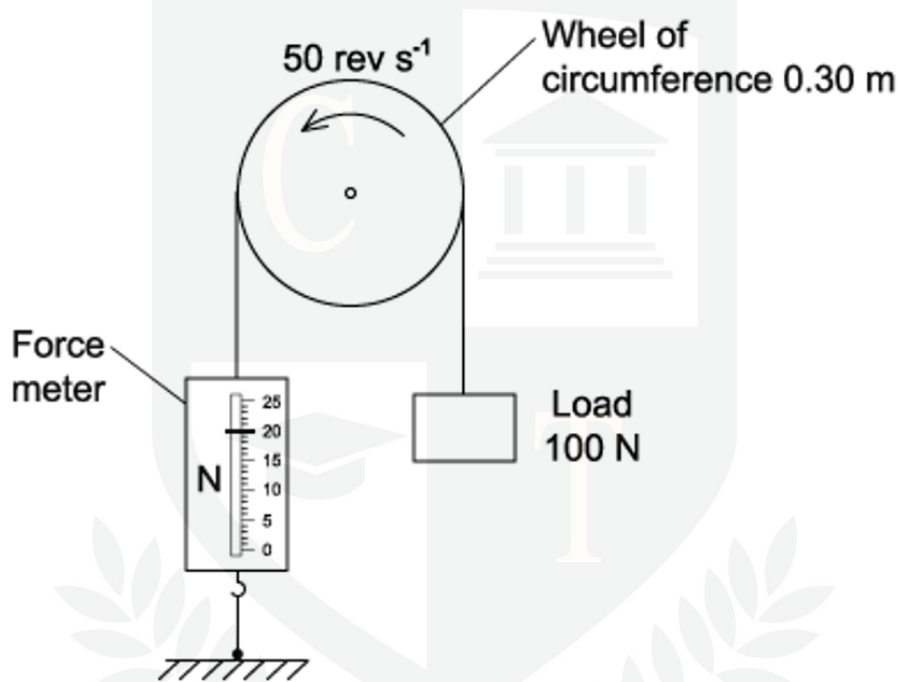
What is the output power of the motor?

A 0.3 kW   **B** 1.2 kW   **C** 1.8 kW   **D** 3.8 kW

[1 mark]

Question 4

A wind turbine has blades that sweep an area of 2000 m^2. It converts the power available in the wind to electrical power with an efficiency of 50%.

What is the electrical power generated if the wind speed is 10 m s^{-1}? (The density of air is 1.3 kg m^{-3})
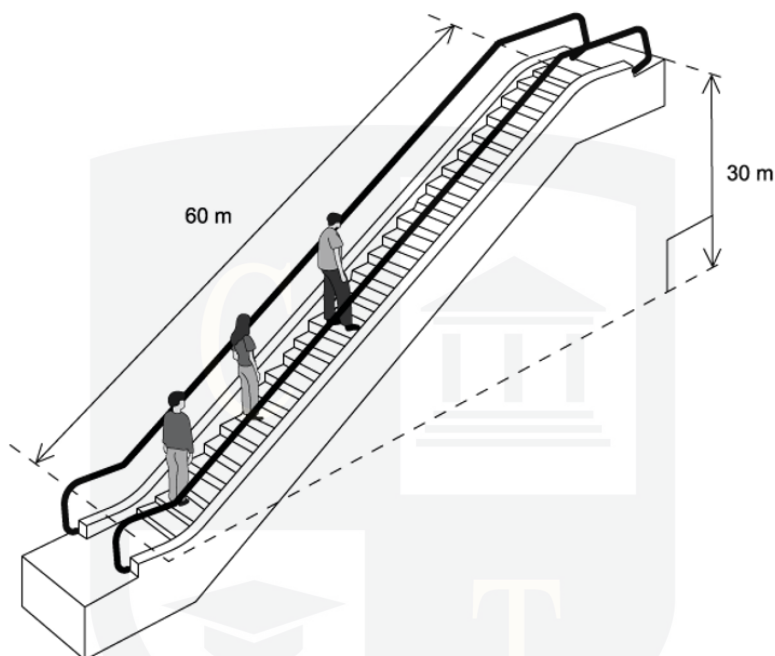
A 130 kW   **B** 650 kW   **C** 1300 kW   **D** 2600 kW

[1 mark]

Question 5

An escalator is 60 m long and lifts passengers through a vertical height of 30 m, as shown.

To drive the escalator against the forces of friction when there are no passengers requires a power of 2.0 kW.

The escalator is used by passengers of average mass 60 kg and the power to overcome friction remains constant.

How much power is required to drive the escalator when it is carrying 20 passengers and is travelling at 0.75 m s^{-1}?

A 4.4 kW   **B** 6.4 kW   **C** 8.8 kW   **D** 10.8 kW

[1 mark]