SMART EXAM RESOURCES
SUBJECT: PHYSICS
TOPIC: WORK / ENERGY /POWER
SET-12-QP-MS

1 Water is held behind a dam in a hydroelectric power scheme.

(c) Hydroelectric energy is a renewable form of energy.

(i) State **one** disadvantage of hydroelectric power schemes.

..... [1]

MARK SCHEME:

damage to habitats (for fish) / construction is expensive / droughts / flood risk if dam bursts	**B1**

2 A train of mass 1.8×10^5 kg is at rest in a station. At time $t = 0$, the train begins to accelerate along a straight, horizontal track and reaches a speed of 20 m/s at $t = 15$ s. The train continues at a speed of 20 m/s for 10 s.

At $t = 25$ s, the driver applies the brakes and the resistive force on the train causes it to decelerate uniformly to rest in a further 24 s.

Fig. 4.1 is an incomplete distance–time graph for this journey.

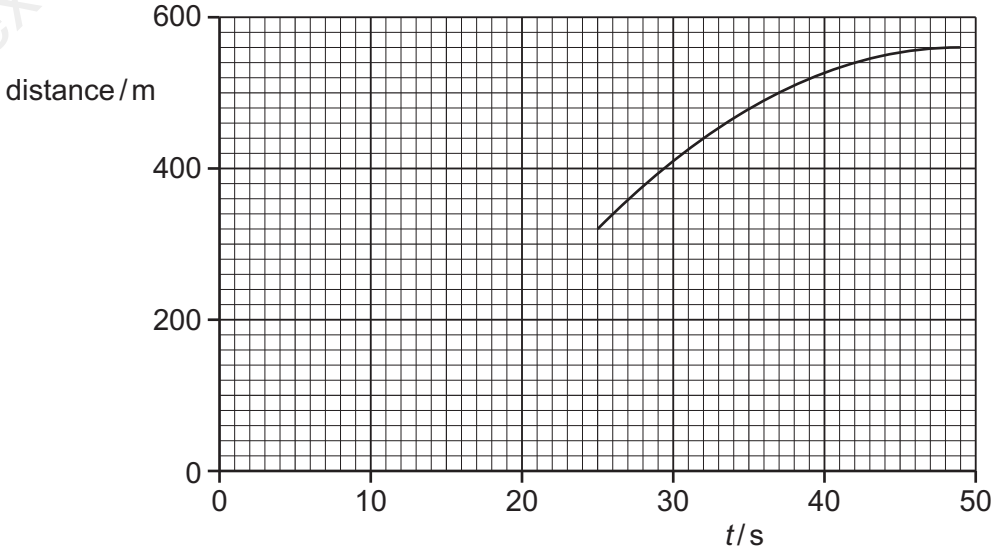

Fig. 4.1

(a) Complete Fig. 4.1 by drawing:

(i) a line to represent the motion of the train between $t = 15$ s and $t = 25$ s [1]

(ii) a curve to represent the motion of the train between $t = 0$ and $t = 15$ s. [1]

(b) Calculate the kinetic energy of the train between $t = 15$ s and $t = 25$ s.

kinetic energy = ... [3]

MARK SCHEME:

(a)(i)	straight line begins at (15 s, 120 m) **and** continues to end of given line	**B1**
(a)(ii)	curve with increasing gradient from origin to beginning of candidate's **(a)(i)**	**B1**
(b)	(E_k =) $\frac{1}{2}mv^2$ in any form	**C1**
	$\frac{1}{2} \times 1.8 \times 10^5 \times 20^2$	**C1**
	3.6×10^7 J	**A1**

3 Fig. 2.1 shows a wooden trolley of mass 1.2 kg at rest on the rough surface of a bench.

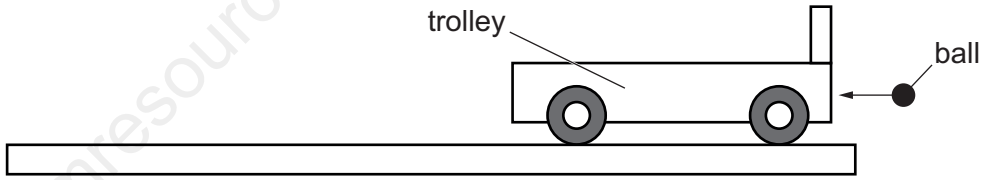

Fig. 2.1

A ball of mass 0.52 g travels horizontally towards the trolley. The ball embeds itself in the wood of the trolley. The trolley moves with an initial speed of 0.065 m / s.

(a) Calculate:

(i) the impulse exerted on the trolley

impulse = ... [2]

(ii) the speed of the ball as it hits the trolley.

speed = ... [2]

(b) As the trolley moves across the rough surface, it slows down and stops.

Explain, in terms of the work done, the energy change that takes place as the trolley slows down.

.....

.....

.....

..... [3]

[Total: 7]

MARK SCHEME:

Question	Answer	Marks
(a)(i)	0.078 N s **or** 0.078 kg m / s	**A2**
	(I =) $m_t(\Delta)v_t$ in any form **or** 1.2 × 0.065	**C1**
(a)(ii)	150 m / s	**A2**
	$v_b = (m_t + v_t) / m_b$ in any form **or** initial momentum = final momentum **or** 1.2(0052) × 0.065 / 0.00052 **or** 0.078(0338) / 0.00052	**C1**
(b)	work done against / due to / because of friction **or** kinetic energy (of trolley) used to do work	**B1**
	kinetic energy decreases (to zero)	**B1**
	thermal energy produced	**B1**

4 Fig. 2.1 shows water stored in a reservoir behind a hydroelectric dam.

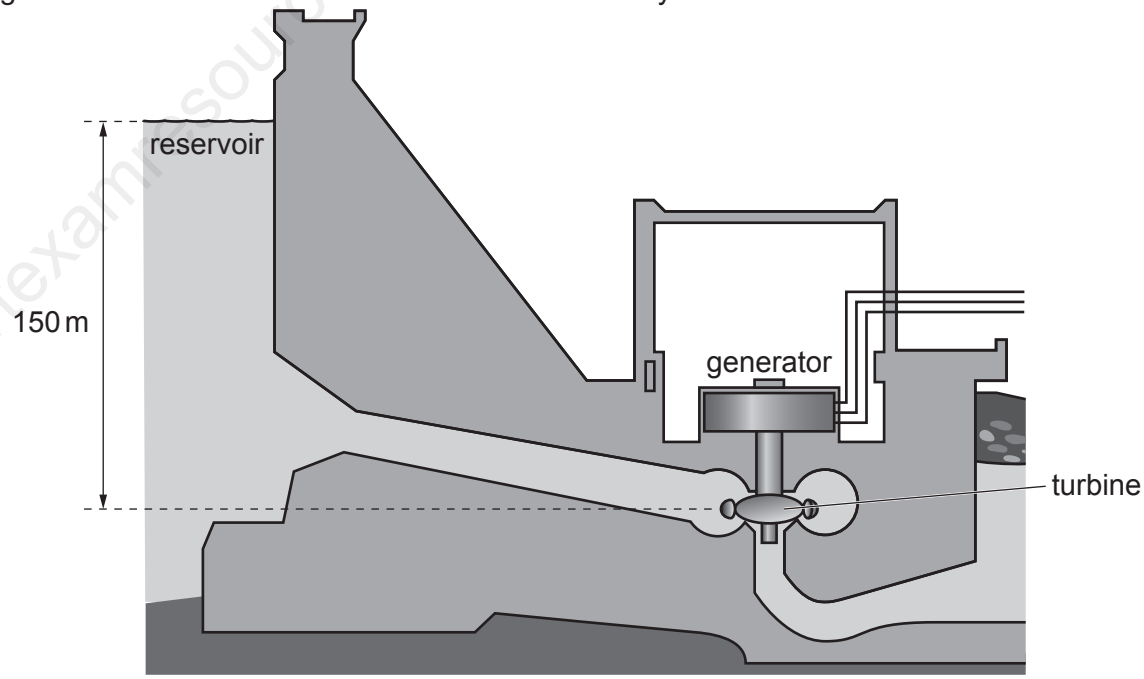

Fig. 2.1 (not to scale)

(c) The water flows to the turbine through a pipe of constant cross-sectional area.

Explain why the kinetic energy of the water in the pipe remains constant as it flows through the pipe.

.....

.....

..... [2]

MARK SCHEME:

	speed (of water) remains constant	**B1**
	otherwise density would decrease **or** gaps would appear in the water **or** volume / density does not change **or** liquids incompressible **or** water enters / leaves at constant rate **or** quantity of water remains constant	**B1**

5 Fig. 1.1 shows an electrically powered bicycle.

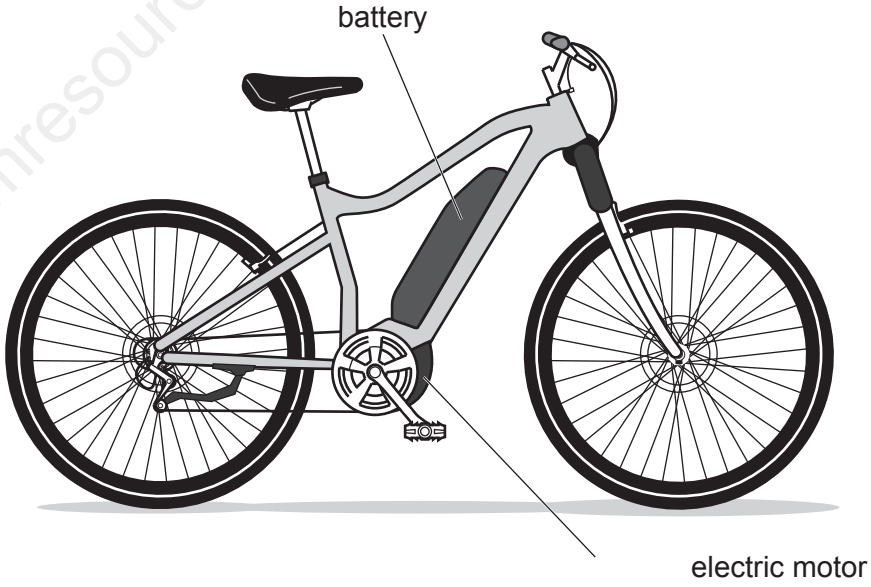

Fig. 1.1

Consider this bicycle compared to a small motorcycle.

State **two** environmental benefits of the electrically powered bicycle.

1. .....

2. .....

[2]

MARK SCHEME:

	any **two** from: • less noise OR no noise • less OR no air / gaseous pollution (from the bicycle) OR does not produce acid rain • (the bicycle) uses no / less fossil fuel • does not contribute to greenhouse effect OR does not release CO_2	**B2**

6 State **one** advantage and **one** disadvantage of generating electrical power in nuclear power stations compared with electrical power generated using wind turbines.

advantage .....

disadvantage .....

[2]

MARK SCHEME:

	advantage – **one** from: • Continuous supply of energy • not affected by the weather **OR** not affected by wind strength • produces large amounts of energy	**B1**
	disadvantage – **one** from: • resources finite / not renewable • cost / difficulty of building / cost / difficulty of decommissioning • danger if any leak of radiation • produces hazardous / dangerous waste **OR** difficulty of storage of used radioactive material **OR** nuclear waste must be stored for a long time	**B1**