3 **(a)** State **two** energy resources for which radiation from the Sun is the main source of energy.

1 .....

2 .....
[2]

(b) A wind turbine is used to generate electricity.
The useful output from the turbine in 1.0 s is 6000 J. The kinetic energy of the wind hitting the turbine in 1.0 s is 11 000 J. The velocity of the wind hitting the turbine is 6.3 m / s.

(i) Show that the mass of air hitting the turbine each second is approximately 550 kg.

[2]

(ii) Calculate the efficiency of the turbines. You may assume that all the kinetic energy stored in the wind is transferred to the turbine.

efficiency = ...% [2]

(c) Tidal energy and wind energy are both renewable energy resources.
Suggest **one** reason why tidal energy is a more useful energy resource than wind energy.

Ignore the costs of construction and maintenance.

.....

..... [1]

[Total: 7]

13 The temperature of the water at the bottom of a waterfall is greater than the temperature of the water at the top.

The energy in the gravitational potential store of the water at the top is transferred to the thermal store at the bottom.

The specific heat capacity of water is 4200 J / (kg °C).

What is the temperature difference for a waterfall of height 21 m?

A 0.0050 °C **B** 0.049 °C **C** 20 °C **D** 200 °C

3 A student drops a heavy ball from a vertical height of 1.8 m above the ground. The ball then falls to the ground. It does **not** bounce after hitting the ground.

(a) Describe the transfers of energy of the ball between stores from when the ball begins to fall to when it reaches the ground.

.....

.....

.....

.....

..... [3]

(b) Calculate the maximum speed of the ball. Ignore air resistance.

Show your working.

maximum speed = ... [3]

[Total: 6]

3 A ball is falling towards the ground.

Which transfer between energy stores is taking place?

A elastic energy to kinetic energy

B gravitational potential energy to elastic energy

C gravitational potential energy to kinetic energy

D kinetic energy to gravitational potential energy

1 **(a)** Fig. 1.1. is a speed–time graph for the first 5 minutes of a bus journey.

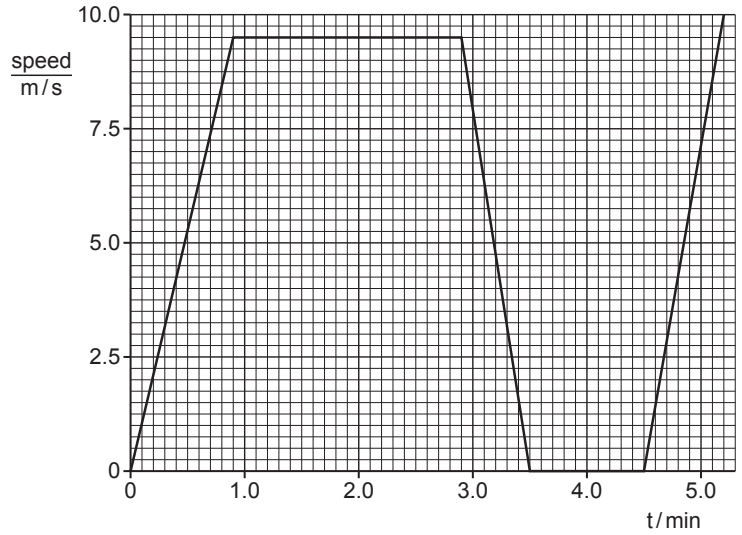

Fig. 1.1

Describe the motion between:

1. t = 0.90 min and t = 2.9 min .....

2. t = 2.9 min and t = 3.5 min .....

3. t = 3.5 min and t = 4.5 min .....

[3]

(b) Another bus travels at a speed of 8.9 m/s. The brakes apply a constant force and the bus stops in a distance of 23 m. This bus has a mass of 18 000 kg.

(i) Calculate the kinetic energy of the bus before the brakes are applied.

kinetic energy = ... [2]

(ii) Calculate the force applied to stop the bus.

force = ... [3]

[Total: 8]