Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

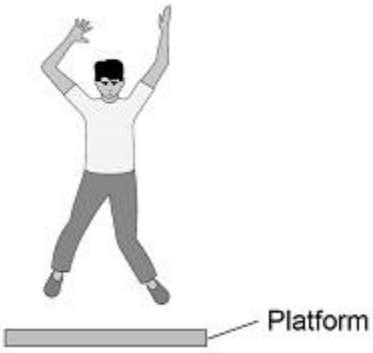
Q1.

A scientist investigated how the maximum muscle power of humans varies with age and gender.

The scientist asked volunteers to stand on a platform and to jump as high as they could.

Figure 1 shows a volunteer taking part in the experiment.

Figure 1



An electronic timer measured the time that the volunteer was in the air.

(a) The muscle power in watts per kg is calculated using the following equation:

$$\text{muscle power} = \frac{9.8 \times \text{jump height}}{\text{time}}$$

One volunteer has a muscle power of 41 W/kg

He was in the air for 0.12 s

Calculate his jump height.

_____

_____

_____

_____

Jump height = _____ m

(3)

(b) Write down the equation which links kinetic energy, mass and speed.

_____

(1)

(c) One volunteer had a kinetic energy of 270 J and a speed of 3.0 m/s at the moment he left the ground.

Calculate his mass.

_____

_____

_____

_____

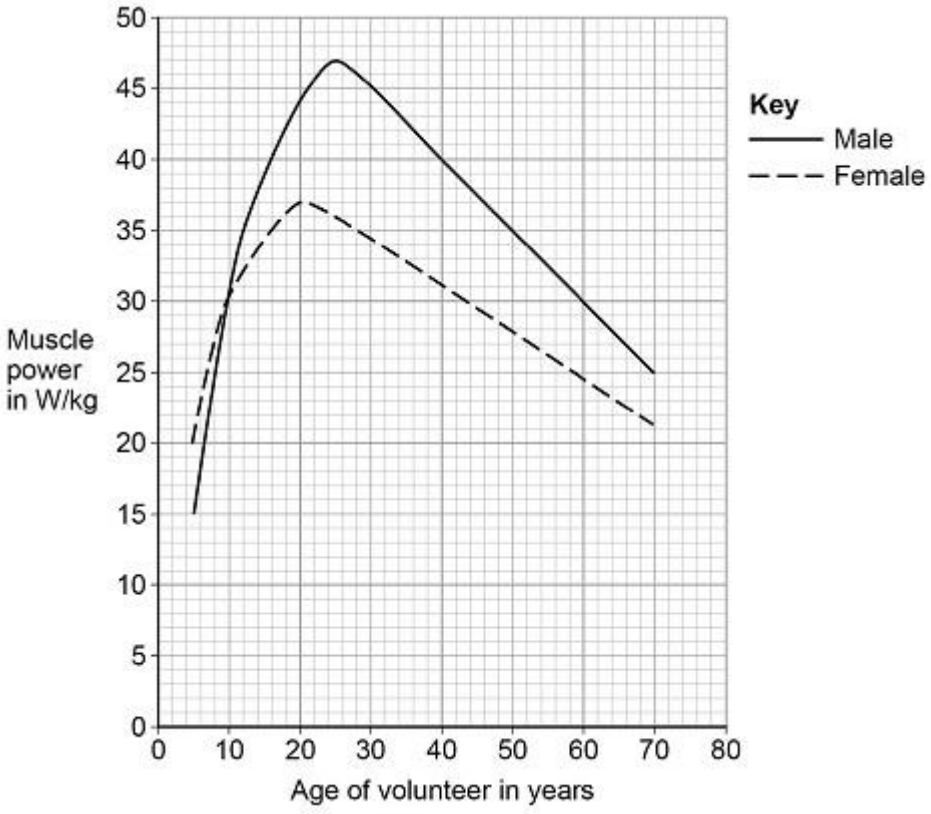
_____

Mass = _____ kg

(3)

Figure 2 shows the scientist's results.

Figure 2



(d) Compare the muscle power of males with the muscle power of females.

Use data from **Figure 2** in your answer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(e) The muscle power of each volunteer was measured five times.

The highest muscle power reading was recorded instead of calculating an average.

Suggest **one** reason why.

_____

_____

_____

_____

(1)

(Total 12 marks)

Q2.

The image shows a battery-powered drone.

(a) Complete the sentences.

Choose the answers from the box.

chemical	**elastic potential**		
gravitational potential	**kinetic**	**nuclear**	

As the drone accelerates upwards

its _____ energy increases

and its _____ energy increases.

The _____ energy store

of the battery decreases.

(3)

(b) In the USA, drones are not allowed to be flown too high above the ground.

Suggest **one** possible risk of flying a drone too high above the ground.

_____

_____

_____

(2)

(c) Write down the equation that links energy transferred, power and time.

_____

(1)

(d) The drone can fly for 25 minutes before the battery needs recharging.

The power output of the battery is 65.0 W

Calculate the maximum energy stored by the battery.

_____

_____

_____

_____

Maximum energy = _____ joules

(3)

(Total 8 marks)