Self-assessment practice test questions Block 1

1 A student is trying to measure the diameter of a piece of wire. She places 20 identical lengths of wire side-by-side and measures across their width using a ruler. She obtains a measurement of 14 mm.

a Determine the diameter of a single length of wire.

b What precaution should the student take to ensure that this result is as accurate as possible?

c What measuring instrument could she use to obtain a measurement using a single length of wire?

d Which method would give a more accurate result? Explain your answer.

2 A student is trying to determine the density of a piece of rock. The table shows his method and his results.

Step 1	Place the measuring cylinder on the balance.	Reading on balance = 120.0 g
Step 2	Half-fill the measuring cylinder with water.	Reading on balance = 172.0 g
Step 3	Submerge the rock in the water.	Reading on balance = 203.4 g Reading on measuring cylinder = 65.6 cm^3

a Determine the mass of water added to the measuring cylinder.

b Determine the volume of the water. You will need to know that 1.0 g of water has a volume of 1.0 cm^3.

c Determine the volume of the rock.

d Determine the mass of the rock.

e Determine the density of the rock.

3 Steel is manufactured in blocks of dimensions 2.40 m × 1.20 m × 0.40 m.

a Determine the volume of a block.

b Determine the mass of a block. The density of the steel is 7500 kg/m^3.

4 Joe is trying to measure Ben's greatest speed when he is cycling. Ben cycles along a straight track and Joe times him as he passes between two points which are 20.0 m apart. They repeat the trial three times.

Here are Joe's measurements, made using a stopwatch:

1.7 s **1.8 s** **1.3 s**

a What is Ben's **average** time over the 20 m distance?

b Determine Ben's **fastest** speed over the 20 m distance.

Joe and Ben decide that they might get a more accurate result if Ben is timed over a distance of 100 m.

c Explain why Joe will be able to make a more accurate measurement of the time taken by Ben to cycle between the two points if they are 100 m apart.

d Suggest a reason why this may not give such an accurate measurement of Ben's greatest speed.

5 The table shows how the speed of a car changed as it travelled along a road.

Time / s	0	10	20	30	40	50	60
Speed / m/s	12.0	12.0	12.0	14.0	16.0	18.0	18.0

a Draw a speed–time graph to represent this motion.

b After how many seconds did the car start to accelerate?

c From the data in the table, determine the distance travelled by the car in the first 20 s of its journey.

S **d** From the graph, determine the car's acceleration between 20 s and 50 s.

e From the graph, determine the total distance travelled by the car during the 60 s shown in the table.

6 A car has a mass of 600 kg. As it sets off, its engine provides a forward force of 1500 N on the car.

a Determine the acceleration of the car produced by this force.

b Later, the engine force is reduced to 800 N. A drag force of 300 N acts on the car in the opposite direction to its velocity. Determine the resultant force acting on the car, and its acceleration.

7 A parachutist is falling vertically downwards through the air. His weight is 750 N and he is acted on by a drag force of 600 N.

a Draw a diagram to show the forces acting on the parachutist.

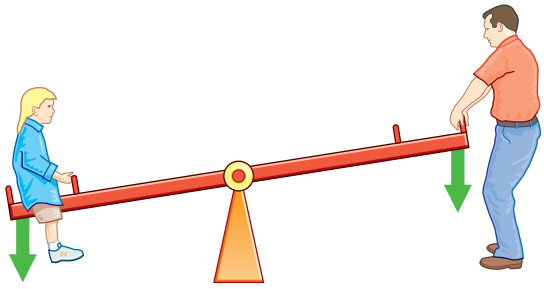
b Determine the resultant force acting on the parachutist.

S **c** The mass of the parachutist is 75 kg. Determine his acceleration.

d As the parachutist falls faster, the drag force on him increases and his acceleration decreases. What will be the value of the drag force when the parachutist is falling at a constant speed?

8 **a** The woman in the illustration is using a crowbar to move a heavy rock. Explain why she is more likely to be successful if she pulls nearer the top end of the crowbar.

b The man in the illustration can push down on the end of the see-saw so that his daughter rises upwards. If the man sits on the end of the see-saw, it will tip in the opposite direction. Explain why.



9 A plank of mass 80 kg has a length of 1.5 m.

a Determine the weight of the plank.

The plank is placed on a pivot which is positioned 0.5 m from one end (A) of the plank. A weight is placed at A so that the plank is balanced.

b Draw a diagram of the forces acting on the plank.

c Determine the value of the weight at A.

d Determine the force which acts on the pivot. Give its magnitude and its direction.

10 A spring has a length of 60.0 cm when it is unstretched. A load of 10 N increases its length to 64.0 cm and a load of 20 N increases its length to 68.0 cm.

a What extension is produced by the 20 N load?

b What length would the spring have if a load of 15 N were added to it?

S **c** Determine the force needed to produce an extension of 1 cm.

d Sketch a graph to show how you would expect the extension of the spring to change as the load on it is increased. Your graph should extend beyond the **limit of proportionality**; mark this point on the graph.

11 The pressure exerted by a force depends on the size of the force and the area it is pressing on.

a Use this idea to explain why a needle (used for sewing) has a sharp point.

b Give an example of a situation where a force presses on a large area in order to reduce the pressure.

S **12** A force of 200 N presses on a flat surface of area 12.5 m^2.

a Determine the pressure exerted by this force, in N/m^2.

b Give the SI name for the unit of pressure.

c It is required to reduce the pressure to 10 N/m^2 by changing the area on which it acts. Determine the value of the area.

13 A hot water tanks has a base of area 0.8 m^2. It contains water to a depth of 1.5 m. You will need to know that the density of water = 1000 kg/m^3 and that the acceleration due to gravity, g = 10 N/kg.

a Calculate the volume of water in the tank.

b Calculate the mass of water in the tank, and its weight.

c Calculate the pressure of the water on the base of the tank.

14 Name the following forms of energy:

a energy of a moving object

b energy of an object raised above the ground

c energy being transferred from a hot place to a cooler place

d energy of a stretched spring.

15 An electric lamp is supplied with 3600 J of energy each minute. It transforms this energy to light and heat energy. It produces 3 J of light energy each second.

a Calculate the energy supplied to the lamp each second.

b Calculate the amount of heat energy produced by the lamp each second.

c Name the principle you have used in calculating your answer to part **b**.

S **d** Calculate the efficiency of the lamp.

16 A boy lifts a stone of mass 0.4 kg from the ground and holds it above his head at a height of 2.0 m above the ground. He then throws it so that it leaves his hand with a speed of 6 m/s.

a Calculate the stone's gravitational potential energy when it is held above the boy's head.

b Calculate the stone's kinetic energy as it leaves the boy's hand.

17 Electricity is generated in a number of ways. What name is given to each of the following?

a electricity generated when the process of fission releases energy from uranium

b electricity generated when water stored behind a dam turns a turbine

c the energy of sunlight converted directly into electrical energy

d electricity generated when moving air turns a turbine.

18 A builder lifts five bricks. Each brick has a mass of 2.4 kg.

a Calculate the weight of five bricks.

b What force is needed to lift five bricks?

S **c** The builder lifts the bricks to the top of a building which is 6.0 m high. Calculate the work done in lifting the bricks.

19 An electric motor has a power rating of 400 W.

a How much energy does the motor transfer each second?

b The motor provides a force of 50 N to lift a load. It raises a load of sand through a distance of 4.0 m. How much work is done on the sand?

c Because the motor is inefficient, it can transfer just 100 J of energy to a load each second. Calculate the time taken by the motor to raise the sand.