Yr 11 Physics worksheet Paper 2

Work done and Moment

Q1) The diagram shows weightlifting equipment found in most gyms.

When using the equipment, John wants to do 300J of work in each lift.

He can vary the weight from 100N to 500N in steps of 50N.

He can also vary the distance he lifts the weights from 1.0 m to 2.0 m in steps of 0.5 m

a) State **three** weights and corresponding distances that John can use to achieve this

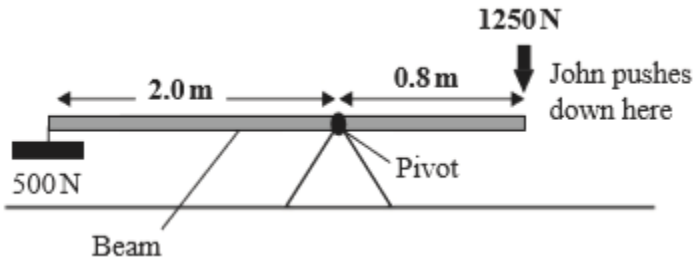
1. weight = _____N distance =_____m

2. weight = _____N distance =_____m **(2)**

b) John repeats the exercise. He does 10 complete lifts in a time of 30 seconds. Calculate the power John produces during this time.

(2)

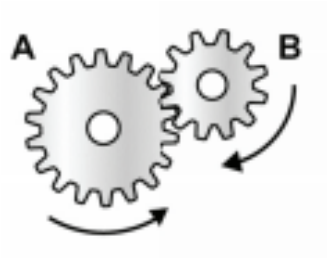
c) John builds a simple weightlifting device as shown below.
The pivot can be moved along the beam.



i) For the arrangement of weight and distances shown above calculate the **moment** of the force that John exerts. (**2)**

ii) To reduce the force that John exerts but keep the same moment, he moves the pivot. In what direction should he move it? Explain your answer. (**2)**

d) The drawing below shows two gear wheels. Gear A has 20 teeth and gear B has 10 teeth.



i) What is the ratio of teeth on gear A to teeth on gear B?_____ **(1)**

ii) Gear A makes 2 complete revolutions. How many times will gear B turns? (1)

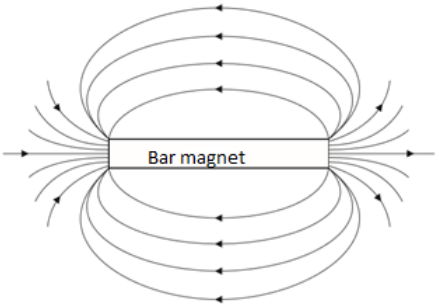
iii) A third 'idler' gear can be introduced between the two gear wheels. What is the purpose of this gear? (**1)**

iv) Would the number of teeth on the 'idler' gear make any difference to the relative rate of rotation of the two gear wheels? Explain why? (2**)**

Force field

Q2) a) The diagram shows the magnetic field pattern around a bar magnet.

Complete the diagram above by labelling the poles on the bar magnet **(1)**



b)* Compare and contrast the effects that gravitational, magnetic and electrostatic (electric) fields have on other objects.

_**(6)**

c) If we place the north pole of a magnet near the north pole of the above magnet a force is exerted on it Explain, in terms of magnetic fields, **why** a force is exerted on the magnet.

Vector diagram

Q3) Fig. 3.1 is an overhead view of two tractor pulling a tree trunk.

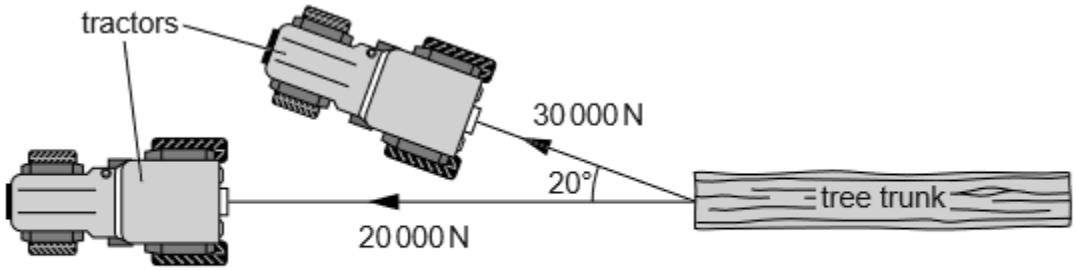


Fig. 3.1

The force exerted by each tractor is indicated in the diagram.

In the space below, carefully draw a scale diagram to determine the resultant force on the tree trunk.
State the scale you use.
Write down the magnitude of the resultant force **and** the angle between the resultant force and one of the original force.

(3)

Q4) a) A student investigates how the current in a resistor varies as the potential difference across the resistor is varied. Draw a suitable circuit diagram for the investigation. **(2)**

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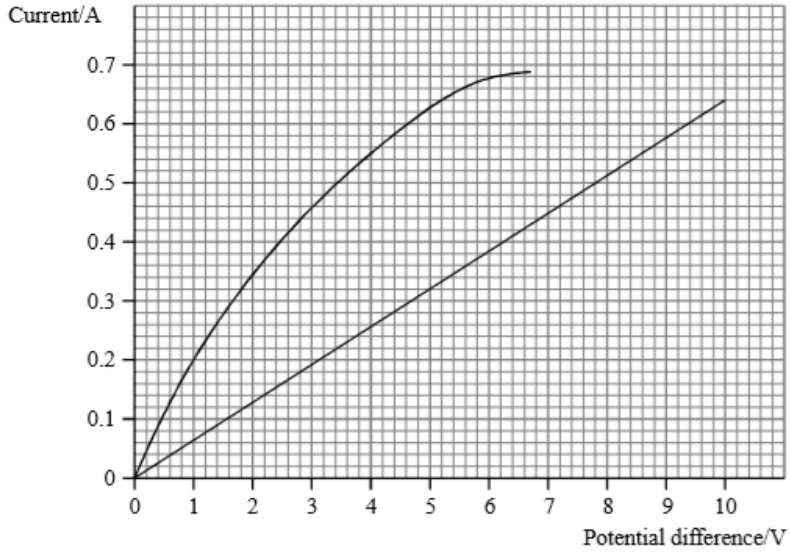
b) The graphs show the variation of current with potential difference for a filament lamp and for an ohmic resistor.



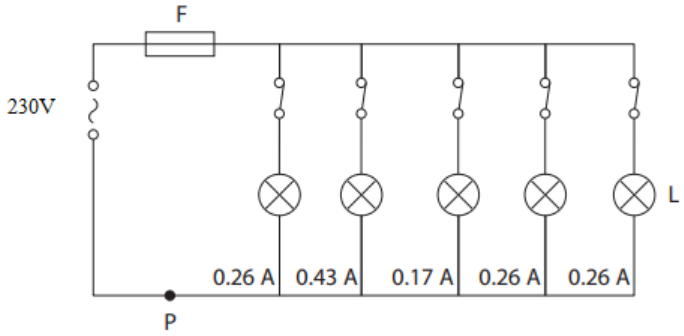
i) Label one graph lamp and the other graph resistor. **(1)**

ii) The lamp and resistor are connected in series as shown. There is a current of 0.50 A.

Use the graph to find the total potential difference across the combination. (2)

iii) What is the resistance of the lamp under these conditions? (2)

c) The diagram shows part of a lighting circuit in a house. The circuit is protected by fuse F.



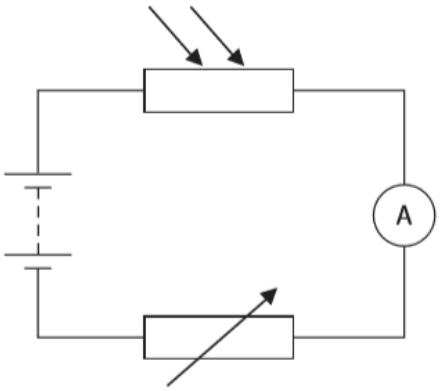
i) What is the current at P?

ii) Calculate the amount of energy transferred by lamp L in 3 minutes. (2)

LDR

Q5) The resistance of a Light dependent Resistor (LDR) is affected by the amount of light that shines on it.

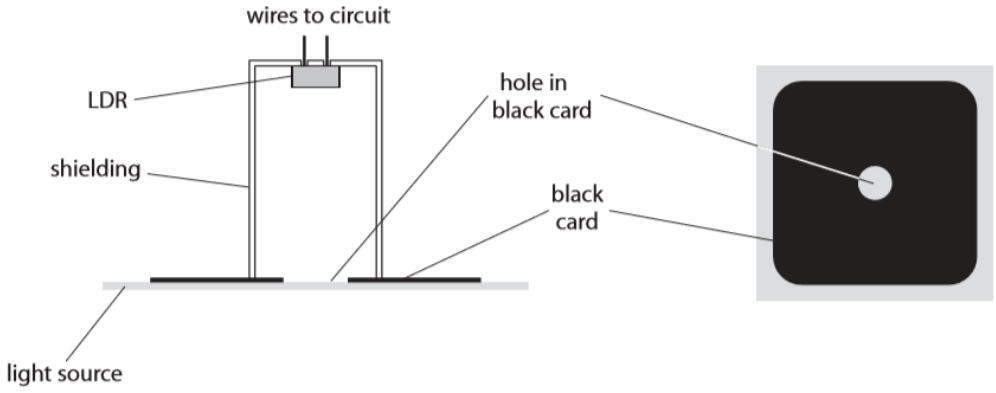
A student investigates this relationship using the circuit shown.



a) (i) The student uses a voltmeter to measure the voltage across the LDR.
Add this voltmeter to the circuit diagram. **(1)**

(ii) Explain how the student can work out the resistance of the LDR using this circuit. (2)

b) The student shines light on the LDR through a circular hole in a piece of black card, as shown in the diagram.
The student repeats the experiment using cards with holes of different diameter.
The distance from the card to the LDR is always **5 cm**.
The student varies the current in the circuit by adjusting the variable resistor.



(i) The independent variable in tthhis expriment is _____(**1**)

(ii) The controlled variable in this experiment is _____ **(1)**

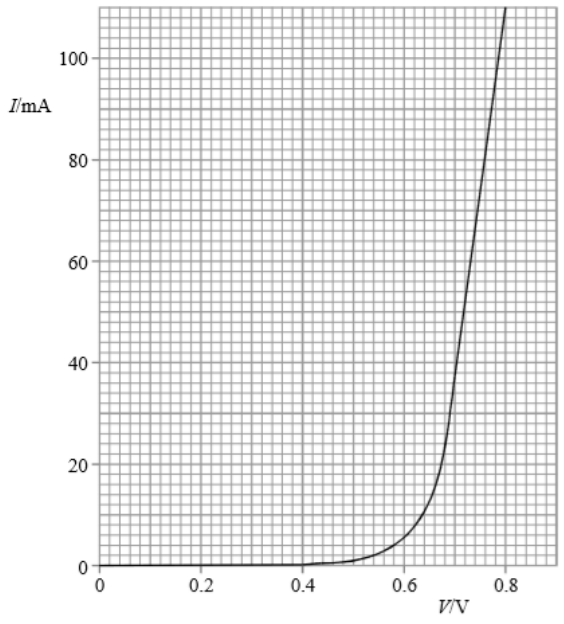
c) The table below shows the student's result

Diameter of hole in mm	8	10	15	20	23	30
Resistance of LDR in Ω	1050	890	640	490	430	340

(i) Plot the student's results on the grid and draw a curve of best fit on the graph. **(4)**

(ii) Describe the relationship between the resistance of the LDR and the diameter of the hole.(2)

Q6) The graph shows the current-voltage characteristic of a semiconductor diode.

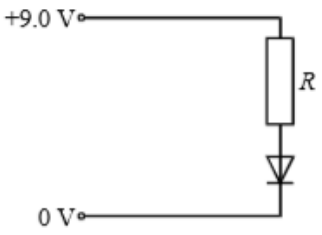


a) State, with a reason, whether the diode obeys Ohm's law. (1)

b) Show that when the voltage across the diode is 0.74 V its resistance is about 11 Ω. (1)

c) When the diode is connected in the following circuit, the voltage across it is 0.74 V.

Calculate the value of the resistance R.



Electronic circuit designers often use a simple model of this type of diode. This "model diode" has the following properties:

(i) For any voltage below +0.7 V it does not conduct at all.

(ii) Once the voltage reaches +0.7 V the diode can pass any size of current with no further increase in voltage.

Add a **second graph** to the grid above to show the current-voltage characteristic of this model diode.

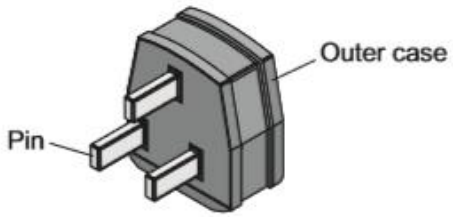
(1)

Electric safety

Q7) A washing machine is connected to the mains electricity supply using a cable and three-pin plug.

Figure 9 shows a three-pin plug.

Figure 9



a) Name the materials used in the structure of a plug. Give the reason why each material is used (2)

b) The three-pin plug contains a fuse. The fuse is connected to one of the wires inside the cable.

(i) Which one of the wires inside the cable is the fuse connected to? (1)

(ii) The fuse is a thin wire inside a closed glass tube. The wire acts as a resistor.
What effect does a current through a wire have on the wire? (1)

(iii) The power of the washing machine varies between 0.7 kW and 2 kW depending on which part of the wash cycle is operating.

Calculate the maximum current drawn from the mains electricity supply by the washing machine. The mains electricity supply is at a potential difference of 230 V. (2)

iv) The fuse in the three pin plug blows and the an electrician has to replace it.
The following fuses are available:

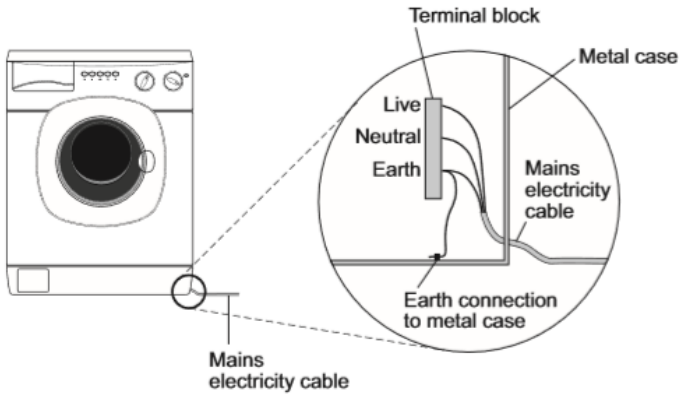
1A, 3A, 5A and 13A

Which fuse should the student use? Explain your choice. (2)

Figure 10 shows how the mains electricity cable is connected to the washing machine.

The earth wire is connected to the metal case of the washing machine.

Figure 10

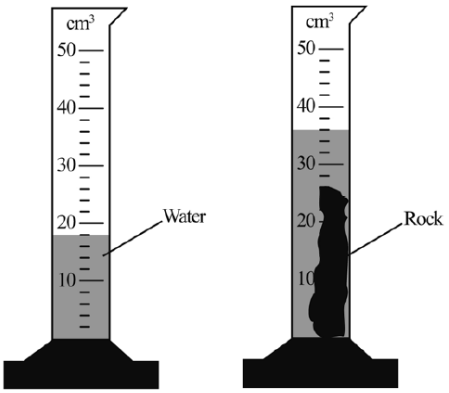


c) If a fault makes the metal case live, the earth wire and fuse inside the plug prevent the mains cable from overheating and causing a fire. Explain how. (20

d) New research has shown that many people underestimate the hazards of using mains electricity.
It is important that people do understand the hazards of using mains electricity. Suggest why. (1)

Q8) Sam finds the volume of the rock using the apparatus shown below to measure its density.

The mass of the rock was measured and found to be 36g. Using the data from the diagram calculate the density of the rock.



Q9) A steel ball has a mass of 28 g. The steel ball is at a room temperature of 20 ^{o}C.
It is then put in a pan of boiling water maintained at 100 ^{0}C.

a) Calculate how much thermal energy the ball gains as its temperature increases from 20 ^{0}C to 100 ^{0}C.
Specific heat capacity of steel = 510 J/ kg ^{0}C

b) The steel ball is put into a furnace where it melts. Compare the motion of particles in the steel when they are in the solid state with their motion when in the molten (liquid) state. **(3)**

Q10) Fig. 5.1 shows a gas contained in a cylinder enclosed by a piston.

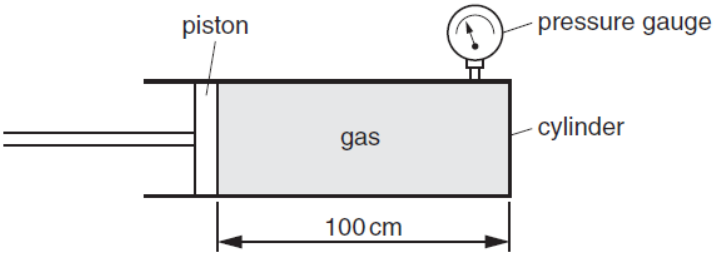


Fig. 5.1

At first, the length of cylinder containing the gas is 100 cm. The pressure of the gas, shown by the pressure gauge, is 300 kPa. The area of cross-section of the cylinder is 0.12 m^2.

The piston is moved so that the new length of cylinder occupied by the gas is 40 cm. The temperature of the gas is unchanged. Calculate the new pressure of the gas.