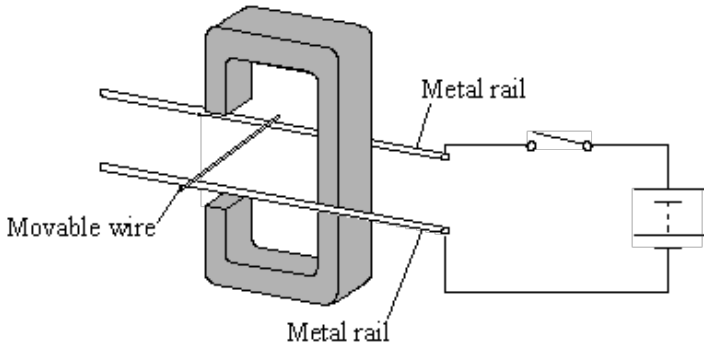
Q1. The diagram shows apparatus used to demonstrate the electric motor effect. When he switch is closed the wire moves.



(i) Draw an arrow on the diagram to show the direction the wire moves.

(1)

(ii) Explain why the wire moves.

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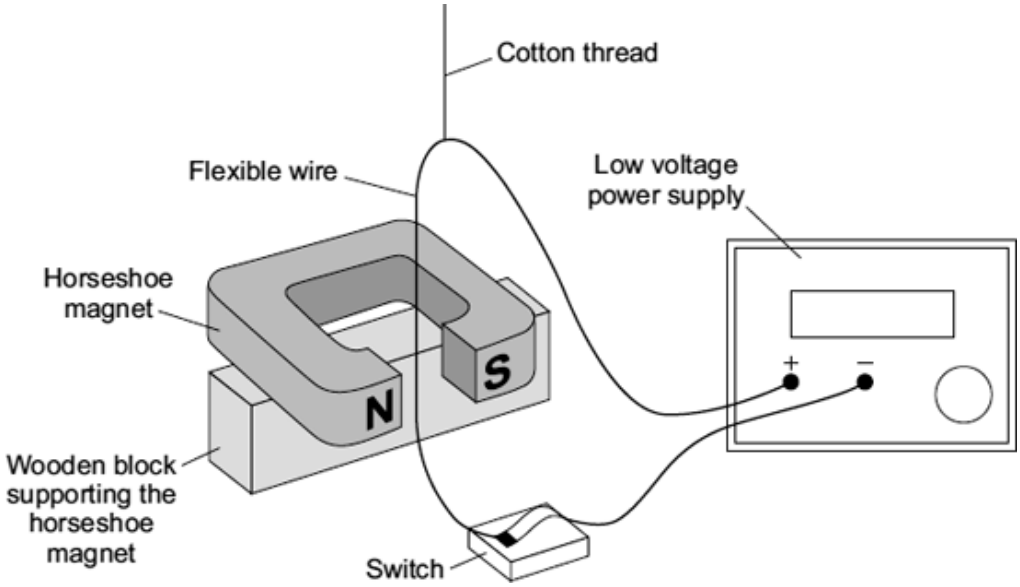
(2)

(Total 3 marks)

Q2. (a) A laboratory technician sets up a demonstration.



A flexible wire is suspended between the ends of a horseshoe magnet. The flexible wire hangs from a cotton thread. When the switch is closed, the wire kicks forward.

Identify the effect which is being demonstrated.

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(1)

(b) A teacher makes some changes to the set-up of the demonstration.

What effect, if any, will each of the following changes have?

(i) more powerful horseshoe magnet is used.

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(1)

(ii) The connections to the power supply are reversed.

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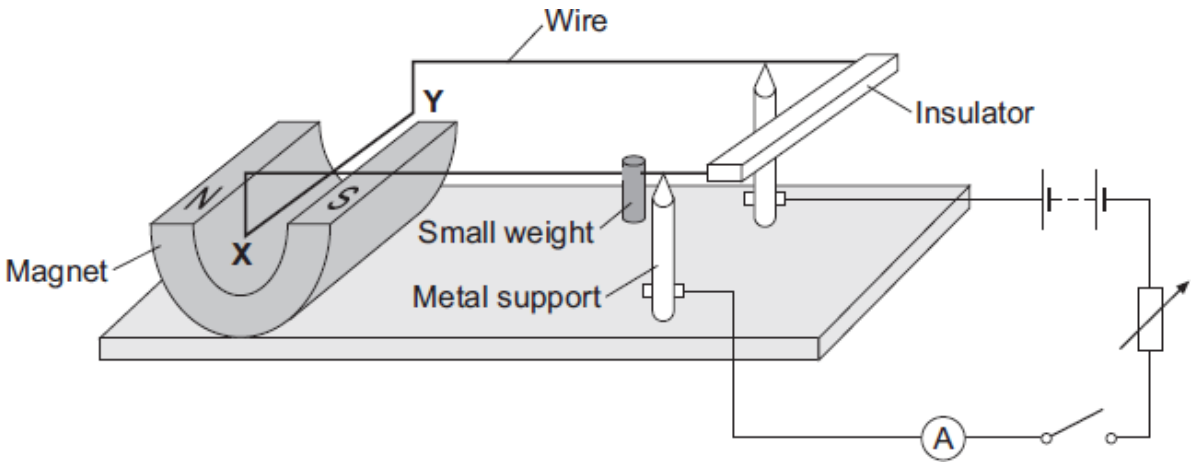
(1)
(Total 3 marks)

Q3. The diagram shows a device called a current balance.



(a) (i) When the switch is closed, the part of the wire labelled **XY** moves upwards.

Explain why.

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(2)

(ii) What is the name of the effect that causes the wire **XY** to move?

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(1)

(iii) An alternating current (a.c.) is a current which reverses direction. How many times the current reverses direction in one second depends on the frequency of the alternating supply.

Describe the effect on the wire **XY** if the battery is replaced by an a.c. supply having a frequency of 5 hertz.

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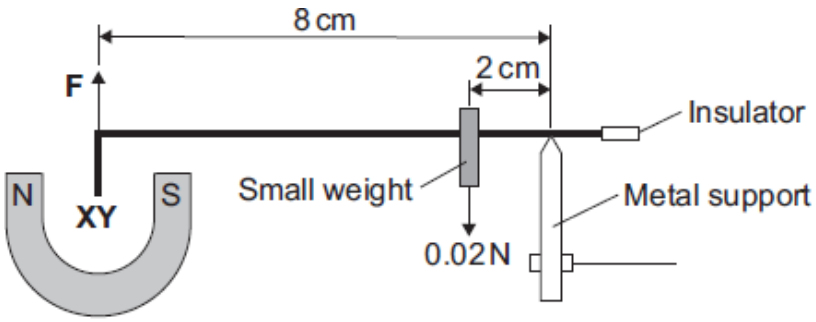
(2)

(b) The diagram shows how a small weight can be used to make the wire **XY** balance horizontally.



Side view

Use the data in the diagram and the equation in the box to calculate the force, **F**, acting on the wire **XY**.

moment	=	force	×	perpendicular distance from the line of action of the force to the axis of rotation

Show clearly how you work out your answer.

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.....

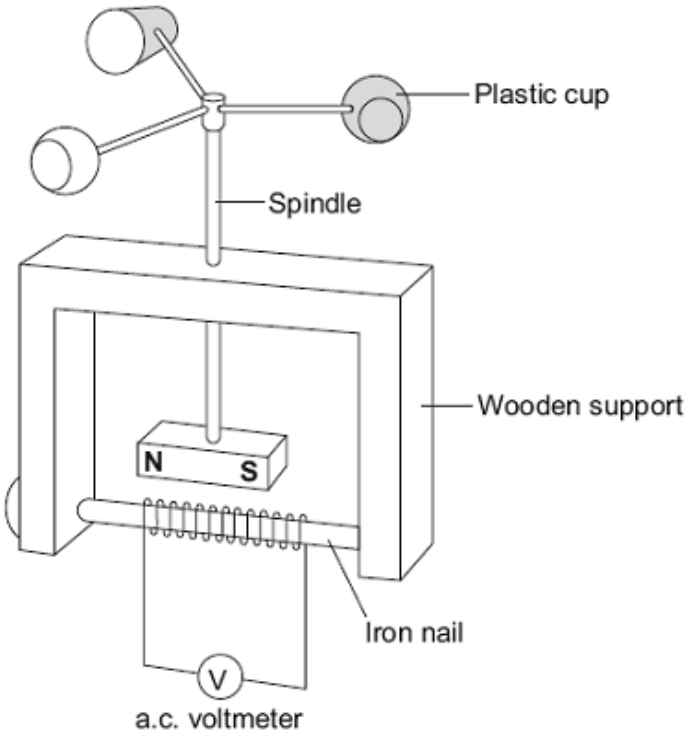
.....

Force = ... N

(3)

(Total 8 marks)

Q4. The diagram shows a student's design for a simple wind speed gauge.



(a) Explain why the wind causes the a.c. voltmeter to give a reading. The explanation has been started for you.

The wind causes the plastic cups to turn. .....

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(3)

(b) The gauge is not sensitive enough to measure light winds.

Suggest **one** way that the design can be modified to make the gauge more sensitive.

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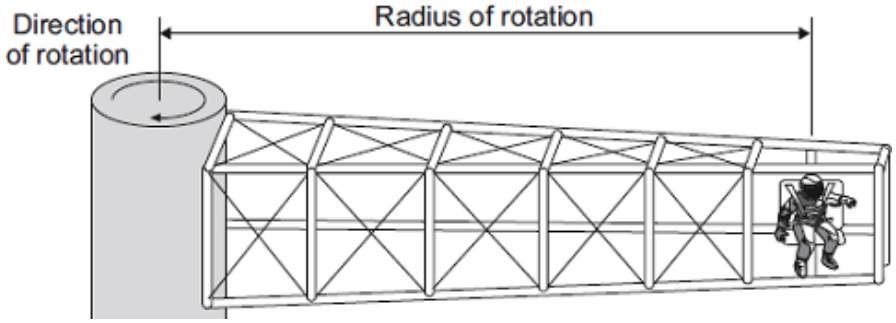
(1)
(Total 4 marks)

Q5. The diagram shows a ‘G-machine’. The G-machine is used in astronaut training.



The G-machine moves the astronaut in a horizontal circle.

(a) When the G-machine is rotating at constant speed, the astronaut is accelerating.

State the name and direction of the force causing the astronaut to accelerate.

Name of force .....

Direction of force .....

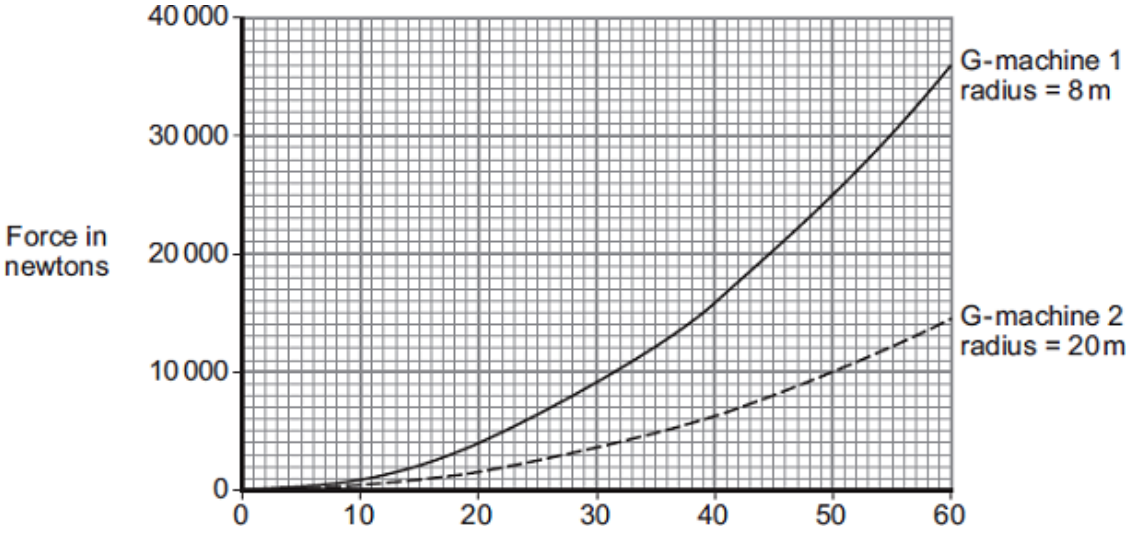
.....

(2)

(b) The force causing the astronaut to move in a circle is measured.

The graph shows how the speed of the astronaut affects the force causing the astronaut to move in a circle for two different G-machines.

The radius of rotation of the astronaut is different for each G-machine.



(i) State **three** conclusions that can be made from the graph.

1 .....

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2 .....

.....

3 .....

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(3)

(ii) The speed of rotation of G-machine 1 is increased from 20 m/s to 40 m/s.

Determine the change in force on the astronaut.

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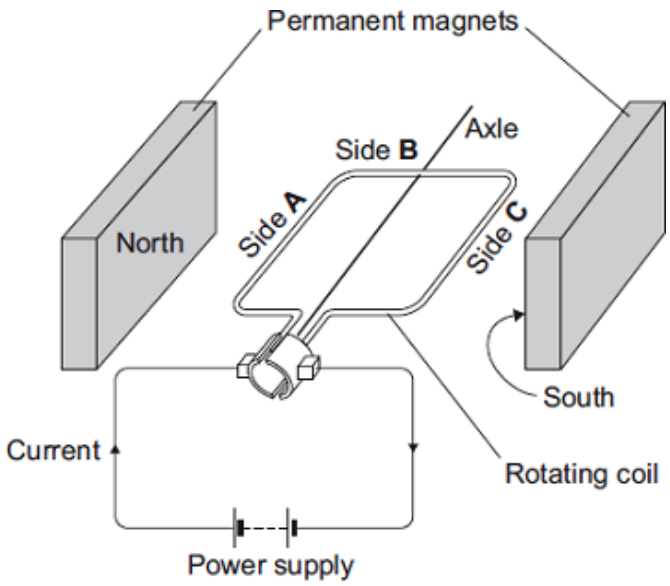
Change in force = ... N

(1)

(c) Each G-machine is rotated by an electric motor. The diagram shows a simple electric motor.



(i) A current flows through the coil of the motor.

Explain why side **A** of the coil experiences a force.

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(2)

(ii) Draw arrows on the diagram to show the direction of the forces acting on side **A** of the coil and side **C** of the coil.

(1)

(iii) When horizontal, side **B** experiences no force.

Give the reason why.

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(1)

(d) While a G-machine is rotating, the operators want to increase its speed.

What can the operators do to make the G-machine rotate faster?

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(1)

(e) The exploration of space has cost a lot of money.

Do you think spending lots of money on space exploration has been a good thing?

Draw a ring around your answer.

Yes **No**

Give a reason for your answer.

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(1)
(Total 12 marks)