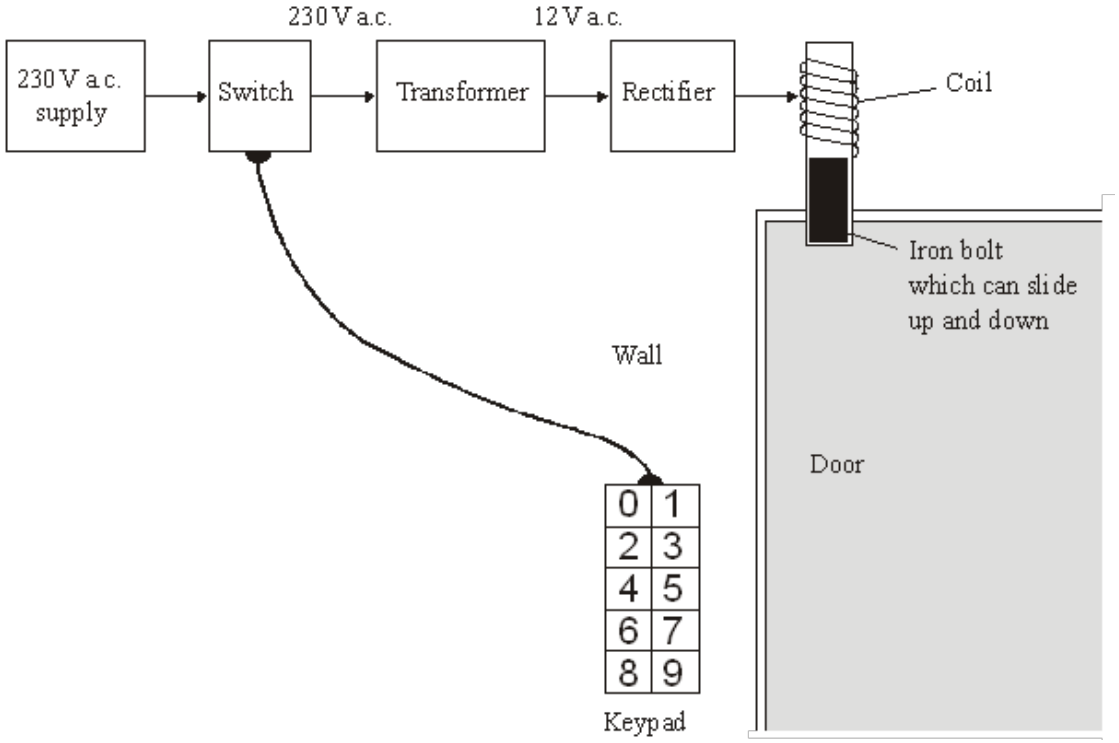
Q1. The diagram shows the design for a remotely controlled door bolt.

When the correct numbers are entered into the keypad the transformer switches on. Then the door can be opened.



(a) What kind of transformer is shown in the diagram?

.....

(1)

(b) What does the abbreviation a.c. stand for?

.....

(1)

(c) Complete the sentences using the correct words from the box.

attracts	**downwards**	**magnet**	**reflects**	**repels**
sideways	**switch**	**transformer**	**upwards**	

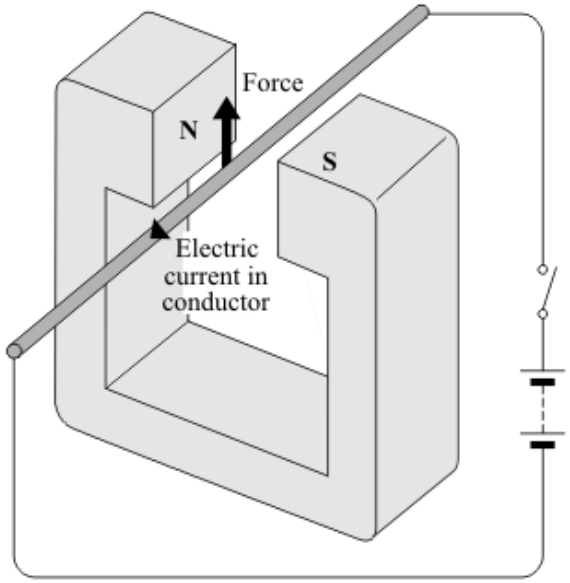
(i) When a current flows in the coil, the coil becomes a ..... .

(ii) The coil ..... the iron bolt which moves .....

(3)

(Total 5 marks)

Q2. When a conductor carrying an electric current is placed in a magnetic field a force may act on it.



(a) State **two** ways in which this force can be increased.

1 .....

2 .....

(2)

(b) State **two** ways in which this force can be made to act in the opposite direction.

1 .....

2 .....

(2)

(c) In what circumstance will **no** force act on a conductor carrying an electric current and in a magnetic field?

.....

.....

(1)
(Total 5 marks)

Show clearly how you work out your answer.

.....

.....

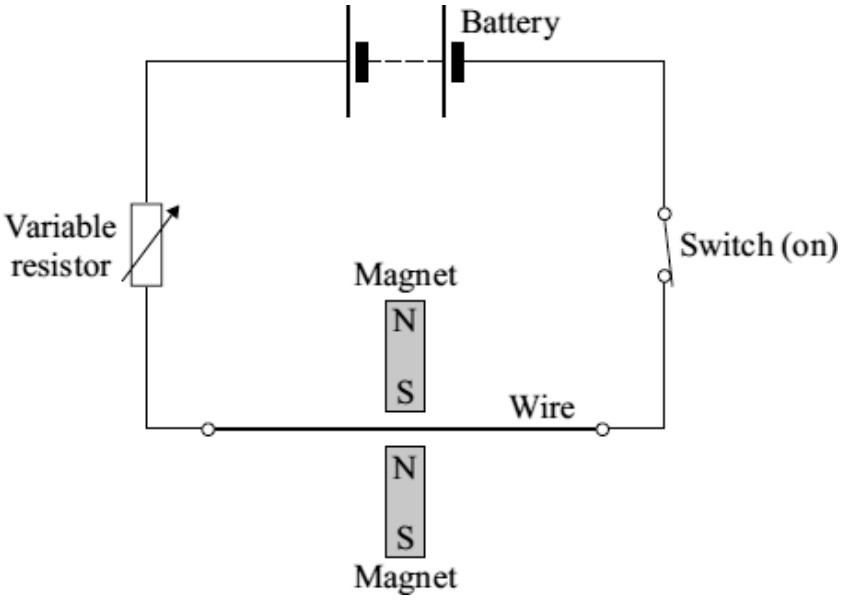
Kinetic energy = ... J

(2)
(Total 7 marks)

Q3. A student investigates the electromagnetic force acting on a wire which carries an electric current. The wire is in a magnetic field.

The diagram shows the circuit which the student uses.

(a) Draw an **X** on the diagram, with the centre of the **X** in the most strongest part of the magnetic field.



(1)

(b) Give **one** change that she can make to the magnets to **decrease** the electromagnetic force on the wire.

.....

.....

(1)

(c) The student wants to change the electromagnetic force on the wire without changing the magnets or moving their position.

(i) Give **one** way in which she can **increase** the electromagnetic force.

.....

.....

(1)

(ii) Give **one** way in which she can **reverse** the direction of the electromagnetic force.

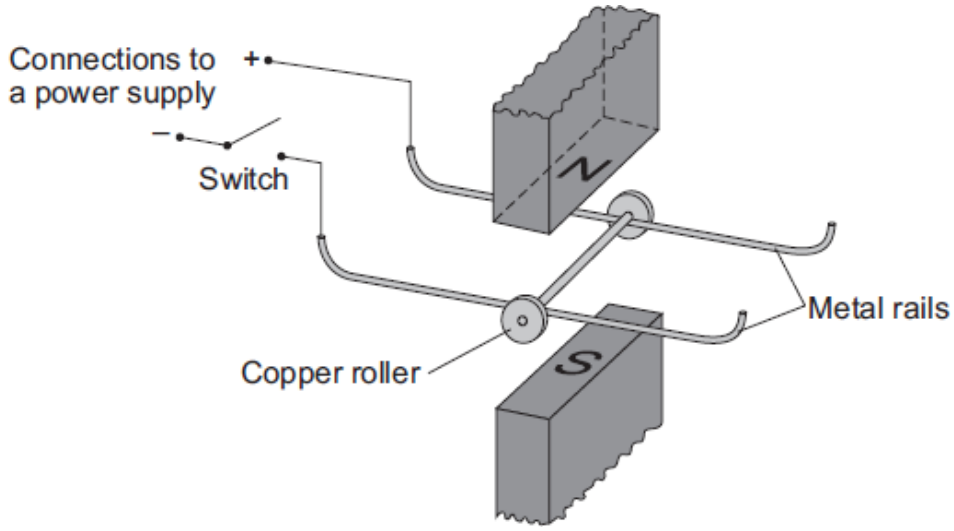
.....

.....

(1)

(Total 4 marks)

Q4. (a) A science technician sets up the apparatus shown below to demonstrate the motor effect. He uses a powerful permanent magnet.



The copper roller is placed across the metal rails. When the switch is closed, the copper roller moves to the right.

(i) Complete the sentence by drawing a ring around the correct line in the box.

This happens because copper is

an electrical conductor.
an electrical insulator.
a magnetic material.

(1)

(ii) Suggest **one** change that the technician can make which will cause the copper roller to move faster.

.....

.....

(1)

(iii) Suggest **two** changes which the technician can make, each of which will separately cause the copper roller to move to the left.

1 .....

.....

2 .....

.....

(2)

(b) Many electrical appliances, such as vacuum cleaners, drills and CD players, contain electric motors. As more electrical appliances are developed, more electricity needs to be generated. Generating electricity often produces pollutant gases.

(i) Complete the sentence by drawing a ring around the correct line in the box.

Generating more electricity to power the increasing number of electrical appliances used

raises | an ethical / an environmental / a political | issue.

(1)

(ii) The number of electrical appliances used in the world's richest countries is increasing yet many people in the world's poorest countries have no access to electricity.

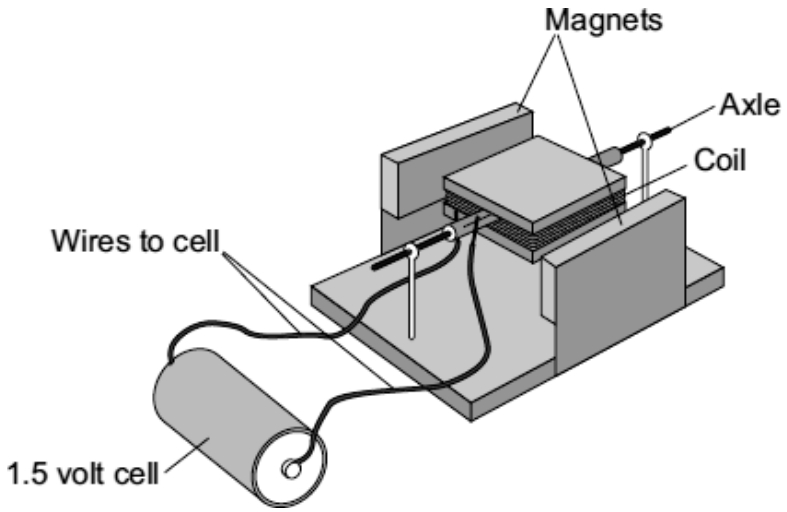
What type of issue does this inequality between people in different countries raise?

.....

(1)

(Total 6 marks)

Q5. (a) Complete the description of the device shown below by drawing a ring around the correct line in each box.



(i) The device is being used as

an electric motor.
a generator.
a transformer.

(1)

(ii) The coil needs a flick to get started. Then one side of the coil is pushed by the

cell
coil
force

and the other side is pulled, so that the coil spins.

(1)

(b) Suggest **two** changes to the device, each one of which would make the coil spin faster.

1 .....

.....

2 .....

.....

(2)

(c) Suggest **two** changes to the device, each one of which would make the coil spin in the opposite direction.

1 .....

.....

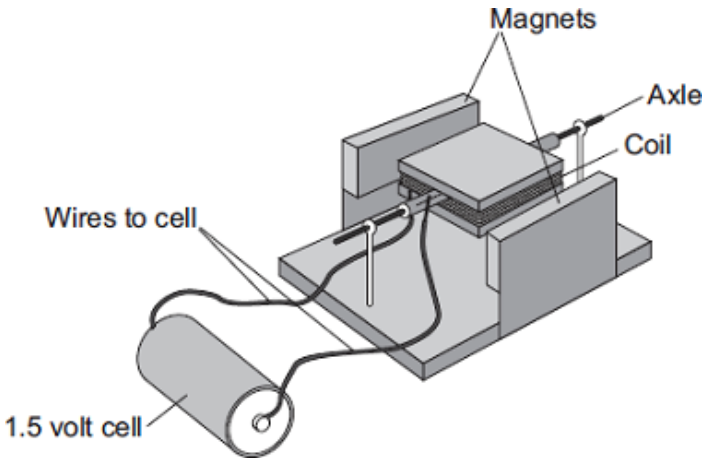
2 .....

.....

(2)

(Total 6 marks)

Q6. A student has made a simple electric motor. The diagram shows the electric motor.



(a) Complete the following sentence by drawing a ring around the correct line in the box.

Once the coil is spinning, one side of the coil is pushed by

the cell
the coil
a force

and the other side is pulled, so the coil continues to spin.

(1)

(b) Suggest **two** changes to the electric motor, each one of which would make the coil spin faster.

1 .....

.....

2 .....

.....

(2)

(c) Suggest **two** changes to the electric motor, each one of which would make the coil spin in the opposite direction.

1 .....

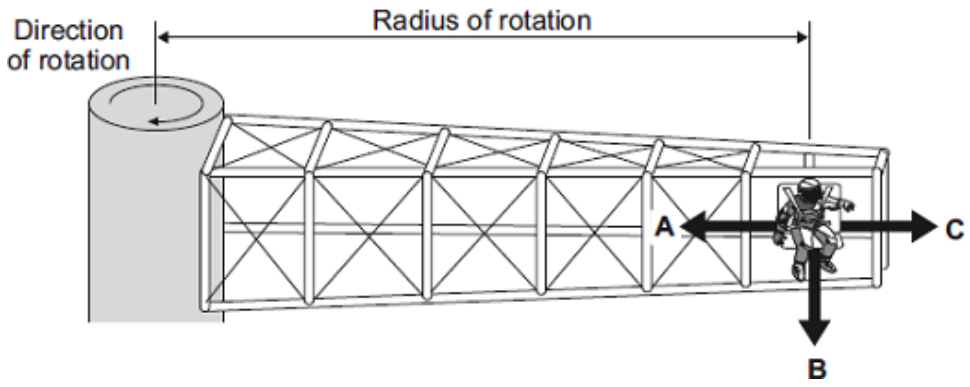
.....

2 .....

.....

(2)
(Total 5 marks)

Q7. The diagram shows a 'G-machine'. The G-machine is used in astronaut training.



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

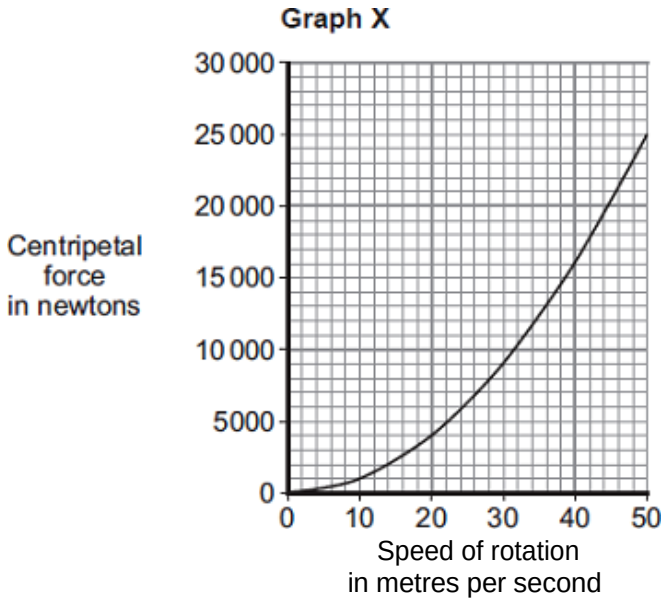
(a) In which direction, **A**, **B** or **C**, does the centripetal force on the astronaut act?

Write your answer in the box. ☐

(1)

(b) The centripetal force on the astronaut is measured.

Graph X shows how the centripetal force is affected by the speed of rotation.
The radius of rotation is kept the same.



(i) Use **Graph X** to determine the centripetal force on the astronaut when rotating at a speed of 30 metres per second.

Centripetal force = ... newtons

(1)

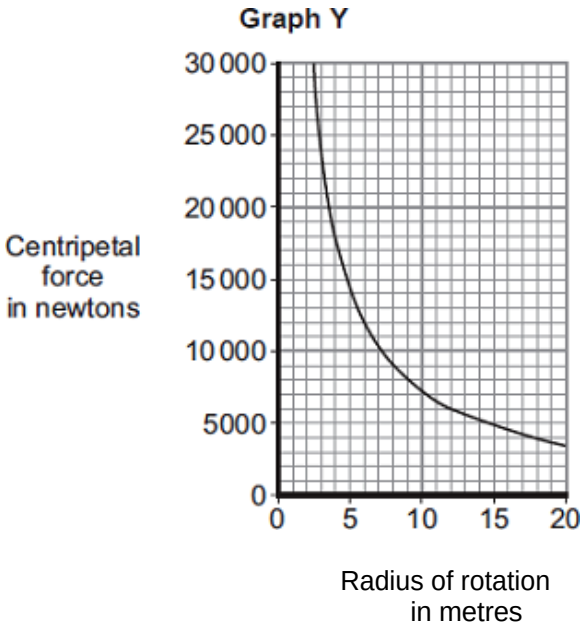
(ii) Complete the following sentence to give the conclusion that can be made from **Graph X**.

Increasing the speed of rotation of a G-machine will .....

the centripetal force on the astronaut.

(1)

(iii) **Graph Y** shows how the centripetal force is affected by the radius of rotation, when the speed of rotation is kept the same.



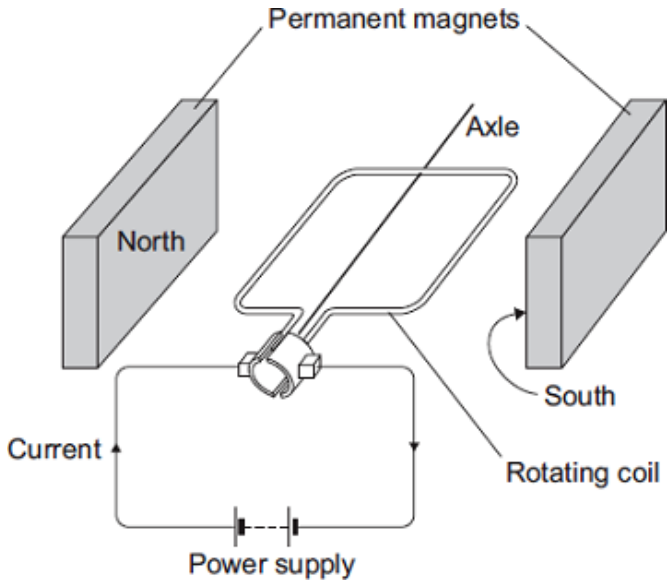
Complete the following sentence to give the conclusion that can be made from **Graph Y**.

The greater the radius of rotation, the ..... the centripetal force

on the astronaut.

(1)

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



The following statements explain how the motor creates a turning force. The statements are in the wrong order.

M – The magnetic field interacts with the magnetic field of the permanent magnets.

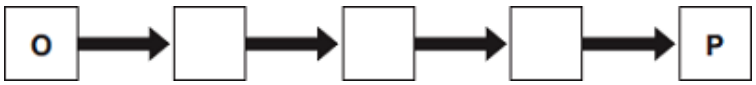
N – A magnetic field is created around the coil.

O – The power supply applies a potential difference across the coil.

P – This creates a force that makes the coil spin.

Q – A current flows through the coil.

Arrange the statements in the correct order. Two of them have been done for you.



(2)

(d) The electric motor produces a turning force.

Give **two** ways of increasing the turning force.

1 .....

.....

2 .....

.....

(2)

(e) Draw a ring around the correct answer to complete the sentence.

It costs a lot of money to send astronauts into space.

This is

- an economic
- an environmental
- a social

issue.

(1)

(Total 9 marks)