



**Week 6 Learning Check
Physics Foundation**

Name: _____

Class: _____

Date: _____

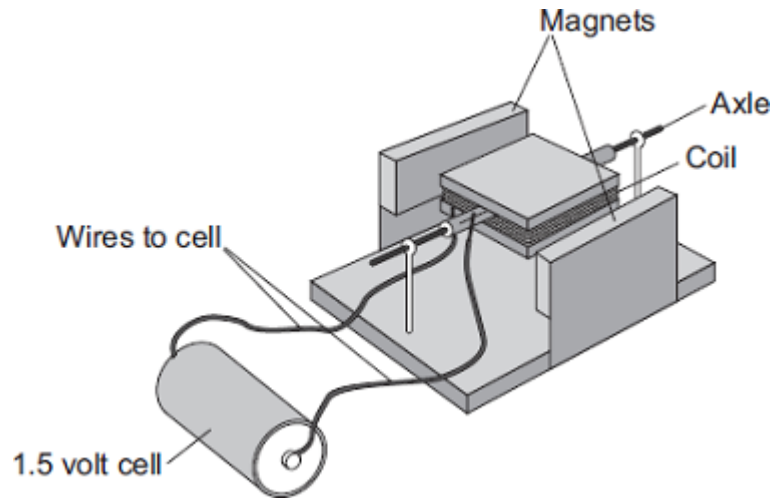
Time: **30 minutes**

Marks: **33 marks**

Comments:

Q1.

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	and
the coil	
a force	

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)

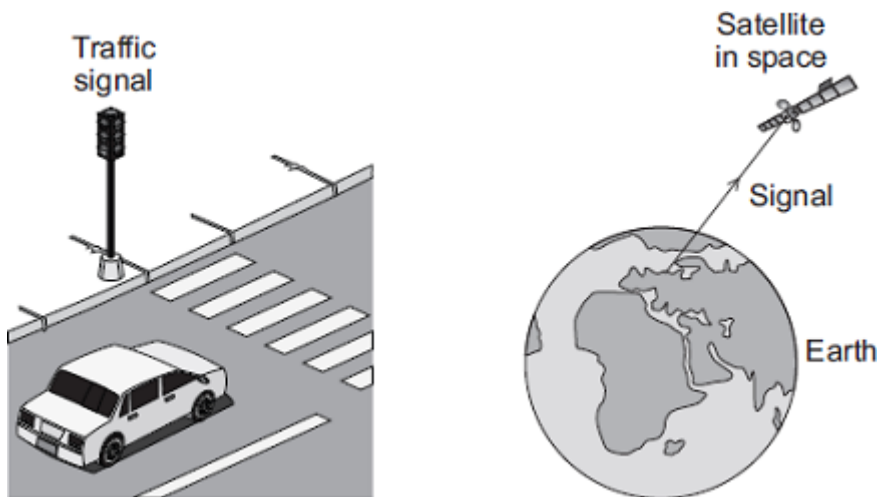
Q2.

Diagram 1 shows four of the seven types of wave in the electromagnetic spectrum.

Diagram 1

J	K	L	Visible light	Infrared	Microwaves	Radio waves
---	---	---	---------------	----------	------------	-------------

- (a) The **four** types of electromagnetic wave named in **Diagram 1** above are used for communication.



- (i) Which type of electromagnetic wave is used when a traffic signal communicates with a car driver?

(1)

- (ii) Which type of electromagnetic wave is used to communicate with a satellite in space?

(1)

- (b) Gamma rays are part of the electromagnetic spectrum.

Which letter, **J**, **K** or **L**, shows the position of gamma rays in the electromagnetic spectrum?

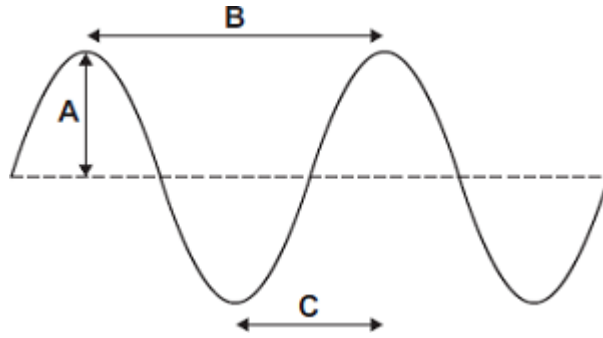
Draw a ring around the correct answer.

J K L

(1)

- (c) **Diagram 2** shows an infrared wave.

Diagram 2



- (i) Which **one** of the arrows, labelled **A**, **B** or **C**, shows the wavelength of the wave?

Write the correct answer, **A**, **B** or **C**, in the box.

(1)

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

The wavelength of infrared waves is shorter than
the same as
longer than the wavelength
of radio waves.

(1)

- (d) Mobile phone networks send signals using microwaves. Some people think the energy a person's head absorbs when using a mobile phone may be harmful to health.

- (i) Scientists have compared the health of people who use mobile phones with the health of people who do not use mobile phones.

Which **one** of the following statements gives a reason why scientists have done this?

Tick (✓) **one** box.

To find out if using a mobile phone is harmful to health.

To find out if mobile phones give out radiation.

To find out why some people are healthy.

(1)

- (ii) The table gives the specific absorption rate (SAR) value for two different mobile phones.

The SAR value is a measure of the maximum energy a person's head absorbs when a mobile phone is used.

Mobile Phone	SAR value in W/kg
X	0.28
Y	1.35

A parent buys mobile phone X for her daughter.

Using the information in the table, suggest why buying mobile phone X was the best choice.

(2)

(Total 8 marks)

Q3.

A student investigates the infrared radiation being emitted by different coloured surfaces to the surroundings.

- (a) Draw a ring around each correct answer to complete the sentences.

- (i) All objects emit and

absorb

conduct

insulate

infrared radiation.

(1)

- (ii) Compared with cooler objects, hotter objects emit

less

the same amount of

more

infrared radiation.

(1)

- (b) The student pours 300 cm³ of hot water into each of 3 metal cubes and seals the top of each cube.

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

Energy is transferred through the sides of the metal cubes by

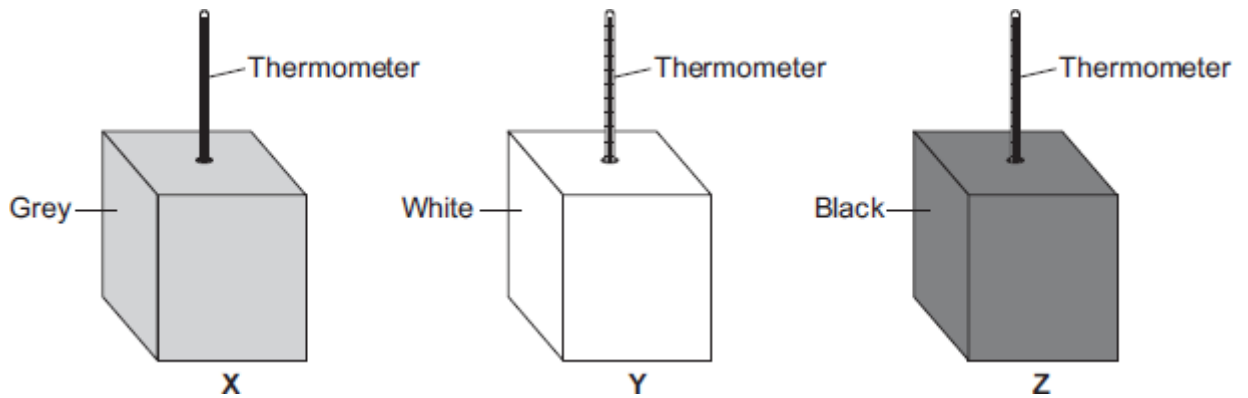
- conduction.
- convection.
- radiation.

(1)

Each cube has the same volume.

Each cube is a different colour.

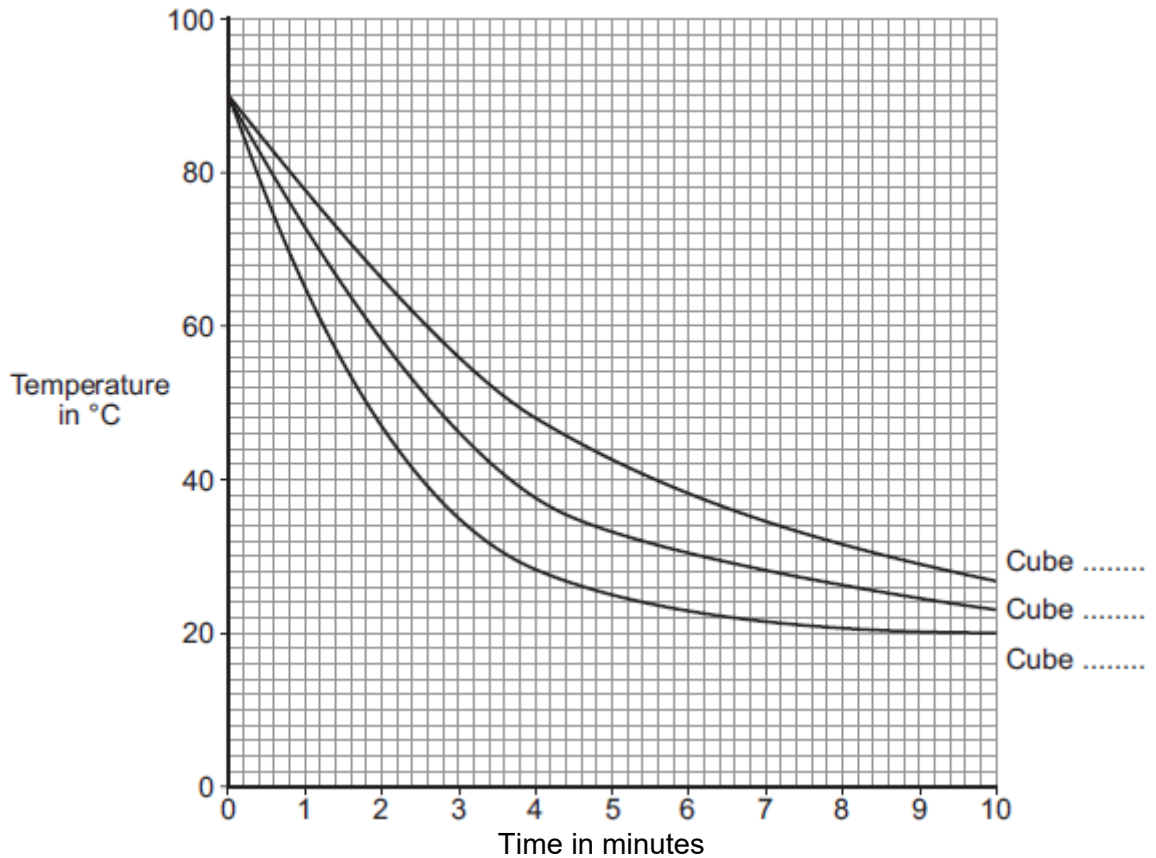
The temperature of each cube is recorded over 10 minutes.



(ii) What is the independent variable in the investigation?

(1)

The results of the investigation are shown on the graph.



(iii) Write the correct letter for each cube, **X**, **Y** or **Z**, next to the lines shown on the graph.

(2)

(iv) All three cubes had the same starting temperature. This was important in the investigation.

Suggest why.

(1)

(v) Some variables are kept the same in an investigation.

What name is given to these variables?

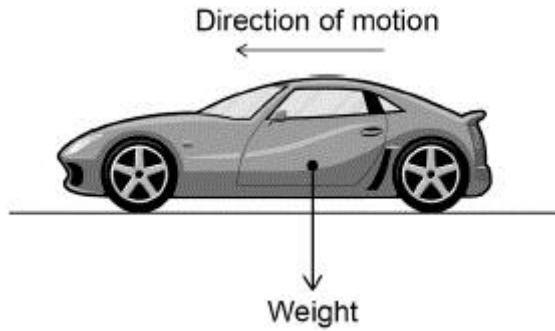
(1)

(Total 8 marks)

Q4.

Figure 1 shows a car travelling at a constant speed on a straight, level road.

Figure 1



- (a) Draw an arrow on **Figure 1** to show the direction of the force of air resistance on the car.

(1)

- (b) The mass of the car is 850 kg

Calculate the weight of the car.

Use the equation:

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{gravitational field strength} = 9.8 \text{ N/kg}$$

$$\text{Weight} = \text{_____} \text{ N}$$

(2)

- (c) What is the direction of the normal contact force of the road on the wheels?

Tick (✓) **one** box.

Down

Left

Right

Up

(1)

- (d) The car is travelling at constant speed.

The resultant force on the car is zero.

How does the size of the normal contact force of the road on the wheels compare with the weight of the car?

Tick (✓) **one** box.

The normal contact force is equal to the weight of the car.

The normal contact force is greater than the weight of the car.

The normal contact force is less than the weight of the car.

(1)

(e) A car is travelling at a constant speed.

A constant braking force of 5100 N is applied by the brakes.

The car decelerates and stops.

The braking distance is 38 m

Calculate the work done by the braking force.

Choose the unit from the box.

joule	metre	newton	watt
-------	-------	--------	------

Use the equation:

$$\text{work done} = \text{force} \times \text{distance}$$

Work done = _____ Unit _____

(3)

(f) Which **two** factors affect braking distance?

Tick (✓) **two** boxes.

Condition of the tyres

Distractions

- Drugs
- Ice on the road
- Using a mobile phone

(2)

The distance a car travels during the driver's reaction time is called the thinking distance.

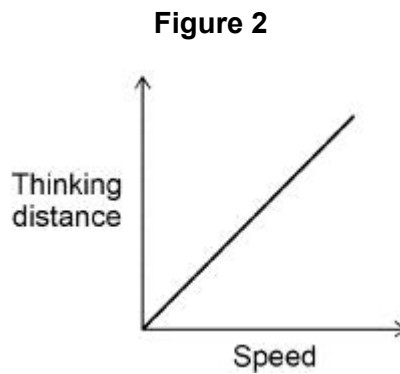
(g) Which factor affects thinking distance?

Tick (✓) **one** box.

- Condition of the brakes
- Mass of the car
- Tiredness of the driver
- Weather conditions

(1)

(h) **Figure 2** shows a sketch graph of how thinking distance varies with speed.



Which term describes the relationship between thinking distance and speed?

Tick (✓) **one** box.

- Direct proportion
- Inverse proportion

Negative correlation



(1)
(Total 12 marks)

Mark schemes

Q1.

(a) a force

1

(b) any **two** from:

- more powerful magnet
do not allow 'bigger magnet'
- reduce the gap (between magnet and coil)
- increase the area of the coil
- more powerful cell
do not allow 'bigger cell'
accept battery for cell
accept add a cell
accept increase current / potential difference
- more turns (on the coil)
allow 'more coils on the coil'
do not allow 'bigger coil'

2

(c) reverse the (polarity) of the cell

allow 'turn the cell the other way round'
accept battery for cell

1

reverse the (polarity) of the magnet

allow 'turn the magnet the other way up'

1

[5]

Q2.

(a) (i) (visible) light

accept visible

1

(ii) microwaves

1

(b) J

1

(c) (i) B

1

(ii) shorter than

1

- (d) (i) To find out if using a mobile phone is harmful to health 1
- (ii) any **two** from:
- (X has a) low(er) SAR value
“it” refers to mobile phone
accept has a low(er) rate
 - (maximum) energy absorbed (by the head) is less
accept energy emitted (by phone) is less
accept radiation for energy
 - (if mobiles are harmful) less likely to cause harm
accept will not cause harm
accept it is safer

2

[8]

Q3.

- (a) (i) absorb 1
- (ii) more 1
- (b) (i) conduction 1
- (ii) colour (of cube)
allow colour (of box) 1
- (iii) Cube Y
all three in correct order for 2 marks
- Cube X
- Cube Z
one or two correct for 1 mark
allow grey for X
allow white for Y
allow black for Z 2
- (iv) results can be compared
accept start temperature affects rate of energy transfer
or
start temperature affects how quickly the cube cools down
ignore fair test / reliability / accuracy / control variable / valid 1
- (v) control (variable)
allow controls / controlled

Q4.

- (a) horizontal arrow pointing from left to right 1
- (b) $W = 850 \times 9.8$ 1
- $W = 8330 \text{ (N)}$ 1
- (c) up 1
- (d) the normal contact force is equal to the weight of the car 1
- (e) $W = 5100 \times 38$ 1
- $W = 193\,800$ 1
- joule / J 1
- (f) condition of the tyres 1
- ice on the road 1
- (g) tiredness of the driver 1
- (h) direct proportion 1

Examiner reports

Q1.

Nearly three quarters of students answered part(a) correctly. In (b)&(c), although better answered than in previous series, students continue to have difficulties describing accurately what changes need to be made to a motor to cause different effects. Some still only state what needs to be changed without specifying in what way it is changed, in many of the answers the descriptions were too vague to merit a mark.

Q2.

- (a) (i) Most students realised that traffic lights communicate using visible light.
- (ii) Most students thought that satellites used radio waves for communication rather than microwaves.
- (b) About two thirds of the students correctly identified position **J** as being gamma rays.
- (c) (i) Most students correctly identified **B** as showing the wavelength.
- (ii) Most students knew that the wavelength of infrared waves is shorter than the wavelength of radio waves.
- (d) (i) Most students realised that scientists were trying to find out if using a mobile phone is harmful to health, although a significant proportion thought that it was to find out if mobile phones give out radiation.
- (ii) Although many students were able to score both marks in this question, about half of them only scored one mark, either for explaining that mobile phone **X** would cause a smaller amount of energy to be absorbed by the head or that mobile phone **X** would be safer. Some students thought that the SAR value showed how much energy the phone itself absorbed.

Q3.

- (a) (i) Almost two thirds of the students knew that all objects absorb infrared radiation. The most common incorrect answer was that they conduct infrared radiation.
- (ii) Just over two thirds of the students knew that hotter objects emit more infrared radiation. The most common incorrect answer was that they emit less infrared radiation.
- (b) (i) Less than half of the students said that energy is transferred through the sides of the metal cubes by conduction. Only slightly fewer students thought that energy was transferred through the metal by convection.
- (ii) Only half of the students identified the independent variable as being the colour of the cube.
- (iii) The majority of students gained 1 mark for this question, usually for realising that Cube **X** would follow the middle line of the three on the graph.
- (iv) Few students scored on this question. The vast majority said that the starting temperatures had to be the same to make it a fair test, which was too vague. If

they went on to explain the effect of different starting temperatures on the rate of heat loss they could have gained the mark.

- (v) Less than half of the students said that variables kept the same in an investigation are called control variables. Some students had not read the question properly and gave an example of a control variable.