



# EMANUEL SCHOOL

## PHYSICS

### Year 9

Thursday 13<sup>th</sup> June, 2002  
1.45 p.m. to 3.05 p.m.

**Set by JN**

**Return to JN**

**Name**

**Set**


#### **Instructions**

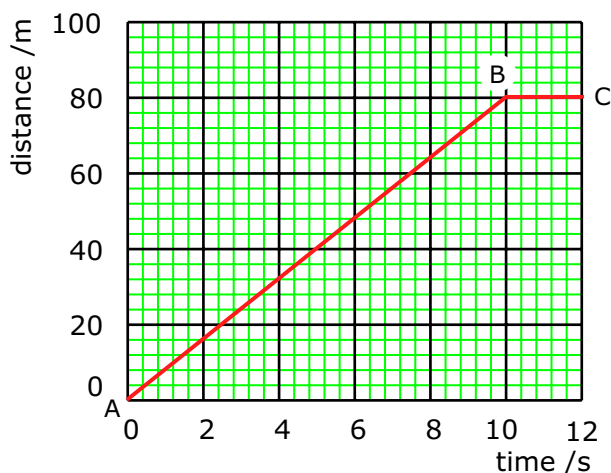
- Write your name and set in the spaces above.
- Answer all the questions.
- Do all rough work in this booklet.
- Cross through any work you do not want marked.
- You may use a calculator, but show *all* working

#### **Information**

- The time allowed for this exam is 1 hour 20 minutes
- No additional materials are required.
- Mark allocations are shown in brackets.

**The maximum mark available for this paper is 100.**

1 Someone runs a race at a steady speed. The runner's motion is plotted on the distance-time graph below.



(i) Describe the runner's motion between A & B \_\_\_\_\_ [1]

(ii) Describe the runner's motion between B & C \_\_\_\_\_ [1]

(iii) Over what distance was the race run? \_\_\_\_\_ [1]

(iv) How long did the runner take to cover this distance? \_\_\_\_\_ [1]

(v) In the space below write down in *words* the equation that links speed, distance and time [2]



(vi) What was the runner's average speed from the moment he began to run until he stopped?

\_\_\_\_\_ [2]

(vi) A cyclist starts cycling 2 seconds after the runner began to run. The cyclist covers 100 m in 6 seconds. On the same axes plot a graph for a cyclist [2]

(vii) How soon after the runner began the race is he overtaken by the cyclist?

\_\_\_\_\_ [1]

2 Explain what is meant by the following words when applied to stretching or squashing objects. Give an example in each case.

Elastic \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

Plastic \_\_\_\_\_

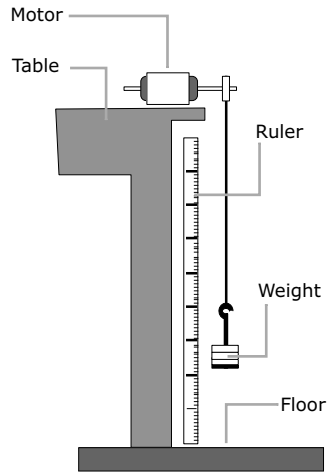
\_\_\_\_\_

\_\_\_\_\_ [2]

2 Write down in words the equation that links work, force and distance. [2]

\_\_\_\_\_

A small electric motor can raise a weight of 2 N through a vertical distance of 0.6 metres.



(a) How much work does the motor do on the weight in raising it through 0.6 m?

\_\_\_\_\_ [2]

(b) What is the form of energy that is supplied to the motor?

\_\_\_\_\_ [1]

(c) The amount of energy supplied to the motor is 3.6 Joules

(i) Write down the equation that links efficiency [2]

\_\_\_\_\_

(ii) Calculate the efficiency of this motor.

\_\_\_\_\_ [2]

(iii) The amount of energy supplied to the motor is much greater than the work done on the weight. What becomes of the energy that is not used to raise the weight?

\_\_\_\_\_ [1]

(iii) What becomes of the energy that used to raise the weight?

\_\_\_\_\_ [1]

(b) The table below gives information about atoms in a solid and a gas.

Solid	Gas
particles vibrate	particles move freely
strong forces between particles	weak forces between particles
particles tightly packed	particles far apart

Use the information in the table to explain why

(i) it is easy to compress a gas

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[3]

(ii) a solid does not spread out to fill a container.

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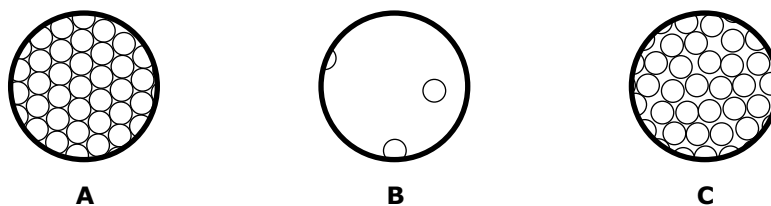
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[2]

(c) The diagram below shows the view through a very powerful microscope capable of showing how atoms are arranged.



Which of these shows a solid? \_\_\_\_\_ [1] a liquid? \_\_\_\_\_ [1] a gas? \_\_\_\_\_ [1]

(d) You can't see atoms because they are far too small. Nevertheless it is possible to see the effect of their motion in the case of a gas.

What is the name of this effect? \_\_\_\_\_ [1]

Explain how the effect can be demonstrated \_\_\_\_\_

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[3]

(e) All matter is made of particles in constant motion. Describe how this motion is affected by a rise in temperature.

(i) in a solid \_\_\_\_\_

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[2]

(i) in a gas \_\_\_\_\_

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[2]

4 Read through the list of materials below

glass	ceramic	iron	wood	lead	plastic	aluminium	copper	rubber,
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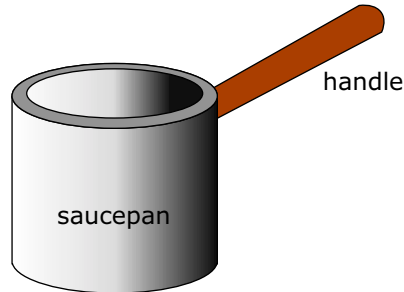


Figure 1

(i) suggest a suitable material from this list for the saucepan \_\_\_\_\_ [1]

(ii) explain your choice \_\_\_\_\_

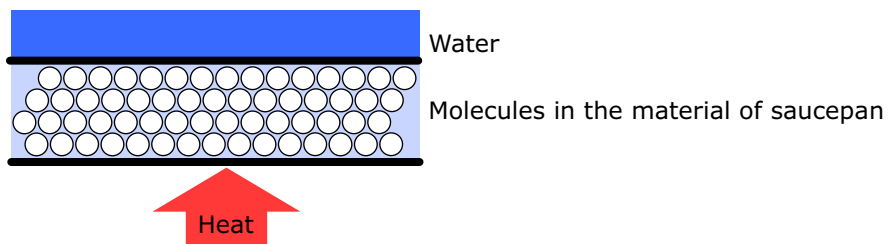
\_\_\_\_\_ [1]

(iii) suggest a suitable material for the handle of the saucepan \_\_\_\_\_ [1]

(iv) explain your choice \_\_\_\_\_

\_\_\_\_\_ [1]

(c) (i) The figure below shows the cross-section of the saucepan. With reference to the diagram, describe in terms of the motion of molecules how heat passes through the metal base of a saucepan to the water inside.

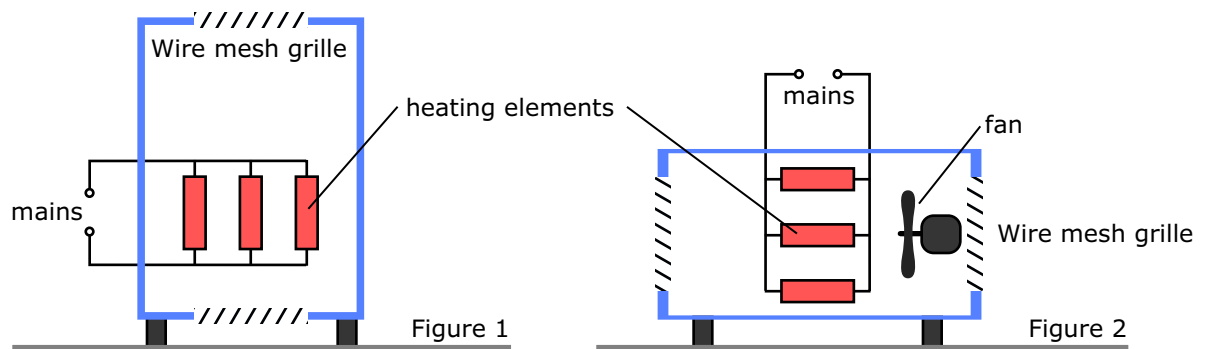


\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

(ii) What is the name given to the way in which heat is transferred through the saucepan.

\_\_\_\_\_ [1]

- 5 The figures below show two types of electrical room heater. In both case air can enter and leave the heater through a wire mesh grille.



(i) What is the main method by which heat is transferred to the room by the type of heater in figure 1. Explain your answer.

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[3]

(ii) Figure 2 shows a type of electrical heater that uses a fan. What advantage does the type of heater in figure 2 have over the type shown in figure 1?

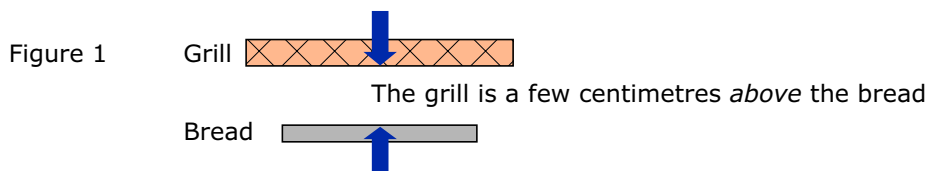
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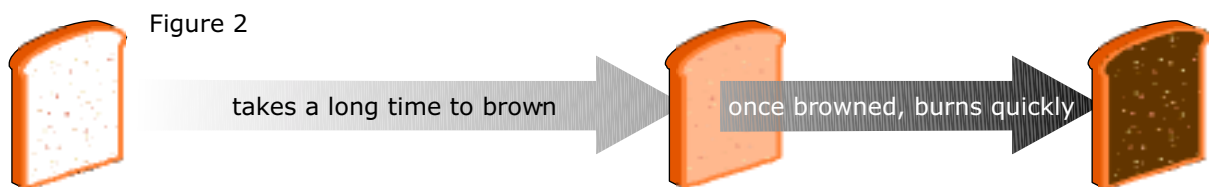
[1]

(b) A slice of white bread is toasted by being placed under a grill. Figure 1 shows that the bread is placed *below* the grill to toast. There is a gap of 5 centimetres between them.



(i) How is energy transferred from the grill to the toast? \_\_\_\_\_ [1]

As figure 2 shows, at first the bread browns slowly, but when grows darker it quickly burns.



(ii) Explain why the toast takes longer to brown than it does to burn?

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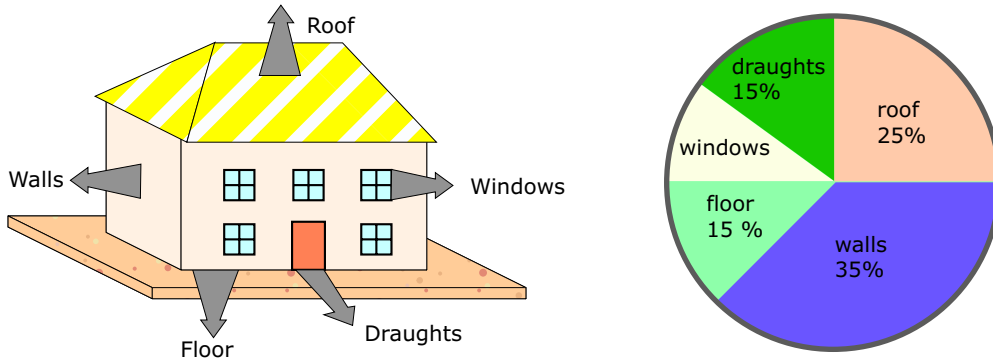


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[3]

6 John works as an adviser on home insulation. He explains to Mary where energy is lost from her house.

He uses these diagrams to help.



(a) (i) How is heat lost through the floor? \_\_\_\_\_ [1]

(ii) Mary uses carpets and underlay to reduce the energy loss. How does this reduce energy loss.

\_\_\_\_\_

\_\_\_\_\_ [2]

(b) John shows Mary information about four methods of reducing energy loss.

He explains that it costs £1000 to install double-glazing. This saves £25 each year so it will take 40 years to recover the cost.

(i) Finish the last column of the table. There are two spaces.

method	cost	saving each year	payback time
double glazing	£1000	£25	40 years
draught proofing	£30	£30	1 year
roof insulation	£300	£100	years
wall insulation	£250	£50	years

(ii) what percentage of all the energy lost from the house is due to loss through the windows?

\_\_\_\_\_ [1]

(iii) Mary's father suggests fitting double-glazing. John explains that this is not the best way to reduce energy loss.

Use the pie chart and the table to explain why.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

7 In the diagram  $F$  is a force exerted by Earth on the Moon.



Earth

Moon

(a) What is the cause of the force  $F$  that pulls the Moon towards the Earth?

\_\_\_\_\_ [2]

(b) Draw an arrow, and label it, to show another force acting between Earth and Moon. [1]

(c) On what *two* factors does the force between planets depend?

(i) \_\_\_\_\_ [1]

(ii) \_\_\_\_\_ [1]

(d) What is the effect on the force between planets does an increase in factor c (i) have?

\_\_\_\_\_  
\_\_\_\_\_ [2]

(e) What is the effect on the force between planets does an increase in factor c (ii) have?

\_\_\_\_\_  
\_\_\_\_\_ [2]

(f) What other forces act on the Earth apart from those between it and the Moon?

\_\_\_\_\_ [1]

3 A balance is used to measure the mass of a brick on earth. The balance reads 2 kg. The brick is then weighed with a newtonmeter.

(a) Write down in words the equation that links weight, mass and gravitational field strength. [2]



(b) What does the newtonmeter read? The Earth's gravitational field strength,  $g = 10 \text{ N/kg}$ .

\_\_\_\_\_  
\_\_\_\_\_ [2]

The brick is then transported to the Moon and its mass and weight measured.

(c) What is its mass and its weight on the moon? The Moon's gravitational field strength,  $g = 1.6 \text{ N/kg}$ .

(i) mass of brick on the Moon \_\_\_\_\_

\_\_\_\_\_ [1]

(i) weight of brick on the Moon \_\_\_\_\_

\_\_\_\_\_ [1]

14 Look at the photograph of a portion of the Moon's surface.



(a) (i) What is the large circular feature? \_\_\_\_\_ [1]

(ii) What caused this feature?

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\_\_\_\_\_ [2]

(iii) Why are such features so common on the Moon and so rare on Earth?

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\_\_\_\_\_ [2]

(iv) Name a planet (not Earth) on which such features are found? \_\_\_\_\_ [1]

(v) Name a planet on which such features are **not** found? \_\_\_\_\_ [1]

(b) Give two reasons why you must wear a space suit to walk on the Moon.

1. \_\_\_\_\_

\_\_\_\_\_ [1]

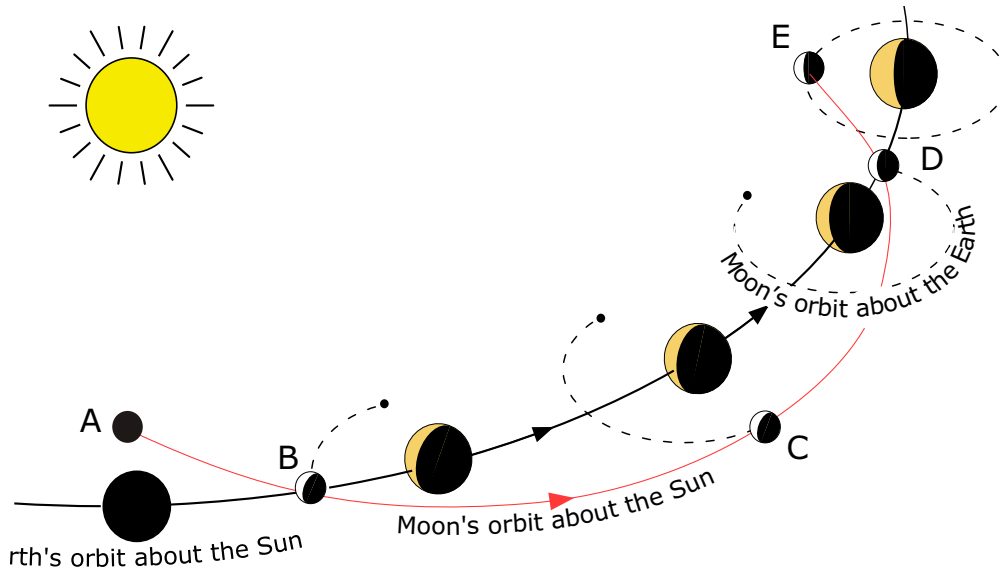
2. \_\_\_\_\_

\_\_\_\_\_ [1]

(c) (i) Name a planet other than Earth that has a moon. \_\_\_\_\_ [1]

(ii) Name a planet that does **not** have a moon. \_\_\_\_\_ [1]

The diagram shows the Earth-Moon system in orbit about the Sun. It takes approximately 29 days for the Moon to travel from A to E. This is known as a lunar month.



(i) How many times will a full moon occur in a year? \_\_\_\_\_

\_\_\_\_\_ [1]

(ii) The Moon does not produce light. How is it that we are able to see it?

\_\_\_\_\_ [1]

(iii) Name the phase of the Moon at each of the following positions

A \_\_\_\_\_ [1]

B \_\_\_\_\_ [1]

C \_\_\_\_\_ [1]

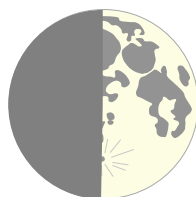
(iv) In what position could the Moon eclipse the Sun? \_\_\_\_\_ [1]

(v) In what position of the Moon is a lunar eclipse possible? \_\_\_\_\_ [1]

(vi) What does the Moon look like seen from Earth when it is in each of the position below? Shade the bit you can't see. Its appearance when it is at B has been done for you. [3]



between A & B



At B



At C



At D

**Now go back and check your work**