Applied Science Physics Summer Work

Applied Science Physics Summer work

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

Supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

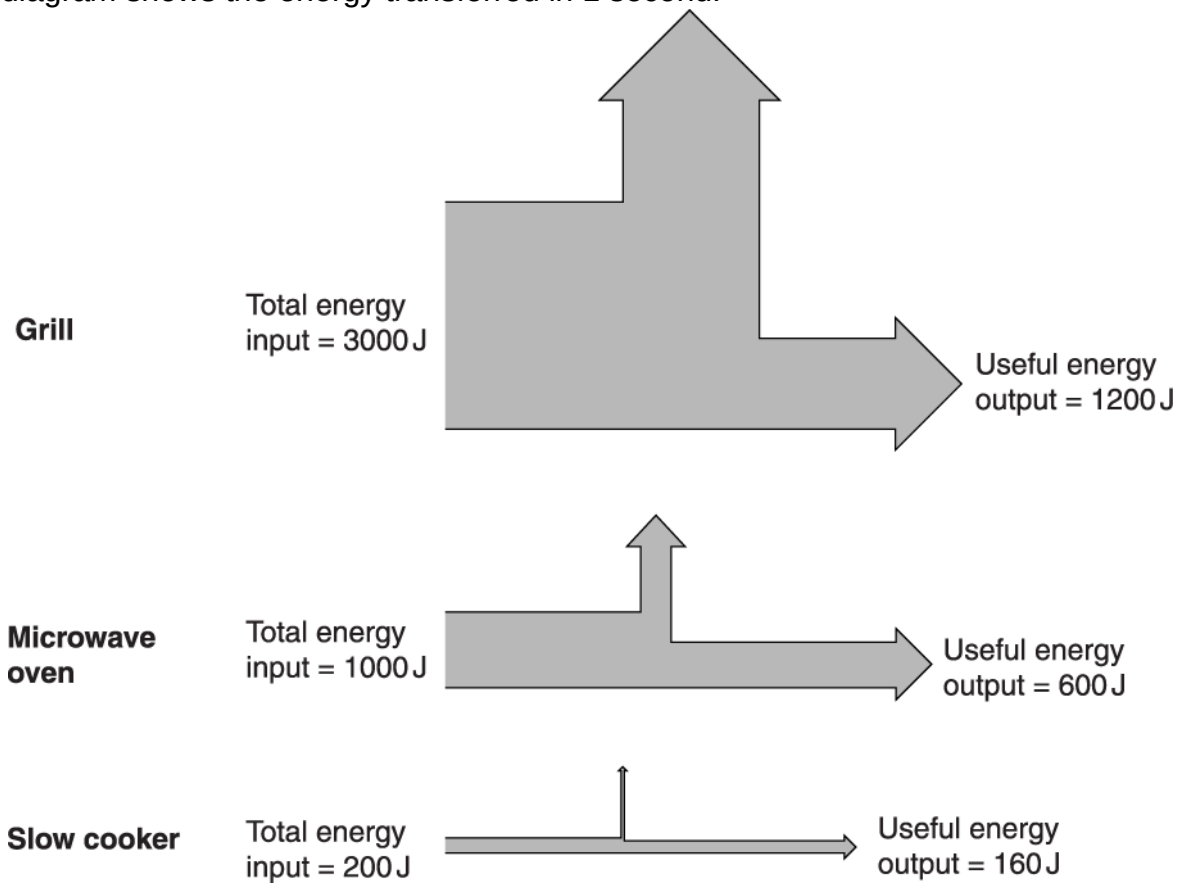
- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The total number of marks may take into account some 'either/or' question choices.

Answer **all** the questions.

1(a). Radhika has many appliances in her kitchen.

She compares the efficiency of the appliances by looking at these Sankey diagrams.

Each diagram shows the energy transferred in 1 second.



Look at the Sankey diagram for the grill.

Calculate the wasted energy for the grill.

Answer ..... J

[1]

(b). Calculate the efficiency of the microwave oven.

Answer

.....

[2]

(c). The slow cooker takes the **longest time** to cook food.

However, it is the **most efficient.**

Use the data in the Sankey diagrams to explain both these statements.

---

[3]

2. A boy kicks a football.

The football has a mass of 400 g.

What is the potential energy of the football when it is 0.8 m above the ground?

Use the constant: gravitational field strength (g) = 10 N/kg.

A. 0.032 J
B. 3.2 J
C. 320 J
D. 3 200 J

Your answer ☐

[1]

3. A car on a roller coaster is stationary at the top of a slope.

It has a weight of 6 500 N and a potential energy of 217 000 J.

Calculate how high above the ground it is.

---

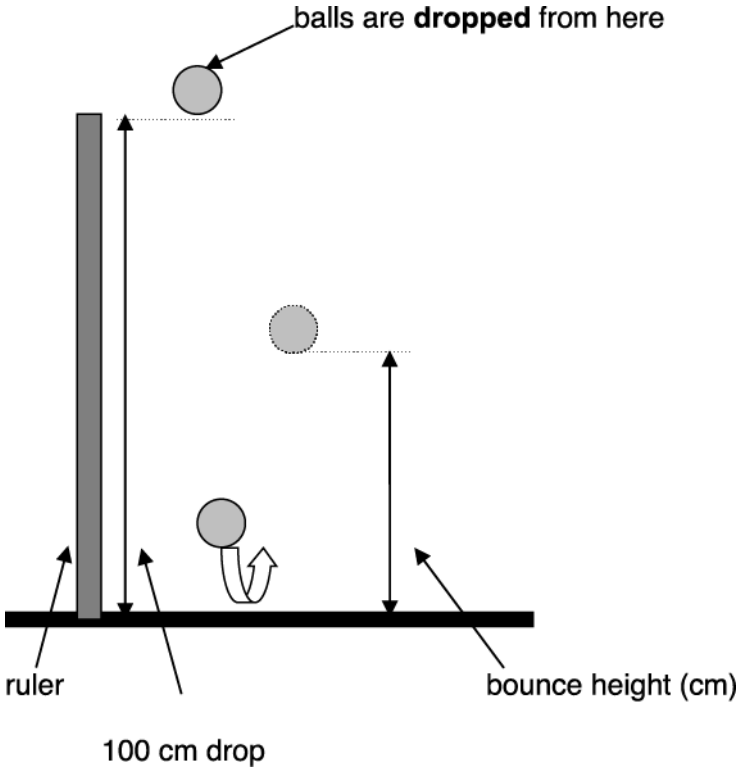
answer: ..... m

[2]

4(a). Kate investigates how well different balls bounce.

She drops different balls from the same height and measures the height the balls bounce.

She repeats the experiment 3 times for each ball.



Her results are shown in the table.

Ball	**Drop height (cm)**	**1st reading bounce height (cm)**	**2nd reading bounce height (cm)**	**3rd reading bounce height (cm)**	**Mean bounce height (cm)**
blue	100	61	62	60	61
green	100	60	31	59	50
white	100	84	86	85	85
yellow	100	26	24		26

Kate missed one result for the **yellow** ball.

Calculate the **missing** result.

---

answer: ..... cm

[1]

(b). Josh does an experiment with bouncing balls.

He does his experiment with a drop height of **200 cm**.

One ball bounces **100** cm.

Josh says that this ball is a better bouncer than any of Kate's.

Use the data and ideas about efficiency to explain why Josh is incorrect.

[2]

(c). Josh uses a new ball. He says this ball is an amazing bouncer.

He says if you drop it from **200** cm it will bounce to a height of **250** cm.

Explain why this is not possible.

[2]

5. Alex has two radiators in her home. They are filled with 10 kg of different liquids.

The radiators have different power ratings.

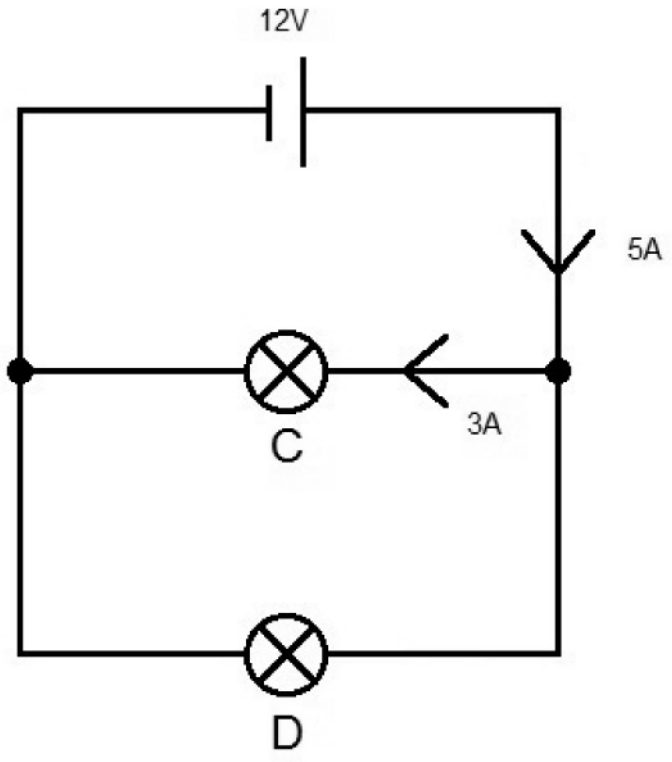
oil-filled radiator	water-filled radiator
 Heater contains 10 kg of oil 400 W heater Specific heat capacity for oil is 1680 J/kg^{0}C	 Heater contains 10 kg of water 1000 W heater Specific heat capacity for water is 4200 J/kg^{0}C

The heaters are turned on and the temperature of each rises by 40 °C in 1 680 seconds.

Use the data to show that the heaters take the same time to heat up.

[4]

6. Look at the circuit diagram.



Use the formula **resistance = potential difference ÷ current** to calculate the resistance of bulb D.

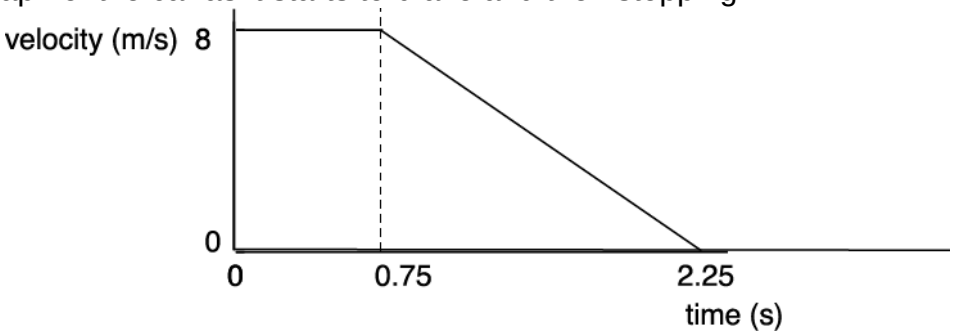
A. 2 Ω
B. 4 Ω
C. 6 Ω
D. 8 Ω

Your answer ☐

[1]

7(a). The A car takes 6 m to brake when moving at 8 m/s.

Look at the graph of the car as it starts to brake and then stopping.



Use the graph to show that the braking distance is 6 m.

.....

.....

[2]

(b). The formula to work out kinetic energy is:

kinetic energy = 0.5 × mass × (velocity^2)

A car has 30 000 J of energy and a mass of 1 tonne (1 tonne = 1 000 kg).

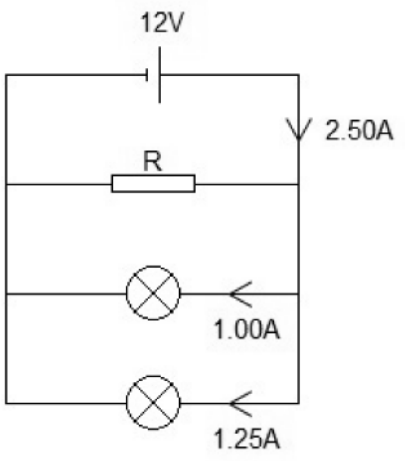
Calculate the velocity of the car and show your working.

---

answer: ..... m/s

[2]

8.



Calculate the power dissipated by resistor R.

A. 30 W
B. 15 W
C. 12 W
D. 3 W

Your answer ☐

[1]

9. A car and driver with a total mass of 1000 kg is travelling at 20 m/s.

The driver applies the brake and the car comes to a stop in 4 seconds.

What is the mean force on the car?

A. 80 000 N

B. 5 000 N
C. 200 N
D. 12.5 N

Your answer ☐

[1]

10. The rate of flow of electrical charge in a circuit is a current.

A current of 40 mA transfers a charge of 3.6 C.

Calculate how long this takes.

Show your working.

---

answer: ..... seconds

[3]

11(a). A student takes voltage and current measurements for four resistors.

The table shows the results from this experiment.

Resistor	Voltage (V)	Current (A)	Resistance (Ω)
A	12.0	2.0	
B	6.0	1.5	
C	7.5	1.5	
D	8.0	2.0	

Which two resistors have the same resistance value?

Use the data to show this.

---

[2]

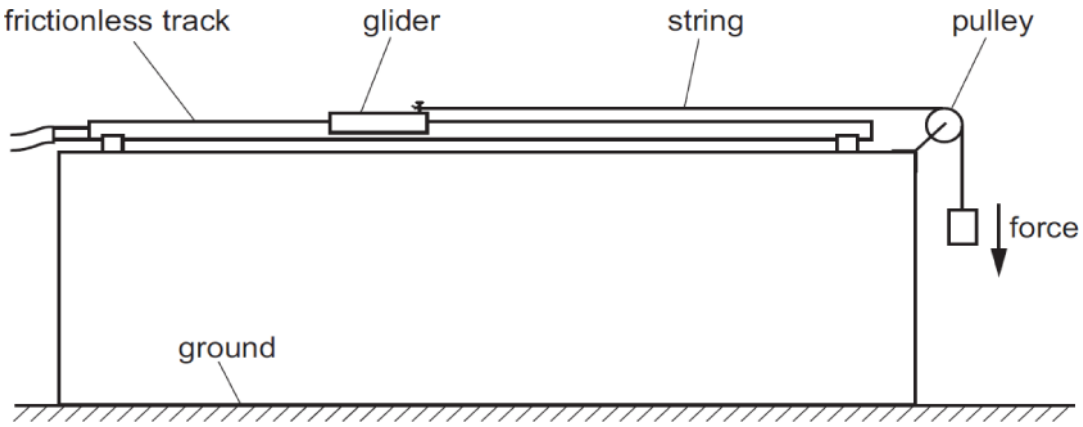
(b). Calculate the maximum resistance that can be made using all four resistors.

---

answer: ..... Ω

[1]

12(a). A student investigates the motion of a glider on a frictionless air track using the apparatus shown in the picture.



The student carries out the experiment for 5 forces

Force (N)	Acceleration (m/s^2)			
	Attempt 1	**Attempt 2**	**Attempt 3**	**Mean**
1.0	3.8	3.9	3.7	3.8
2.0	7.8	7.7	7.7	7.7
3.0	11.2	11.4	11.6	11.4
4.0	12.0	14.9	15.1	13.8
5.0	19.0	18.9	19.1	19.0

There is an anomaly in the results.

Identify the anomaly and explain how the student could have dealt with it.

---

[2]

(b). i. Explain how the student can use this apparatus to demonstrate Newton's Second Law.

Include details of any additional equipment required.

---

[3]

ii. A 0.25 kg glider is pulled by a 1.0 N force.

Calculate the acceleration of the glider using the formula:

force = mass × acceleration

---

answer: ..... m/s^2

[1]

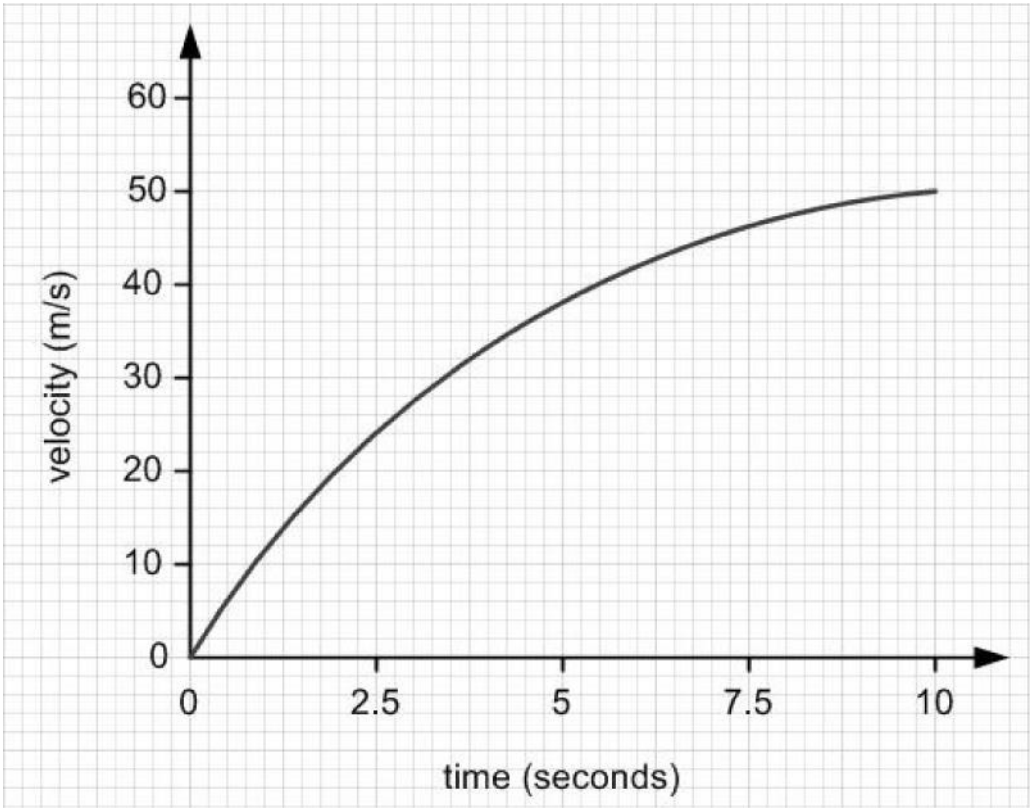
iii. Suggest reasons why the recorded value was less than your calculated value.

---

[2]

13. A free-fall skydiver falls from a plane and reaches terminal velocity after 15 seconds.

Look at the graph of her motion.

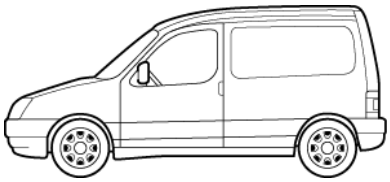


Use the graph to find the acceleration at 5 seconds.

answer: ..... m/s^2

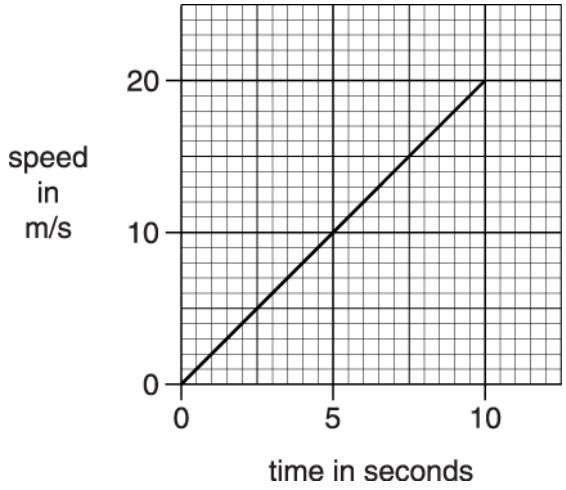
[3]

14(a). Emily has a van.



The van has a mass of 1400 kg.

Look at the speed–time graph for the first 10 seconds of her journey in the van.



Calculate the acceleration of the van in the first 10 seconds.

Choose your answer from:

0.5 m/s^2 **2 m/s^2** **10 m/s^2** **100 m/s^2** **200 m/s^2**

answer ..... m/s^2

[1]

(b). The accelerating force on the van is 2800 N.

Use this force and information from the graph to calculate the work done to accelerate the van in the first 10 seconds.

---

answer ..... J

[3]

(c). The van now travels at a steady speed of 20 m/s.

Use the force given in **(b)** to calculate the power developed by the engine when travelling at this speed.

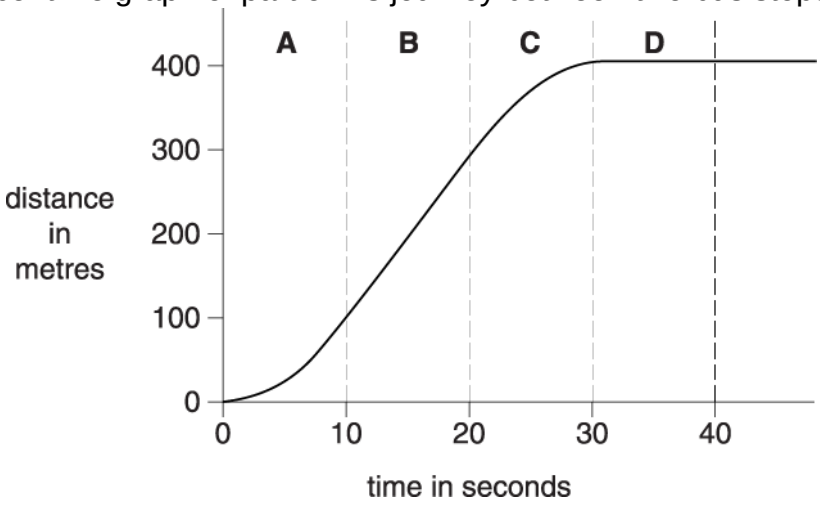
---

answer ..... W

[2]

15. Dan travels on a bus to school each day.

Look at the distance–time graph of part of his journey between two bus stops.



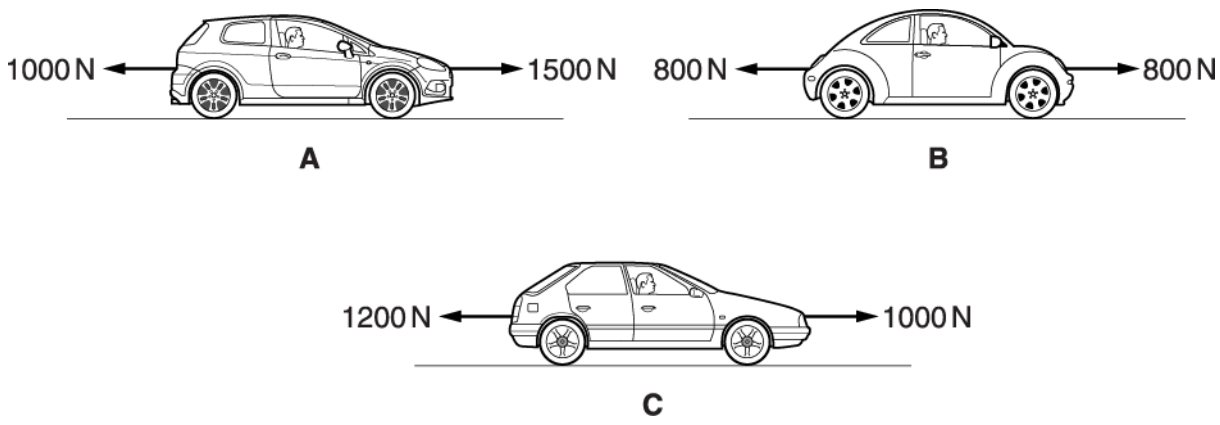
Describe in detail what this graph shows about the speed and acceleration of the bus for the first 40 seconds of the journey.

You may use a calculation in your answer.

The quality of written communication will be assessed in your answer to this question.

[6]

16. Look at the drawings showing forces acting on cars **A, B** and **C** travelling from left to right.



Put a tick (✓) in the correct box in the table below to show if each car is moving at a steady speed, increasing speed or decreasing speed.

	steady speed	increasing speed	decreasing speed
A			
B			
C			

[2]

17. Ivy wants to insulate her house.

Look at the information on different types of house insulation.

Type of insulation	Cost to fit insulation in £	Money saved each year in heating bills in £
Cavity wall insulation	840	210
Double glazing	4000	160
Draught proofing	120	72
Loft insulation	360	120

Ivy decides against fitting double glazing.

One reason is because it costs a lot to fit.

Use the information in the table to suggest other reasons why she has made this decision.

Do a calculation to explain your answer.

---

[2]

18(a). Tarak has a café.

He uses five appliances in his café.

He writes down the power of each appliance and the time it is used each day.

Look at the table.

Appliance	**Power in kilowatts**	**Time used each day in hours**
toaster	2.0	4.0
kettle	3.0	2.5
microwave	1.0	3.0
fridge	0.3	8.0
freezer	0.5	12.0

Which appliance costs Tarak the **most** to use each day?

---

[1]

(b). Which appliance costs Tarak the **least** to use each day?

---

[1]

END OF QUESTION paper