Write your name here

| Surname | Other names |
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**Edexcel GCSE**

| Centre Number | Candidate Number |
|---|---|
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# Physics/Additional Science

## Unit P2: Physics for Your Future

**Foundation Tier**

Thursday 8 November 2012 – Morning
**Time: 1 hour**

Paper Reference
**5PH2F/01**

**You must have:**
Calculator, ruler

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

### Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

*Turn over* ▶

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PEARSON

## FORMULAE

You may find the following formulae useful.

charge = current × time $Q = I \times t$

potential difference = current × resistance $V = I \times R$

electrical power = current × potential difference $P = I \times V$

energy transferred = current × potential difference × time $E = I \times V \times t$

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}} \qquad a = \frac{(v-u)}{t}$$

force = mass × acceleration $F = m \times a$

weight = mass × gravitational field strength $W = m \times g$

momentum = mass × velocity

work done = force × distance moved in the direction of the force $E = F \times d$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{E}{t}$$

gravitational potential energy = mass × gravitational field strength × vertical height

$\text{GPE} = m \times g \times h$

kinetic energy = ½ × mass × velocity$^2$ $\text{KE} = ½ \times m \times v^2$

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**Questions begin on next page.**

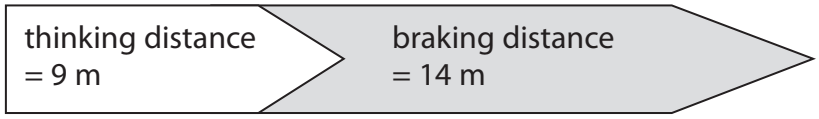
**Answer ALL questions.**

**Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.**

## Speed and safety

**1** The Highway Code gives this information about the stopping distance of a car.

speed = 30 miles per hour




(a) (i) What is the stopping distance?

Put a cross (☒) in the box next to your answer.

**(1)**

☒ **A** 5 m

☒ **B** 9 m

☒ **C** 14 m

☒ **D** 23 m

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The driver's **thinking** distance is most likely to increase when

**(1)**

☒ **A** the driver is tired

☒ **B** there is ice on the road

☒ **C** the car is heavier

☒ **D** the car moves at a slower speed

(b) A car has a mass of 800 kg.
It has a velocity of 3.0 m/s.

Calculate the momentum of the car.

**(2)**

momentum of car = ..... kg m/s

(c) (i) The braking force on another car is 600 N.
The force acts for a distance of 15 m.

Calculate the work done by the braking force.

**(2)**

work done by braking force = ..... J

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The work done by the brakes during braking is equal to

**(1)**

☒ **A** the energy transferred

☒ **B** the stopping distance

☒ **C** the acceleration

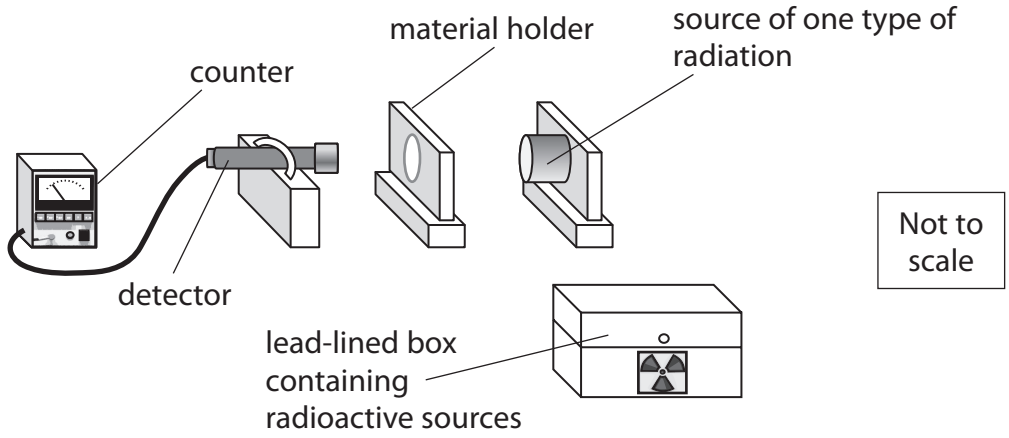
☒ **D** the thinking distance plus braking distance

**(Total for Question 1 = 7 marks)**

## Radioactive materials

**2** (a) A student watches a radioactivity demonstration.

The demonstration uses this arrangement.




The teacher puts different materials in the holder.
Then she measures the radiation entering the detector.
Here are the results.

| material in the holder | radiation entering detector (counts per minute) |
|---|---|
| nothing (only air) | 121 |
| paper | 17 |
| aluminium | 17 |
| thick lead | 17 |

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The radiation from the source is

**(1)**

☒ **A** alpha particles

☒ **B** beta particles

☒ **C** gamma rays

☒ **D** X-rays

(ii) The teacher returns the radioactive source to the box.

Suggest why the box is lined with lead.

**(1)**

.....

.....

(iii) The counter still gives a reading.
The teacher says this is caused by background radiation.

State **one** source of background radiation.

**(1)**

.....

(iv) The teacher takes precautions to protect her students from the radiation emitted by the radioactive sources.

State **two** suitable precautions that protect the students.

**(2)**

1 .....

2 .....

(b) Radon is a radioactive gas which emits alpha particles.

(i) A sample of air contains 6 mg of radon.
Radon has a half-life of 4 days.

Calculate the mass of the radon remaining after 8 days.
Show your working.

**(2)**

mass remaining after 8 days = ..... mg

(ii) Some places have rocks which release radon gas.
Explain why people living in these places may have an increased risk of long-term health problems.

**(2)**

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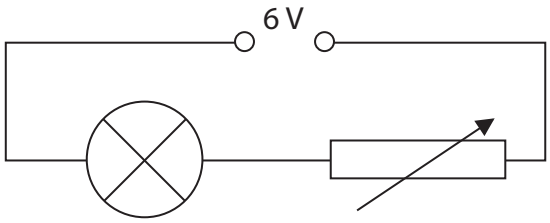
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**(Total for Question 2 = 9 marks)**

## Electric circuits

**3** (a) Some students investigate electric circuits.
They set up this circuit.




What can the students do to increase the brightness of the lamp?

Put a cross (☒) in the box next to your answer.

**(1)**

☒ **A** add another lamp in series

☒ **B** add another lamp in parallel

☒ **C** increase the resistance of the variable resistor

☒ **D** decrease the resistance of the variable resistor

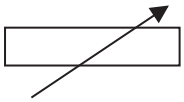
(b) The students want to measure both the current in the lamp and the potential difference (voltage) across the lamp.

(i) Complete the circuit below with an ammeter and a voltmeter correctly connected.
The power supply, variable resistor and lamp symbols are already drawn for you.

**(3)**





(ii) The current in a lamp is 0.5 A.
Its resistance is 8 Ω.

Calculate the potential difference (voltage) across the lamp.

**(2)**

potential difference = ..... V

(c) Some electrical energy is transferred to light energy in the lamp.

Explain why only some of the electrical energy is transferred to light energy in the lamp.

**(2)**

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(d) The students use a different lamp in the circuit.
The current in this lamp is 0.4 A.
The potential difference (voltage) across the lamp is 5 V.

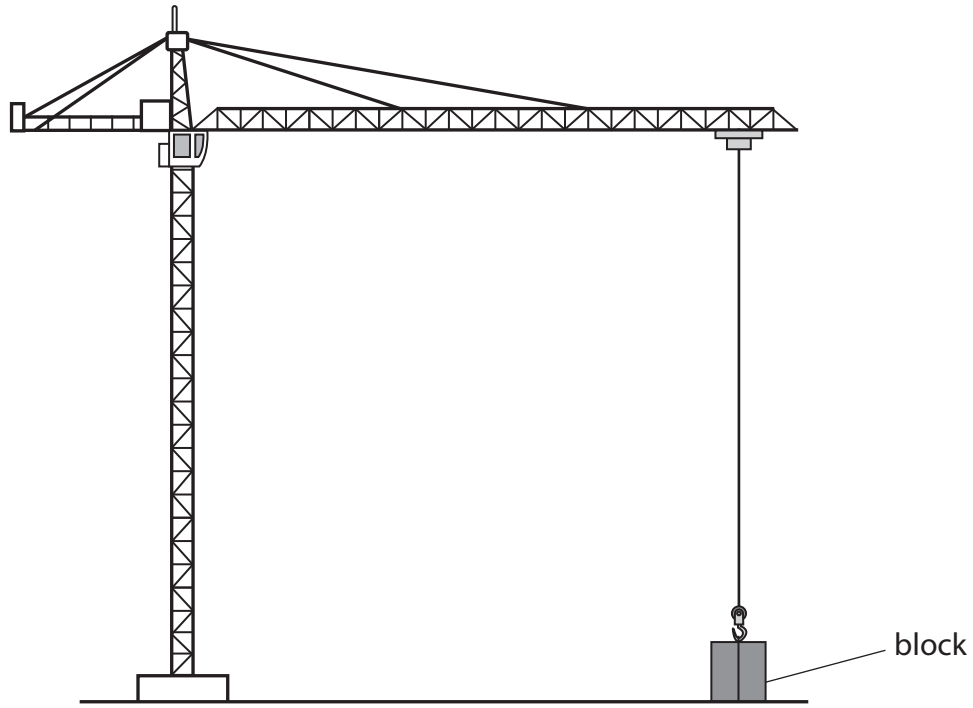
Calculate the power being supplied to the lamp.

**(2)**

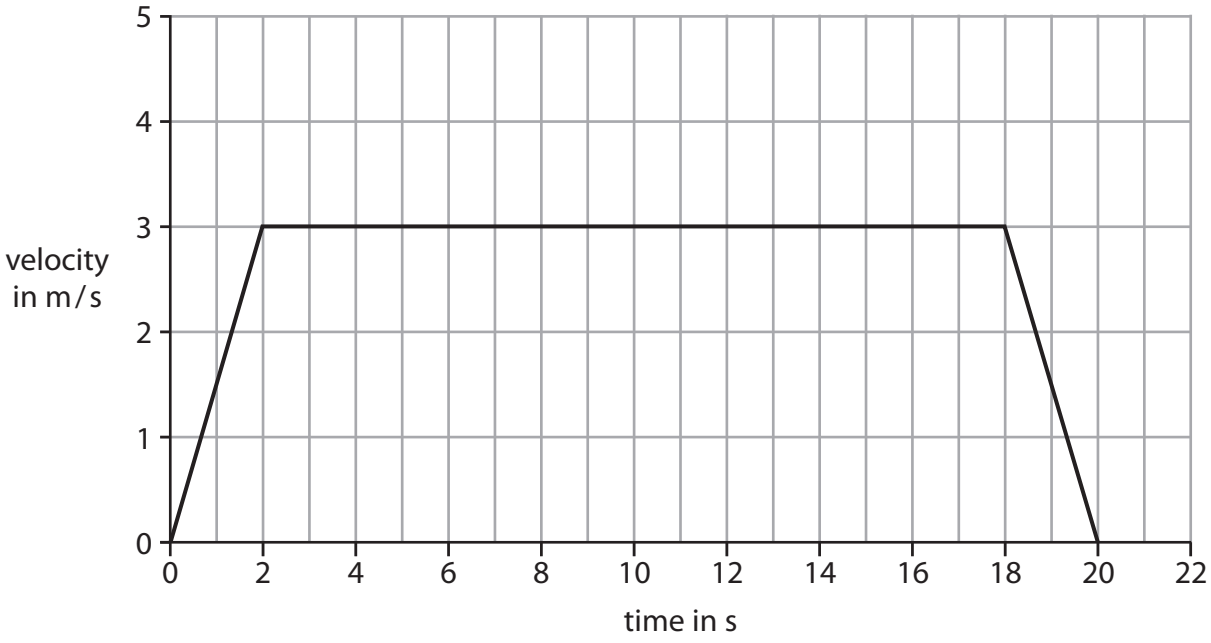
power supplied to the lamp = ..... W

**(Total for Question 3 = 10 marks)**

**4** (a) A crane is lifting a heavy block from the ground to the top of a building.




This is the velocity/time graph for the block as it travels upwards.

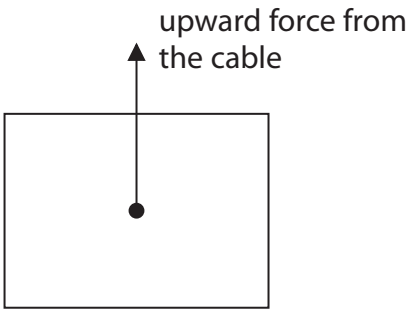



(i) For how many seconds is the block moving at a constant velocity?

**(1)**

number of seconds = .....

This diagram shows one of the forces acting on the block.




(ii) Draw an arrow on the diagram to represent the weight of the block.

**(1)**

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

When the block is moving upwards at a constant velocity, the resultant force on the block is

**(1)**

☒ **A** upwards and equal to its weight

☒ **B** downwards and equal to its weight

☒ **C** upwards and more than its weight

☒ **D** zero

(iv) Use the velocity/time graph to calculate the acceleration of the block during the first 2 s.
State the unit.

**(3)**

acceleration = ..... unit .....

(v) Explain why the upward force from the cable during the first 2 s is greater than the upward force for the next 4 s.

**(2)**

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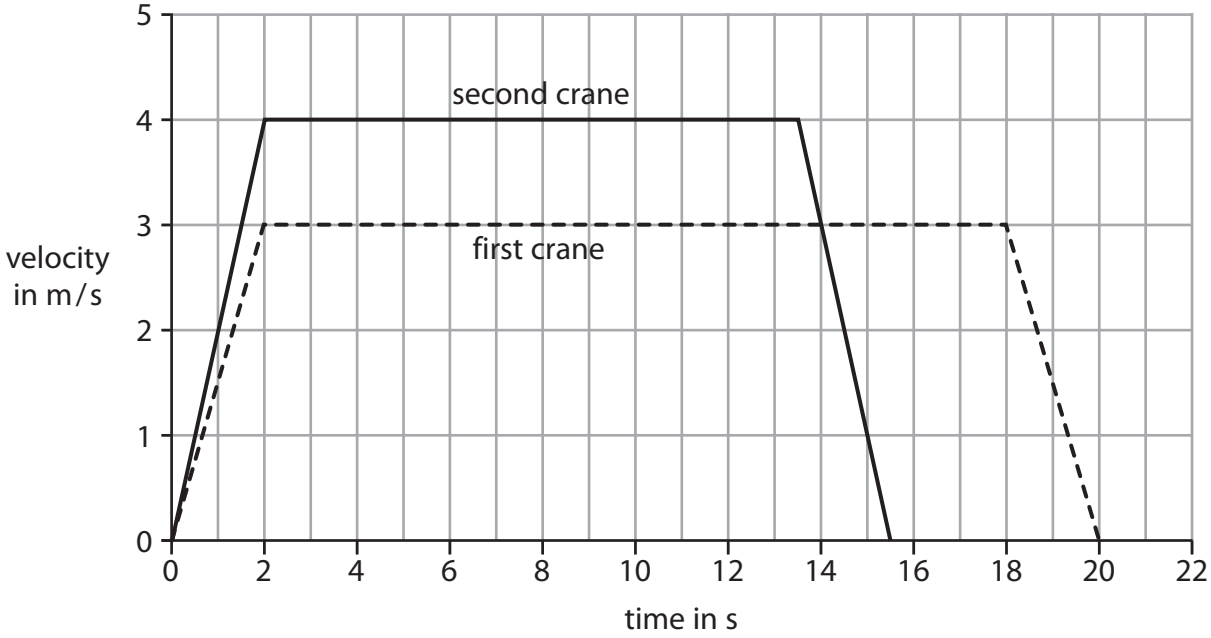
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(b) A second crane lifts an identical block to the same height.

This is the velocity/time graph for the second crane.

The graph for the first crane is shown as a dotted line.




The second crane has a larger power than the first crane.

Explain how the graph shows that the second crane has the larger power.

**(2)**

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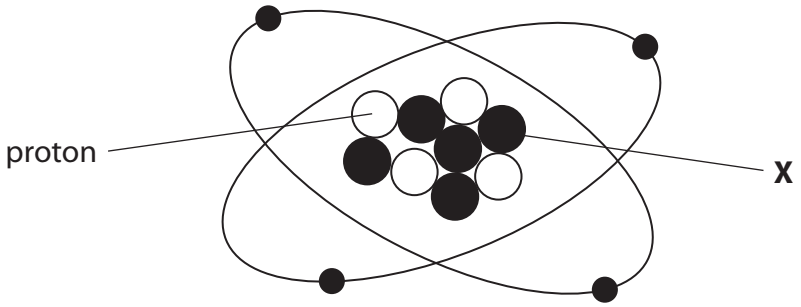
**(Total for Question 4 = 10 marks)**

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**Turn over for Question 5.**

## Nuclear particles and reactions

**5** (a) The diagram represents an atom of beryllium (Be).




Not to scale

(i) State the name of the particle labelled **X**.

**(1)**

.....

(ii) Which of these is the correct symbol for this nucleus of beryllium?
Put a cross (☒) in the box next to your answer.

**(1)**

$^{5}_{4}Be$ ☒ **A**

$^{5}_{9}Be$ ☒ **B**

$^{9}_{5}Be$ ☒ **C**

$^{9}_{4}Be$ ☒ **D**

(iii) Explain how a beryllium atom can become a positive ion.

**(2)**

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(b) Nuclear fusion is one type of nuclear reaction.
Nuclear fusion reactions release energy in the Sun.

Describe what happens during nuclear fusion.

**(2)**

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*(c) Nuclear fission is another type of nuclear reaction.
In some nuclear reactors, the controlled fission of uranium-235 (U-235) is used to release thermal energy.

Describe the process of fission and its control in a nuclear reactor.

You may draw a labelled diagram to help with your answer.

**(6)**

**(Total for Question 5 = 12 marks)**

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**Using static electricity**

**6** (a) Vicky combs her hair with a plastic hair comb.
The comb now has a negative charge.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The comb has a negative charge because it has

**(1)**

☒ **A** gained electrons

☒ **B** lost electrons

☒ **C** gained protons

☒ **D** lost protons

(ii) Vicky's hair has also become charged.

Explain how Vicky's hair has become charged.

**(2)**

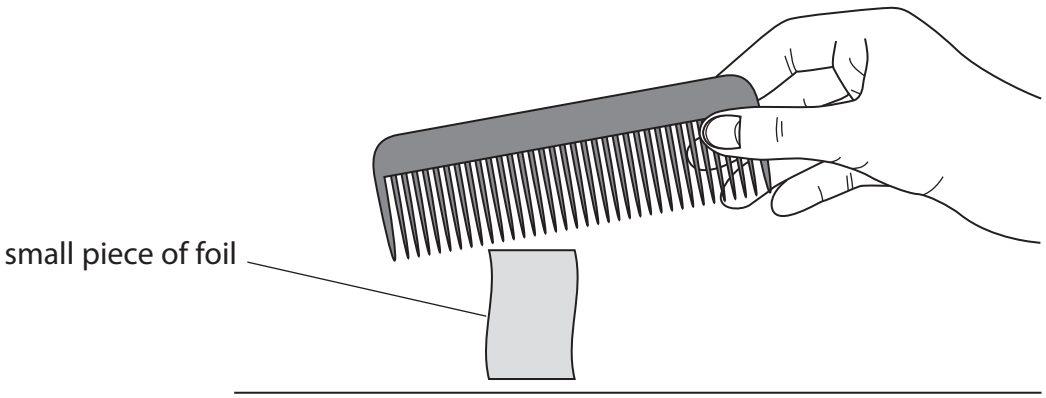
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(iii) Vicky holds the comb over a small piece of metal foil.
The foil jumps up and sticks to the comb.




Show on the diagram where the foil is negatively charged.

**(1)**

(b) Vicky combs her hair with a metal comb.
Then she tries to pick up some small pieces of metal foil with the comb.
The metal comb does not pick up any pieces of metal foil.

Explain why the metal foil is not picked up by the comb.

**(2)**

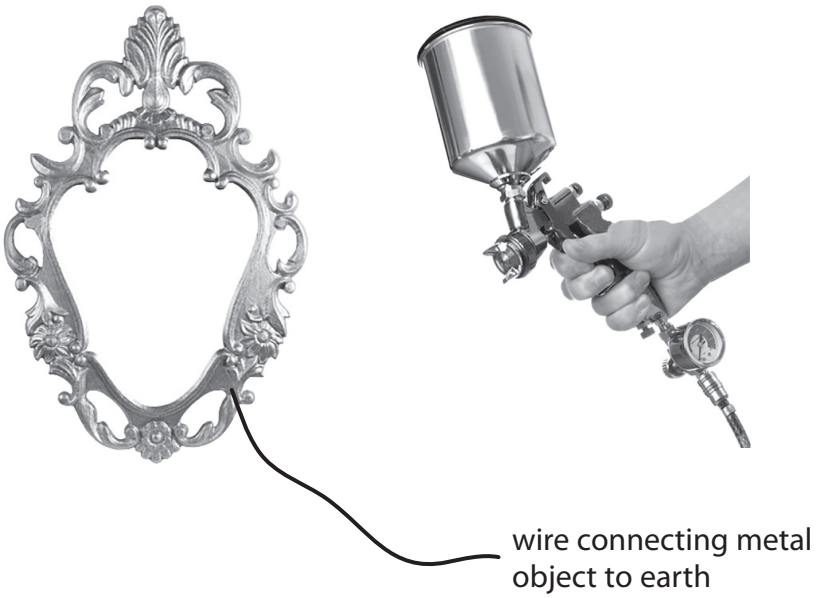
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(c) The picture shows an electrostatic paint sprayer about to be used to paint a metal object.




When the paint particles leave the sprayer, they are negatively charged.

Explain the benefits of using this sprayer compared with one that does not charge the paint.

**(6)**

**(Total for Question 6 = 12 marks)**

**TOTAL FOR PAPER = 60 MARKS**

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