



General Certificate of Secondary Education  
2018–2019

Centre Number

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Candidate Number

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# Double Award Science Physics

Unit P1

Higher Tier

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| <b>ML</b> |
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[GDW32]

**WEDNESDAY 22 MAY 2019, AFTERNOON**

### TIME

1 hour, plus your additional time allowance.

### INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

**You must answer the questions in the spaces provided.**

**Do not write outside the boxed area on each page or on blank pages.**

Complete in black ink only. **Do not write with a gel pen.**

Answer **all eight** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 1.

- 1 A student wants to find the density of milk. Describe the experiment she would carry out.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

Your account should include:

The two measuring instruments the student would use.

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The two readings which must be taken to allow the mass of the milk to be found.

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The equation for density in **words**.

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A precaution to ensure accuracy.

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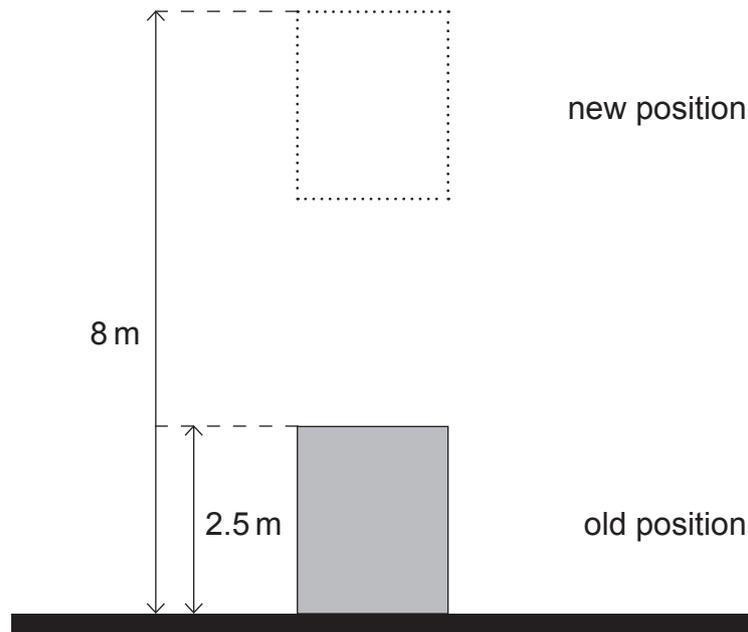
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[6]



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**(Questions continue overleaf)**

- 2 A crane lifts a crate of weight 4000 N to a new position above the ground.



- (a) (i) Calculate the work done by the crane.

Show your working out.

Work done = \_\_\_\_\_ J [4]

- (ii) Express your answer in kilojoules (kJ).

Work done = \_\_\_\_\_ kJ [1]

On another occasion the crane does 30 000 J of work in lifting a crate and develops 2000 W of power.

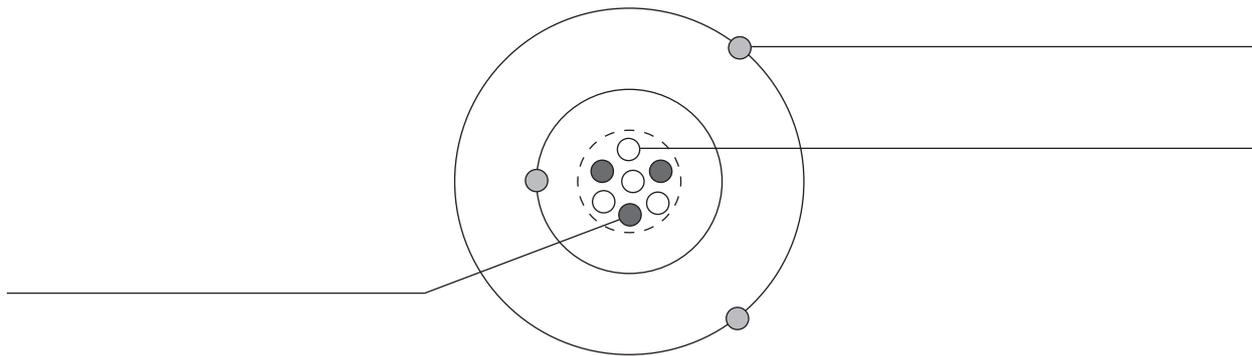
(b) Calculate how long it takes to lift the crate.

**Show your working out.**

Time = \_\_\_\_\_ s [3]

[Turn over

3 Look at the diagram below. It shows a neutral atom.



(a) (i) Write the names of the different particles in the correct spaces. [3]

(ii) Explain why this atom is neutral. [1]

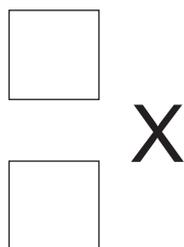
\_\_\_\_\_

(iii) What change, in terms of particles, will occur to this atom if it is to become an ion? [2]

\_\_\_\_\_

\_\_\_\_\_

The nucleus of another atom X has 6 protons and 8 neutrons.



(b) Insert the correct numbers in the two boxes to represent the nucleus. [2]

(c) In terms of **particles** describe what isotopes are.

\_\_\_\_\_

\_\_\_\_\_



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**(Questions continue overleaf)**

4 An isotope of a certain metal has a half-life of 46 days.

(a) (i) Complete the statement below by circling the correct choice in each case.

You must circle two choices.

After a time of

|         |
|---------|
| 23 days |
| 46 days |
| 92 days |

the number of

|                  |
|------------------|
| decayed atoms    |
| decayed nuclei   |
| undecayed nuclei |

will have decreased to half of their original number.

[2]

(ii) A sample of this isotope has an activity of 32 counts per second.  
How much time has passed since its activity was 512 counts per second?

Show your working out.

Time = \_\_\_\_\_ days [3]

We can get energy from nuclear reactions.

In each case below, give the name of the nuclear process to which the statement refers.

**(b) (i)** This reaction occurs when light nuclei are combined.

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

**(ii)** This reaction is currently used in reactors to supply electricity commercially.

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

**(iii)** This reaction uses fuel that can be found in seawater.

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

[Turn over

5 Radioactive isotopes are used in industry and medicine.

Three applications are described below:

- a radioactive isotope is used to sterilise medical equipment;
- a radioactive tracer is introduced into underground pipes to detect leaks;
- a radioactive isotope is used in smoke alarms.

(a) In the table below:

- tick (✓) if a long or short half-life would be suitable, and
- write what type of radiation, alpha, beta or gamma would be the most suitable.

| Application                   | Short half-life | Long half-life | Alpha, beta or gamma |
|-------------------------------|-----------------|----------------|----------------------|
| Sterilising medical equipment |                 |                |                      |
| Tracer in pipes               |                 |                |                      |
| Smoke alarms                  |                 |                |                      |

[6]

(b) This question is about the dangers of using radioactive substances.

State a health danger involved in using radioactive substances.

\_\_\_\_\_

State three different methods that people who work with radioactive substances can use to protect themselves.

Method 1 \_\_\_\_\_

\_\_\_\_\_

Method 2 \_\_\_\_\_

\_\_\_\_\_

Method 3 \_\_\_\_\_

\_\_\_\_\_

[4]

- 6 A military tank has a mass of  $8.48 \times 10^4$  kg and **each** caterpillar tread has an area of  $3 \text{ m}^2$  in contact with the ground.

caterpillar tread \_\_\_\_\_



© DoroO / Getty Images

- (a) Calculate the pressure exerted by the tank on the ground.  
Remember to include the unit.

**Show your working out.**

Pressure = \_\_\_\_\_ [5]

(b) A metal wire may be used to cut through a piece of cheese with a smaller force than using a metal knife.

Explain why.



© IgorSPb / Getty Images

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[2]

[Turn over

- 7 Pearl climbs to the top of a slide.



© izzy71 / Getty Images

Pearl, who has a mass of 50 kg, reaches a velocity of 7 m/s at the bottom of the slide.

On her way down she loses 500 J of energy because of friction.

- (a) Calculate her kinetic energy at the bottom and then find the height of the slide. Give your answer correct to one decimal place.

**Show your working out.**

Kinetic energy = \_\_\_\_\_ J

Height of slide = \_\_\_\_\_ m [7]

(b) Pearl has speed, velocity and acceleration as she slides down.

Complete the table to indicate whether these quantities are scalars or vectors. In each case show your choice with a tick (✓).

|              | Scalar | Vector |
|--------------|--------|--------|
| Speed        |        |        |
| Velocity     |        |        |
| Acceleration |        |        |

[3]

(c) Study the shape of the slide in the diagram.

Consider Pearl's displacement and distance from the top to the bottom.

Choose the correct statement below by ticking (✓) the box.

Her displacement and distance are equal.

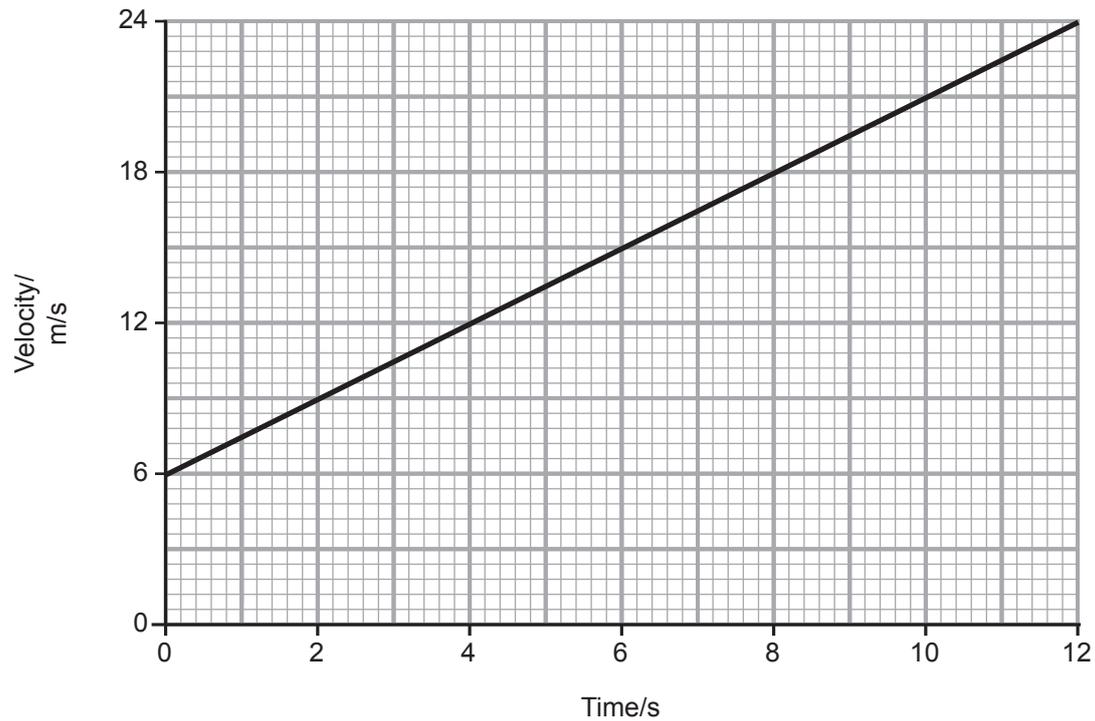
Her displacement is greater than her distance.

Her distance is greater than her displacement.

[1]

[Turn over

- 8 The graph below shows part of the velocity–time graph for a car journey.



- (i) Use the graph to calculate the displacement of the car during this 12 second time interval.

**Show your working out.**

Displacement = \_\_\_\_\_ m [4]

- (ii) The car exerts a resultant force of 2250 N.  
Use the graph to help you calculate the mass of the car.

**Show your working out.**

Mass of car = \_\_\_\_\_ kg [6]

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| For Examiner's use only |       |
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| Question Number         | Marks |
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| 2                       |       |
| 3                       |       |
| 4                       |       |
| 5                       |       |
| 6                       |       |
| 7                       |       |
| 8                       |       |

|                    |  |
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| <b>Total Marks</b> |  |
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Examiner Number

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