OCR GCSE GATEWAY PHYSICS A · J249

PHYSICS



EXAM QUESTION PACK

WS1.4 SCIENTIFIC VOCABULARY, QUANTITIES, UNITS, SYMBOLS AND NOMENCLATURE

SCORE	PERCENTAGE
/137	%

STEMUP

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Gateway Physics A (9-1)

Scientific vocabulary, quantities, units, symbols and nomenclature

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

Candidates answer on the Question paper.

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

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

Duration: Not set

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 **137**.
- The total number of marks may take into account some 'either/or' question choices.

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1 An object moved 20 cm with a force of 20 N.

Use the equation: work done = force × distance

Which is the correct calculation of work done?

A 0.4 J

B 4.0 J

C 40 J

D 400 J

Your answer ☐ [1]

2 Which distances are the **same**?

A 1×10^{-3} m and 1 μm

B 1×10^{-6} m and 1 mm

C 1×10^{-9} m and 1 nm

D 1×10^{-12} m and 1 Gm

Your answer ☐ [1]

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3 A charge of 44 000 C flows through a light bulb. The potential difference is 230 V.

Calculate the energy transferred.

Use the equation: Charge = Energy ÷ Potential difference

Record your answer to **2** significant figures.

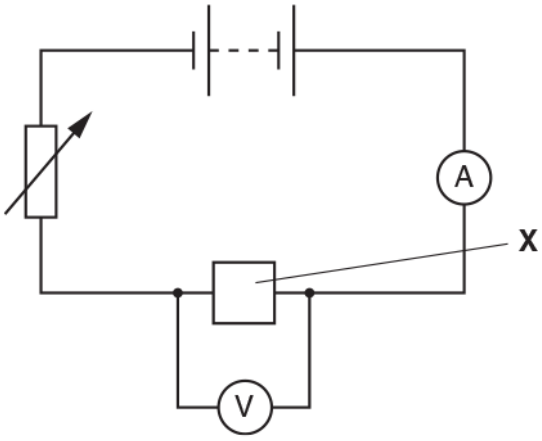
Answer = ... J **[4]**

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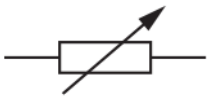
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4 A student builds a circuit to investigate the resistance of component **X**.



(i) What is the name of this component?



---------- [1]

(ii) Why is this component needed in this circuit?

---------- [1]

5 Which statement is equivalent to the mass of an object?

A The ratio of acceleration over force

B The ratio of force over acceleration

C The ratio of velocity over acceleration

D The ratio of displacement over acceleration

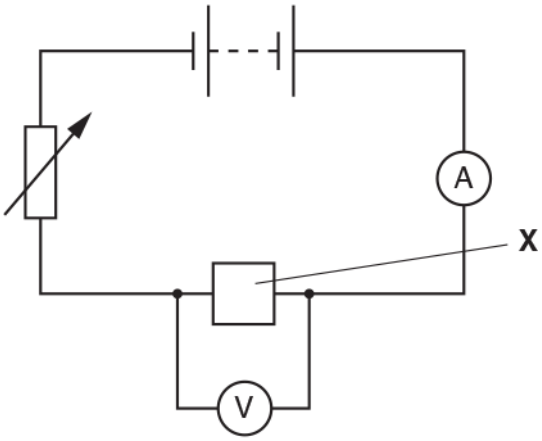
Your answer [ ] [1]

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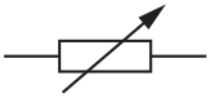
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6 A student builds a circuit to investigate the resistance of component **X**.



(i) What is the name of this component?



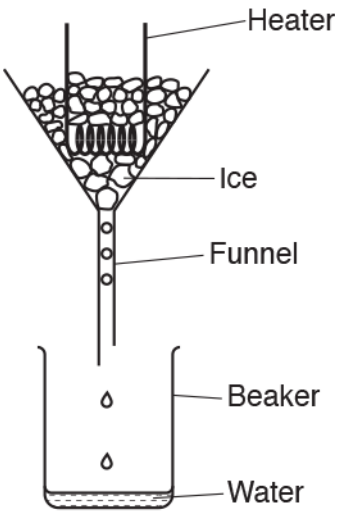
---------- [1]

(ii) Why is this component needed in this circuit?

---------- [1]

7 Two students design an experiment to find the specific latent heat of water.

They set up their equipment as shown in the diagram.



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The students also have access to a power supply, a voltmeter, an ammeter, a stop-clock and a top-pan balance.

* Explain how the students could use this equipment to determine an accurate value for the specific latent heat of water.

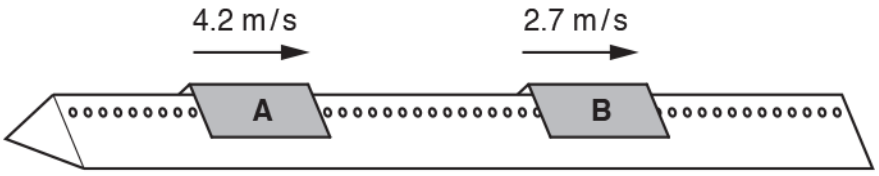
[6]

8(a) A student investigates collisions of trolleys on a horizontal airtrack.

Write down the **two** quantities involved with motion which are conserved during an elastic collision.

[2]

(b) Trolley **A** has a mass of 2 kg. Trolley **B** has a mass of 2.5 kg.



(i) Calculate the **momentum** of each trolley.

Trolley **A** = ... kg m/s

Trolley **B** = ... kg m/s

[3]

(ii) The two trolleys collide and stick together after the collision. Use your answers to **(i)** to calculate the **speed** of the combined trolleys after the collision.

Record your answer to **2** significant figures.

Answer = ... m/s **[3]**

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9 Which of the following correctly describes the domestic electricity supply in the UK?

A 230 V a.c. at 50 Hz

B 230 V a.c. at 60 Hz

C 230 V d.c. at 50 Hz

D 230 V d.c. at 60 Hz

Your answer [1]

10 An alpha particle collides with an atom to produce a positive ion.

What happens to the atom for it to become a positive ion?

A It loses an electron from inside the nucleus.

B It loses an electron from outside the nucleus.

C It loses a neutron from inside the nucleus.

D It loses a proton from outside the nucleus.

Your answer [1]

11 A car accelerates from 0 to 60 mph (miles per hour) in about 9 seconds.

Use the relationship: 1 m/s = 2.24 mph

Estimate the acceleration for this car in m/s^2.

A 1 m/s^2

B 3 m/s^2

C 7 m/s^2

D 15 m/s^2

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Your answer 

[1]

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12 A gas fire, used to heat a room, has an input energy transfer of 180 000 J per minute.

The fire has an efficiency of 0.8.

Use the equation: Efficiency = Useful output energy transfer / Input energy transfer

Calculate the useful output energy transfer per minute.

A 600 J

B 2400 J

C 36 000 J

D 144 000 J

Your answer ☐ **[1]**

13 A pump lifts 500 kg of water to a water tank at the top of a building.

The water gains 240 000 J of gravitational potential energy.

The gravitational field strength is 10 N/kg.

Use the equation: Potential energy = Mass × Height × Gravitational field strength

Calculate the height of the water tank.

A 4.8 m

B 48 m

C 240 m

D 480 m

Your answer ☐ **[1]**

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14 An artificial satellite is kept in its low polar orbit by a gravity force from a planet.

The satellite is moved to a higher orbit above the planet.

Which statement is correct about the satellite in this higher orbit?

A The force of gravity is greater and its speed decreases.

B The force of gravity is greater and its speed increases.

C The force of gravity is less and its speed decreases.

D The force of gravity is less and its speed increases.

Your answer [ ] [1]

15 Which row **A**, **B**, **C** or **D**, describes what has happened to light that has undergone red shift?

	Wavelength	Frequency
A	Decreases	Decreases
B	Decreases	Increases
C	Increases	Decreases
D	Increases	Increases

Your answer [ ] [1]

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16(a) Power stations in the UK generate electricity at 25 kV a.c.

The voltage is then increased to 400 kV a.c. and distributed by power lines.

(i) Write down the full name of the device used to **increase** the voltage.

---

[1]

(ii) Why is it important to increase the voltage in these power lines?

---

[1]

(iii) The high voltages across the power lines are reduced to 230 V a.c. for use in the home.

A phone charger changes the 230 V a.c. to a 5 V d.c.

Explain the difference between d.c. and a.c.

---

[2]

(b) A domestic wind turbine has a power rating which varies from 1.0 kW to 3.0 kW.

(i) The domestic wind turbine has an electrical resistance of 23 Ω.

It generates a current of 11 A on a windy day.

Calculate the power output in kW of the turbine on this day.

Answer = ---------- kW **[4]**

() Suggest why the manufacturer gives a range for the power rating of the wind turbine.

---**[1]**

(i) Using just **one** domestic wind turbine may be an unreliable source of power for a house.

State a reason why.

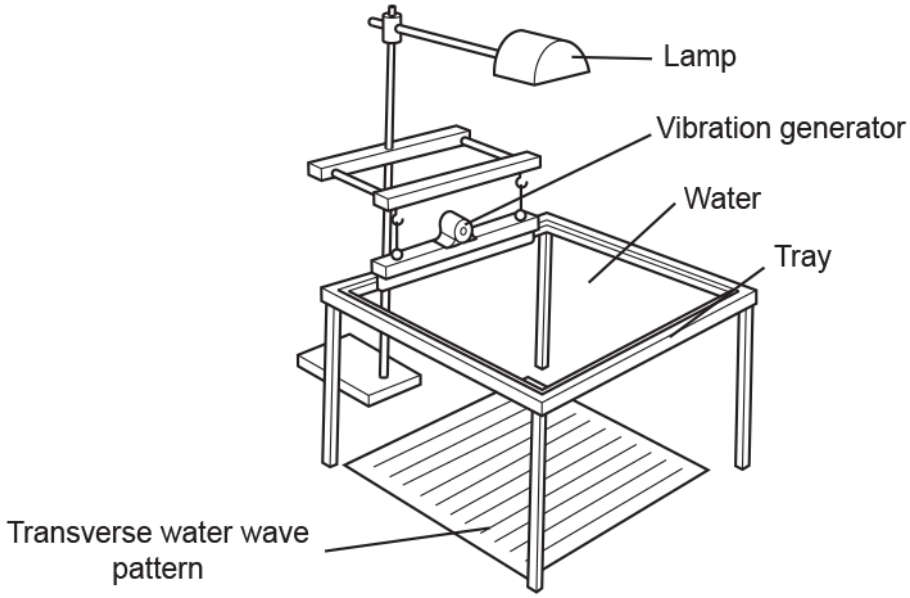
---**[1]**

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17(a) A teacher uses water waves in a ripple tank to demonstrate **transverse** waves.



She makes measurements of the water waves.

The frequency of the water waves is 0.5 Hz.

(i) Calculate the number of water waves produced in 5 seconds.

Answer = ---------- [1]

(ii) The teacher **increases** the frequency of the water waves.

Describe what happens to the speed **and** the wavelength of the water waves.

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[2]

(iii) A student tries to describe water waves in the sea.

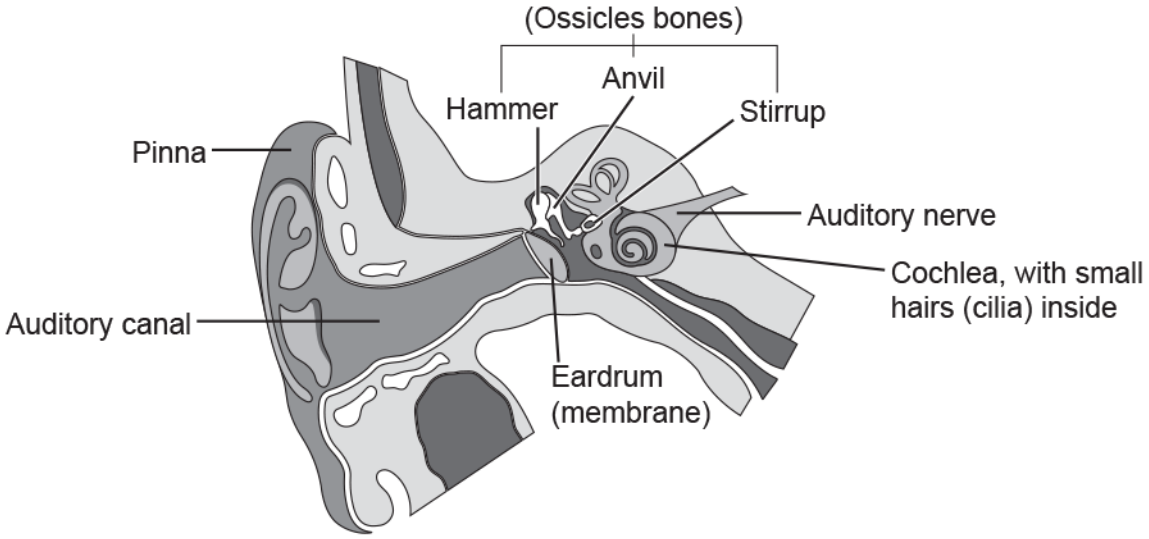
'The water waves move up and down. The water particles move all the way across the surface of the sea. This means that water moves in the direction of the waves.'

Part of his explanation is **incorrect**.

Write an improved and correct description about water waves in the sea.

[2]

(b) Look at the diagram of a human ear.



Sound wave disturbances, outside the ear, transfer energy to the small hairs (cilia) inside the cochlea.

The cochlea then sends nerve impulses along the auditory nerve to the brain.

Explain how sound wave disturbances in the air outside the ear transfer to the small hairs (cilia) inside the cochlea.

---

[3]

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18(a) Look at the table showing information about the electromagnetic spectrum.

Radio	Micro-wave	Infra-red	Visible light	Ultra-violet	X-rays	Gamma-rays
3 MHz	30 GHz	3 THz		3000 THz	3 000 000 THz	300 000 000 THz
100 m	1 cm	100 μm				

The speed of all electromagnetic radiation is 3×10^8 m/s.

(i) Use data in the table to show that the speed of microwaves is 3×10^8 m/s.

[2]

(ii) Ultra-violet waves typically have a frequency of 3000 THz.

Calculate the wavelength of these ultra-violet waves in nm.

Answer = ---------- nm [3]

(b) Ultra-violet waves can damage human skin.

Describe the damage caused to human skin by ultra-violet waves.

---

[1]

19 Nuclear radiation, such as gamma, is used to irradiate some fresh food to increase its 'shelf-life' and make it last longer.

Fresh herbs and spices are dried and irradiated with gamma rays.

Explain the difference between nuclear **irradiation** and nuclear **contamination**.

---

[2]

20 A scientist uses different drivers to test the stopping distances of the same car.

Look at the results.

Driver	Speed (m/s)	Thinking distance (m)	Braking distance (m)
A	8	6	6
B	16	13	24
C	32	24	96
D	16	12	22
E	8	5	6
F	32	30	120

Driver **C** travels at 32 m/s on the road and then stops. The car has a mass of 1200 kg.

(i) Show that the **kinetic energy** stored by the car at 32 m/s is 614 000 J.

[3]

(ii) Describe what happens to the kinetic energy of the car as it brakes and stops.

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22 Which row **A**, **B**, **C** or **D**, is true for electromagnetic waves?

	Transmission	Type	Movement in space
A	Transmit energy from absorber to source	Longitudinal	Travel through space at different velocities
B	Transmit energy from absorber to source	Transverse	Travel through space at different velocities
C	Transmit energy from source to absorber	Longitudinal	Travel through space where all have the same velocity
D	Transmit energy from source to absorber	Transverse	Travel through space where all have the same velocity

Your answer ☐ **[1]**

23 A vehicle has an input power from fuel of 20 kW and a useful output power of 6 kW.

Calculate the power it wastes.

A 3 kW

B 6 kW

C 14 kW

D 20 kW

Your answer ☐ **[1]**

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24 A radio wave has a wavelength of 100 m. It has a speed of 3×10^8 m/s.

Use the equation: Wave speed = Frequency × Wavelength

Calculate the frequency of the wave.

A 3 MHz

B 30 MHz

C 300 MHz

D 3000 MHz

Your answer ☐ [1]

25 A lorry has a mass of 3500 kg. It travels at a speed of 30 m/s.

Use the equation: Kinetic Energy = 0.5 × Mass × Speed^2

Calculate the kinetic energy of this lorry.

A 10 500 J

B 52 500 J

C 1 575 000 J

D 3 150 000 J

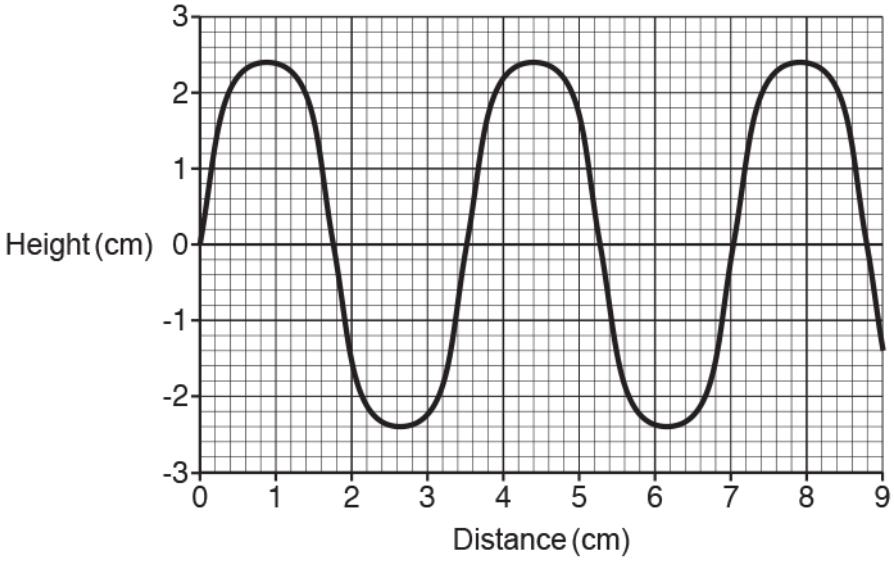
Your answer ☐ [1]

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26 Look at the diagram of a water wave.



(i) What is the **wavelength** of this wave?

Answer = _____ cm **[1]**

(ii) What is the **amplitude** of this wave?

Answer = _____ cm **[1]**

(iii) The wavelength of the wave is changed to 25 cm. Two waves are produced each second.

Use the equation: Wave speed = Frequency × Wavelength

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Calculate the speed of the wave.

Answer = ---------- m/s **[2]**

27 Power stations in the UK generate electricity at 25 kV a.c.

The voltage is then increased to 400 kV a.c. and distributed by power lines.

(i) Write down the full name of the device used to **increase** the voltage.

---------- **[1]**

(ii) Why is it important to increase the voltage in these power lines?

---------- **[1]**

(iii) The high voltages across the power lines are reduced to 230 V a.c. for use in the home.

A phone charger changes the 230 V a.c. to a 5 V d.c.

Explain the difference between d.c. and a.c.

---------- **[2]**

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28 What is the typical diameter of an atom?

A 1.0×10^{-15} m

B 1.0×10^{-10} m

C 1.0 μm

D 1.0 mm

Your answer [ ] **[1]**

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29 A domestic wind turbine has a power rating which varies from 1.0 kW to 3.0 kW.

(i) The domestic wind turbine has an electrical resistance of 23 Ω.

It generates a current of 11 A on a windy day.

Calculate the **power** output in kW of the turbine on this day.

Answer = ---------- kW **[4]**

(ii) Suggest why the manufacturer gives a range for the power rating of the wind turbine.

30(a) A TV has the label below on it.

OCR TV
Voltage: 230 V Power: 65 W Frequency: 50 Hz

Calculate the **current** in the TV when it is turned on.

Use the equation: power = potential difference × current

Give your answer to **2** significant figures.

Current = ... A **[4]**

(b) The TV is turned on for 30 minutes.

Calculate the energy transferred by the TV.

Energy used = ... J **[4]**

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31 A car travels at 72 km / h.

How fast is this in metres per second (m / s)?

A 1.2 m/s

B 20 m/s

C 120 m/s

D 1200 m/s

Your answer ☐ **[1]**

32(a) A TV has the label below on it.

OCR TV
Voltage: 230 V Power: 65 W Frequency: 50 Hz

Calculate the **current** in the TV when it is turned on.

Use the equation: power = potential difference × current

Give your answer to **2** significant figures.

Current = ... A **[4]**

(b) The TV is turned on for 30 minutes.

Calculate the energy transferred by the TV.

Energy used = ... J **[4]**

33 A radiator has a power of 2 kilowatts (2 kW).

Convert 2 kW into watts.

A 0.002 W
B 200 W
C 2000 W
D 2 000 000 W

Your answer ☐ **[1]**

34 The speed of the wind is measured to be 5.555 m / s.

What is 5.555 m / s written to **2** significant figures?

A 5.5 m / s
B 5.55 m / s
C 5.56 m / s
D 5.6 m / s

Your answer ☐ **[1]**

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35 A car travels at a speed of 60 mph (miles per hour).

1 mph = 0.45 m / s.

Convert 60 mph into m / s (metres per second).

A 0.45 m / s
B 7.5 m / s
C 27 m / s
D 130 m / s

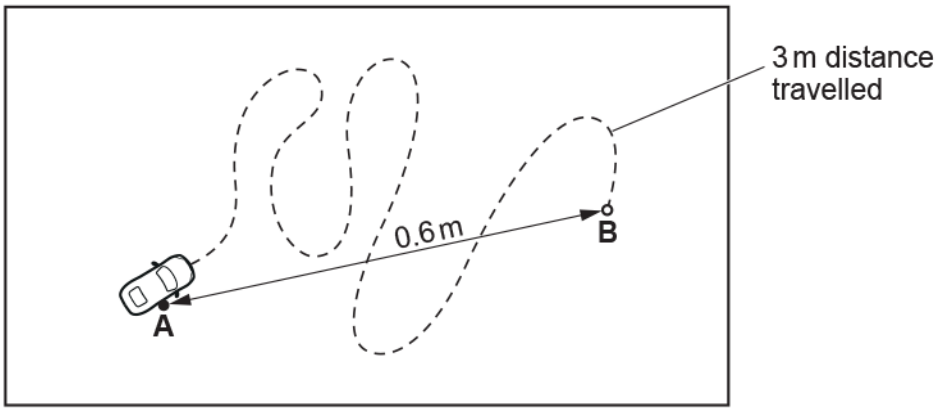
Your answer ☐ [1]

36 A student is measuring power of different machines. Which two measurements show the **same** power measured?

A 10 GW and 1.0×10^{10} W
B 4.0 kW and 40×10^{3} W
C 10 mW and 10×10^{3} W
D 10 MW and 1.0×10^{6} W

Your answer ☐ [1]

37 * A toy car moves randomly on a table.



It moves from position **A** to position **B** in 0.5 minutes, covering a distance of 3.0 m. The start and finish positions are 0.6 m apart.

Explain why the average speed and average velocity of the moving toy car are different from one another.

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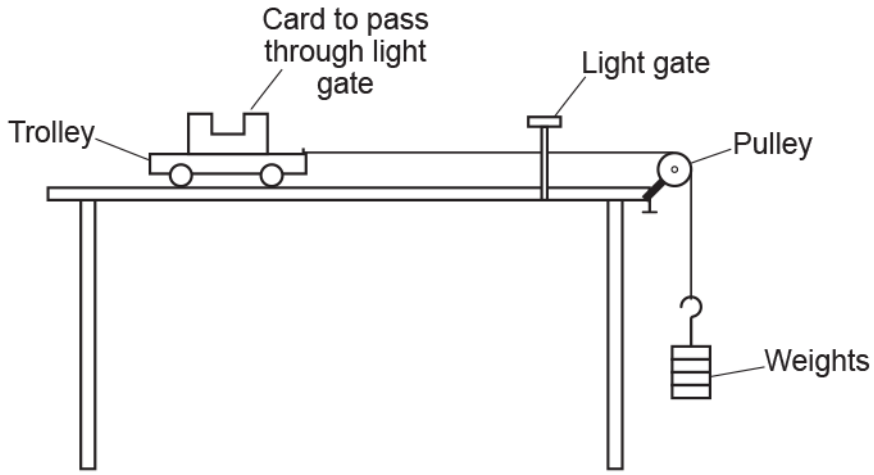
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You should include calculations in your answer.

[6]

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38 A student investigates the acceleration of a trolley.



The trolley is released from a fixed position and accelerates.

The accelerating force is provided by the weights attached to the trolley with string.

Acceleration is measured using a light gate and data logging equipment.

Look at the results from the experiment.

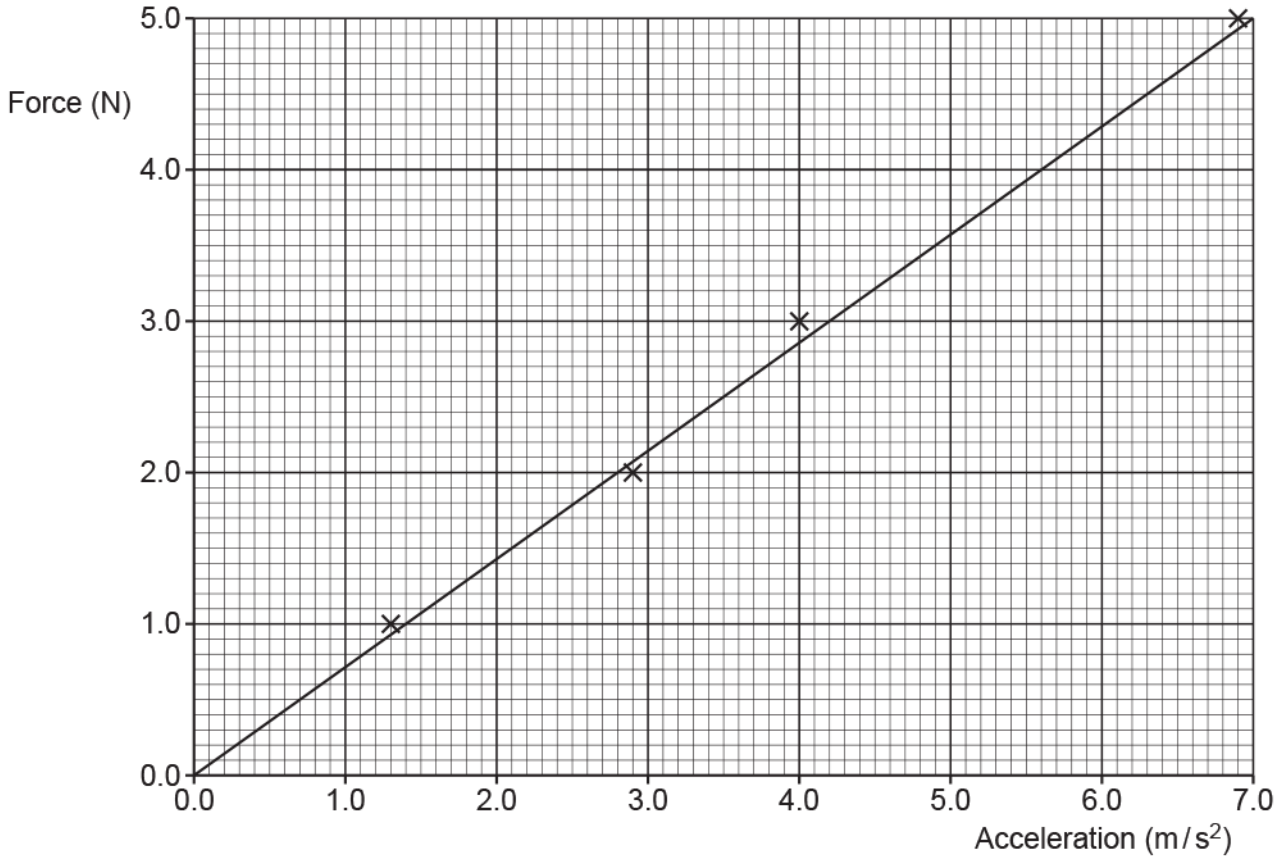
Force (N)	Acceleration
1.0	1.3
2.0	2.9
3.0	4
4.0	5.7
5.0	6.0

The student plots the results on a graph.

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(i) One point has not been plotted on the graph. Plot the missing point on the graph.

[1]

(ii) Describe the relationship between the two variables on the graph.

---

[2]

(iii) Calculate the gradient of the graph and use this to determine the mass of the trolley.

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Mass = ... kg **[2]**

(iv) The actual mass of the trolley is lower than that found in the experiment. Suggest two reasons why.

Use ideas about forces and energy in your answer.

1 ---

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2 ---

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[2]

(v) Suggest **two** ways the experiment could be improved.

1 ---

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2 ---

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[2]

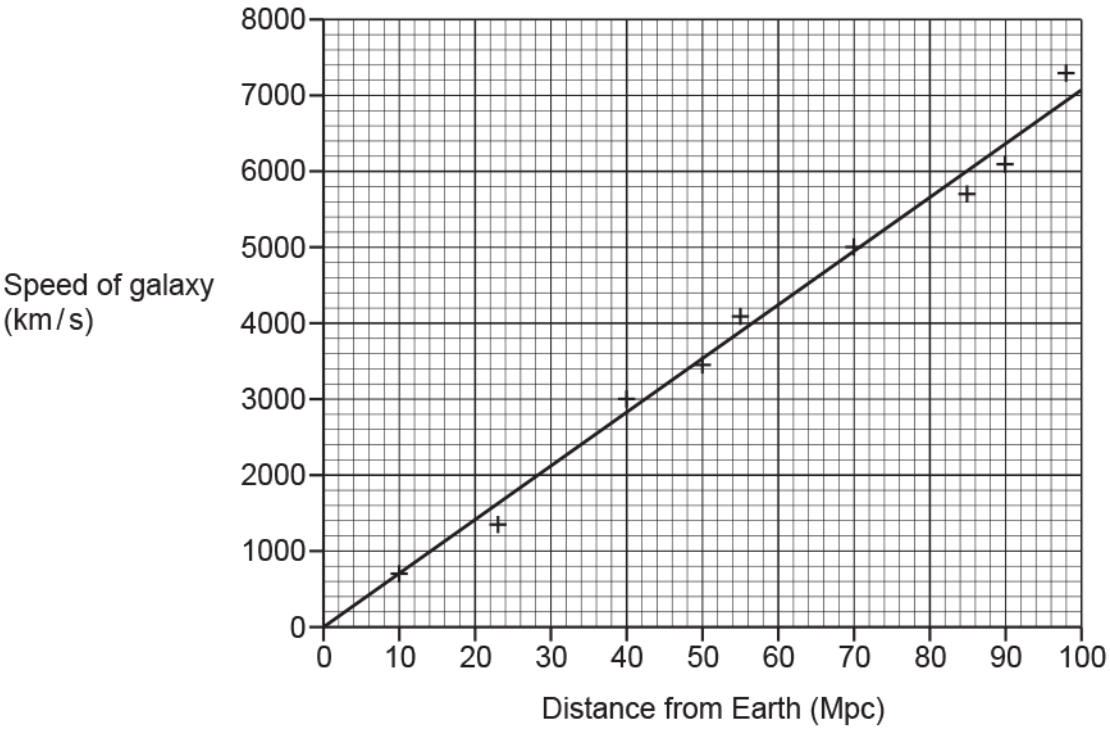
39(a) Edwin Hubble discovered that all distant galaxies were moving away from the Earth.

Explain how he could tell that all distant galaxies were moving away from the Earth.

---

[2]

(b) This graph shows how the speed of a galaxy changes with distance from the Earth.



(i) Use data from the graph to show that the speed of the galaxy is proportional to the distance from the Earth.

---

[2]

(ii) Explain how data from the graph provides evidence for the Big-Bang.

---

[1]

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(c) Before Edwin Hubble could publish his results, his work was peer reviewed.

Suggest why peer review is important.

---

[1]

(d) The parsec (pc) is a unit used for measuring large distances in the Universe.

(i) A galaxy is at a distance of 82 Mpc from the Earth.

Use the graph to determine the speed of this galaxy.

Give your answer in metres per second (m / s).

Speed = ... m / s **[2]**

(ii) Calculate the time it takes for the galaxy to travel 2.53×10^{24} m.

Use your answer to **(i)** to help you.

Time = ... s **[3]**

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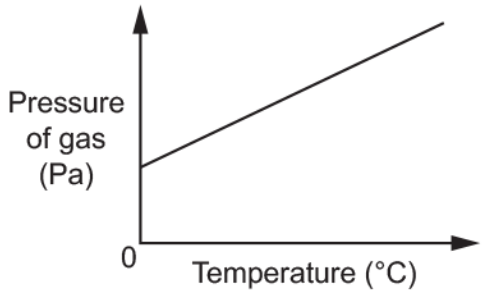
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40 What is the typical size for a small molecule?

A 0.1 cm
B 0.1 km
C 0.1 m
D 0.1 nm

Your answer ☐ [1]

41 A student investigates how temperature and pressure of a gas are linked. The student measures the pressure of a gas as its temperature increases. The results are plotted on a graph.



Explain how temperature and pressure are linked.

Use the graph to support your answer.

[2]

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42 A toy car travels around a race track. After one lap it is back at the start position.

Explain why the velocity of the toy car is different from its speed as it travels around the track.

---

[2]

END OF QUESTION PAPER

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