Cambridge Assessment International Education

# Cambridge O Level

**PHYSICS** **5054/12**

Paper 1 Multiple Choice **May/June 2024**

**1 hour**

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

**INSTRUCTIONS**

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m / $s^2$).

**INFORMATION**

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **16** pages. Any blank pages are indicated.

**1** What is measured using a micrometer?

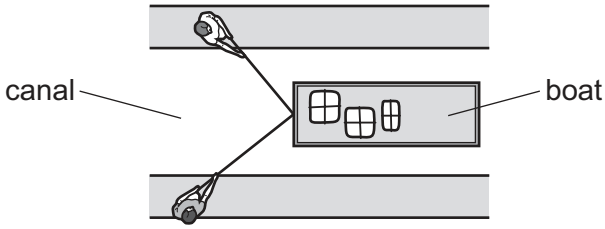
**A** area

**B** current

**C** length

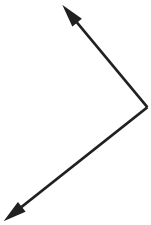
**D** mass

**2** Two people pull on ropes to move a boat along a canal.

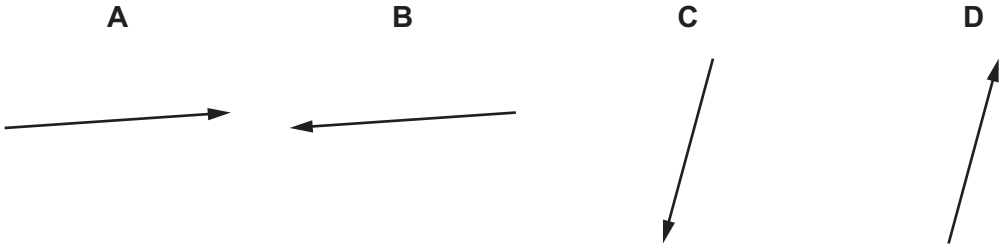



The boat moves at a constant velocity.

The vector diagram for the tension in the ropes is shown.

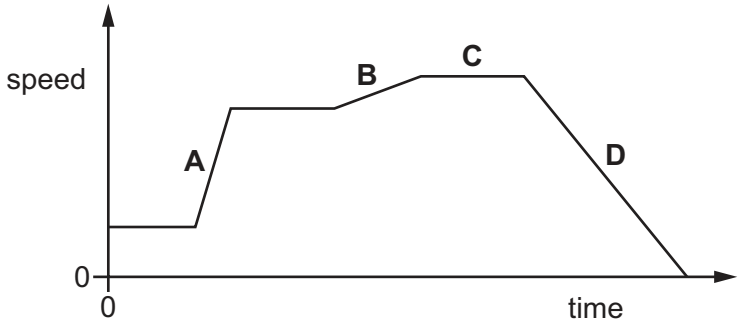


Which vector is the drag acting on the boat?




**3** The graph shows how the speed of a car travelling in a straight line changes with time.

Which section shows the largest acceleration?



**4** A man walks along a path from X to Y. The diagram shows the path from above.


The man measures the distance he walks and the time taken.

Which quantity can be calculated using this data only?

**A** acceleration

**B** average speed

**C** average velocity

**D** power

**5** Which property of an object determines its resistance to a change from its state of rest or motion?

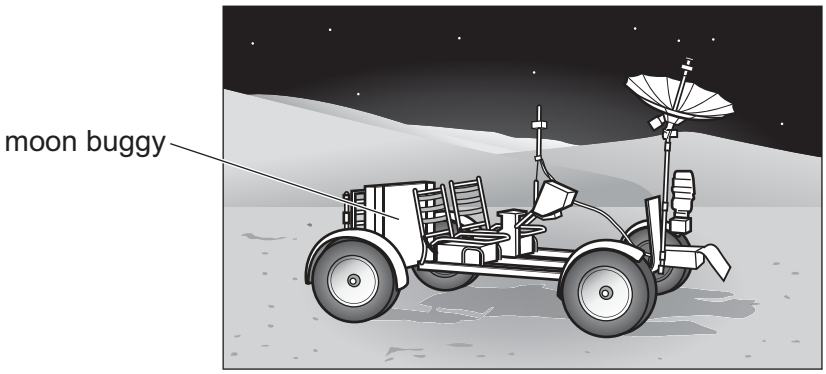
**A** its mass

**B** its shape

**C** its surface area

**D** its volume

**6** The diagram shows a moon buggy used by astronauts.



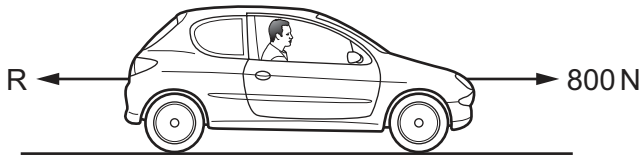

The mass of the moon buggy on the Earth is 210 kg. The gravitational field strength on the Moon is $\frac{1}{6}$ of that on the Earth.

What is the weight of the moon buggy on the Moon?

**A** zero **B** 35 N **C** 210 N **D** 340 N

**7** A car travels along a road. The force on the car due to the engine is 800 N.

The motion of the car depends on the value of the total resistive force R.




Which row shows the motion of the car for the given value of R?

| | value of resistive force R / N | motion |
|---|---|---|
| **A** | 500 | deceleration |
| **B** | 800 | acceleration |
| **C** | 900 | deceleration |
| **D** | 1000 | acceleration |

**8** Four of the gravitational forces that act between objects in the Solar System are listed.

P the force on the Moon due to the Earth

Q the force on the Earth due to the Sun

R the force on the Earth due to the Moon

S the force on the Moon due to the Sun

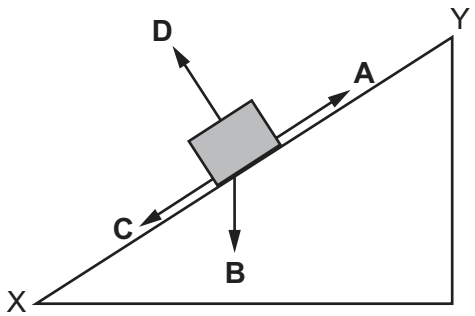
Which two forces are a Newton's third law pair?

**A** P and Q **B** P and R **C** Q and S **D** R and S

**9** A box is moved up a rough slope from X to Y.

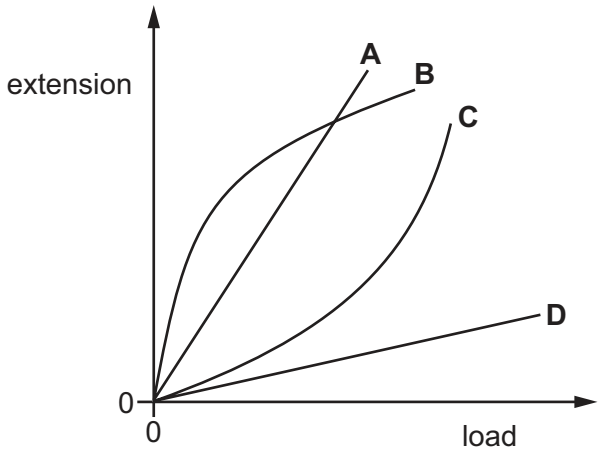
The diagram shows four forces acting on the box.

Which force is the force due to friction on the box?



**10** The graph shows how the extension of four different threads depends on the load attached.

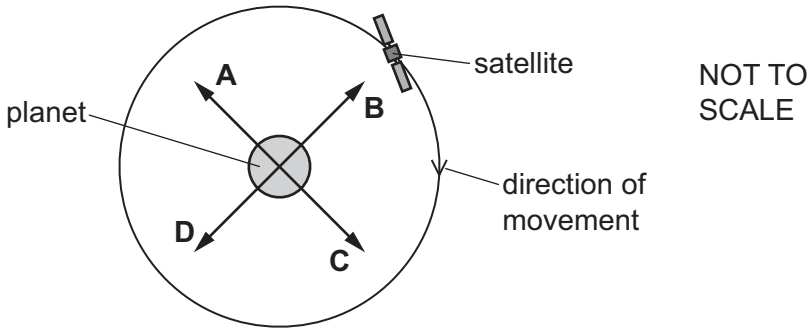
Which thread is the most difficult to stretch over the range of loads shown?




**11** A satellite orbits a planet in a circular path as shown. It has constant speed.

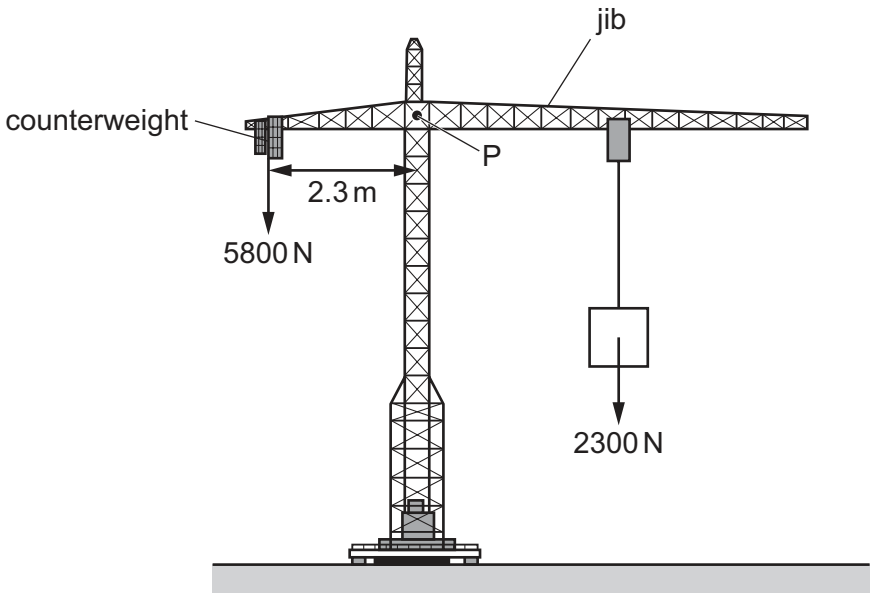
There is a force on the satellite due to the planet.

In which direction is the force on the satellite when it is in the position shown?



**12** A crane has a 5800 N counterweight positioned 2.3 m from the tower along a horizontal jib.

The centre of gravity P of the crane jib is marked.




What is the horizontal distance between the 2300 N load and P so that there is no moment about P?

**A** 0.91 m **B** 3.5 m **C** 5.8 m **D** 8.1 m

**13** A car of mass 750 kg travels 400 m at 25 m / s. It then accelerates to 35 m / s and travels a further 400 m.

What is the change in the momentum of the car due to acceleration?

**A** 7500 kg m / s

**B** 24 000 kg m / s

**C** 45 000 kg m / s

**D** 75 000 kg m / s

**14** A ball is dropped from rest at the top of a building. Air resistance is negligible.

The velocity of the ball is 14 m / s when it hits the ground.

What is the height of the building?

**A** 2.9 m **B** 10 m **C** 20 m **D** 40 m

**15** Which energy source is available constantly over a 24-hour period?

**A** natural gas

**B** solar cells

**C** tidal

**D** wind

**16** A 15 W lamp is turned on for 30 minutes. It wastes 7000 J of energy.

What is the efficiency of the lamp?

**A** 0.26 **B** 0.35 **C** 0.59 **D** 0.74

**17** Which quantity is **not** measured in joules (J)?

**A** gravitational potential energy

**B** latent heat

**C** power

**D** work

**18** Which description of a liquid is correct?

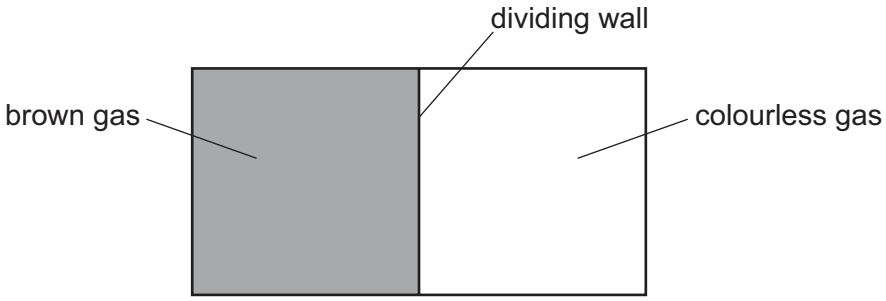
**A** fixed shape, fixed volume

**B** fixed shape, variable volume

**C** variable shape, fixed volume

**D** variable shape, variable volume

**19** A transparent box has a dividing wall in its middle. It contains two different gases, one in each half, as shown.




The dividing wall is removed. The box is left for a long time. The gases do not react.

What is then seen in the box?

**A** brown gas on the right and colourless gas on the left

**B** pale brown gas throughout

**C** several distinct clouds of colourless and brown gas throughout

**D** colourless gas on the right and brown gas on the left

**20** A bottle containing a cold liquid is placed on a table on a warm day. Drops of water form on the outside of the bottle.

Which process causes the drops to form?

**A** condensation

**B** conduction

**C** convection

**D** evaporation

**21** What is the specific heat capacity of a liquid?

**A** the difference between the boiling temperature and the melting temperature of the liquid

**B** the energy required to change the state of 1 kg of the liquid

**C** the energy required to heat 1 kg of the liquid through 1 °C

**D** the increase in temperature of the liquid when it is heated

**22** Which statement about infrared radiation is correct?

**A** In a vacuum, infrared radiation travels at the speed of light.

**B** Infrared radiation is a longitudinal wave.

**C** Infrared radiation has a higher frequency than ultraviolet radiation.

**D** White surfaces are better emitters of infrared radiation than black surfaces.

**23** The speed of sound in air is 330 m / s.

Which sound is classed as ultrasound?

**A** a sound with a wavelength of 250 cm

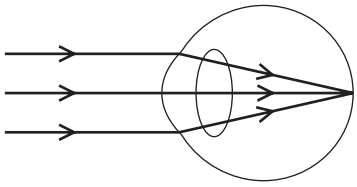
**B** a sound with a wavelength of 25 cm

**C** a sound with a wavelength of 2.5 cm

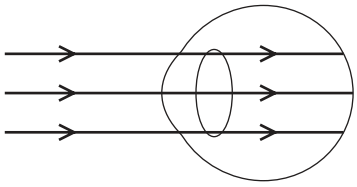
**D** none of the above

**24** Which diagram shows how light from a distant object forms an image in a normal eye?

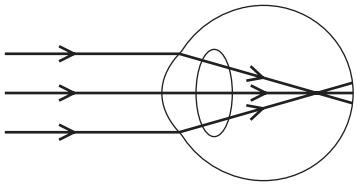
**A**



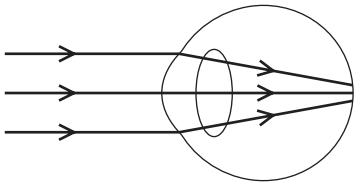
**B**



**C**



**D**



**25** The colour of visible light is related to the wavelength of the light.

Which list of colours is in order of increasing wavelength?

**A** blue → green → yellow → red

**B** blue → green → red → yellow

**C** green → red → yellow → blue

**D** red → yellow → green → blue

**26** A thin converging lens is used as a magnifying glass.

Which row gives the nature of the image produced and an expression that is the linear magnification?

| | nature of image | expression for linear magnification |
|---|---|---|
| **A** | real | $\frac{\text{image length}}{\text{object length}}$ |
| **B** | real | $\frac{\text{object length}}{\text{image length}}$ |
| **C** | virtual | $\frac{\text{image length}}{\text{object length}}$ |
| **D** | virtual | $\frac{\text{object length}}{\text{image length}}$ |

**27** Which application is **not** a use for ultrasound?

**A** cleaning jewellery

**B** scanning an unborn baby

**C** sonar

**D** sterilising water

**28** Which equation is correct for potential difference (p.d.)?

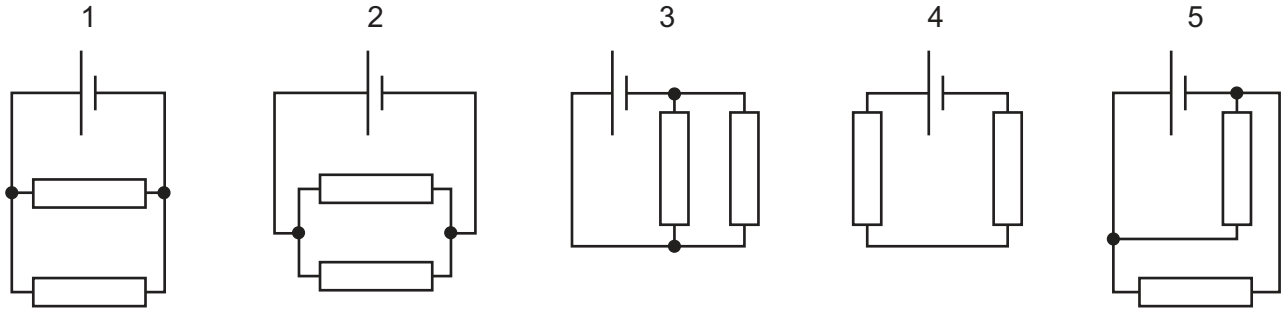
**A** p.d. = voltage $\times$ current

**B** p.d. = $\frac{\text{energy}}{\text{time}}$

**C** p.d. = $\frac{\text{work done}}{\text{charge}}$

**D** p.d. = $\frac{\text{current}}{\text{resistance}}$

**29** The diagrams show five electrical circuits. All of the resistors shown are identical.




Which circuits have equal resistance?

**A** 1, 2, 3 and 5

**B** 1, 2, 4 and 5

**C** 1, 3, 4 and 5

**D** 2, 3, 4 and 5

**30** Which electrical appliance uses the heating effect of electricity?

**A** a cell phone (mobile phone)

**B** a fan

**C** a hairdryer

**D** a lawnmower

**31** How many kilowatt-hours of energy are used by a 1000 W heater connected to a 230 V supply for 30 minutes?

**A** 0.30 kW h **B** 0.50 kW h **C** 30 kW h **D** 120 kW h

**32** Which safety precautions must be taken when wiring an electrical kettle that has a stainless-steel outer casing?

**A** It must be earthed and have a fuse in the live wire.

**B** It must be earthed and have a fuse in the neutral wire.

**C** It needs a fuse in the live wire but does **not** need to be earthed.

**D** It needs a fuse in the neutral wire but does **not** need to be earthed.

**33** What is the purpose of the earth wire in a plug connected to an appliance?

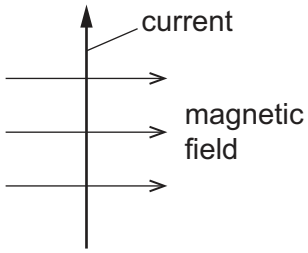
**A** to complete the circuit so that the appliance works

**B** to conduct thermal energy so that the appliance does not get too hot

**C** to prevent a person getting a shock

**D** to protect the appliance from a current that is too large

**34** The diagram shows a wire carrying a current in a magnetic field.




What is the direction of the force on the wire?

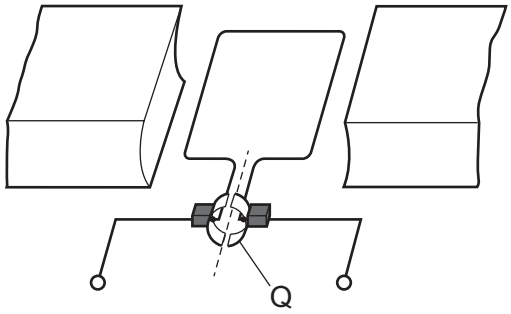
**A** left to right

**B** right to left

**C** into the page

**D** out of the page

**35** The diagram shows a simple d.c. motor.




What is the part labelled Q?

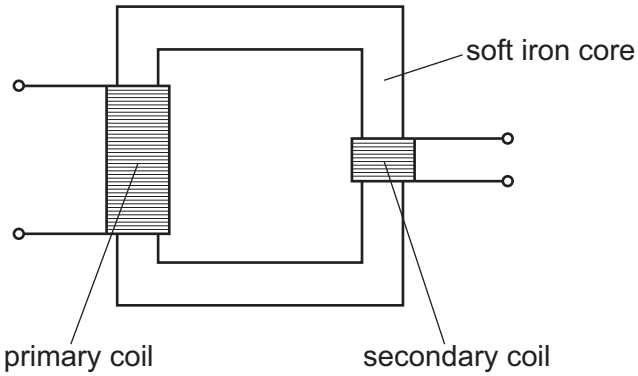
**A** a coil

**B** a magnet

**C** a slip ring

**D** a split-ring commutator

**36** The diagram shows a transformer.




A student writes four statements about how the transformer works.

1 An alternating voltage across the primary coil induces an unchanging voltage across the secondary coil.

2 An alternating voltage across the primary coil produces a changing magnetic field in the iron core.

3 A changing magnetic field in the iron core induces an alternating voltage across the secondary coil.

4 An unchanging voltage across the primary coil produces a changing magnetic field across the secondary coil.

Which statements explain how the transformer works?

**A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

**37** Which particle has the smallest mass?

**A** alpha particle

**B** electron

**C** neutron

**D** proton

**38** Which two atoms are isotopes of the same element?

| atom | number of neutrons | number of protons |
|---|---|---|
| 1 | 22 | 12 |
| 2 | 22 | 14 |
| 3 | 25 | 13 |
| 4 | 24 | 14 |

**A** 1 and 2 **B** 1 and 4 **C** 2 and 4 **D** 3 and 4

**39** Four types of ionising radiation are listed.

- alpha particles
- beta particles
- X-rays
- gamma rays

Which types of radiation can be emitted from the unstable nuclei of a radioactive material?

**A** alpha particles, beta particles and gamma rays

**B** alpha particles and beta particles only

**C** gamma rays only

**D** X-rays and gamma rays

**40** What is the nuclear reaction that powers the Sun?

**A** the fission of hydrogen into helium

**B** the fission of helium into hydrogen

**C** the fusion of hydrogen into helium

**D** the fusion of helium into hydrogen

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