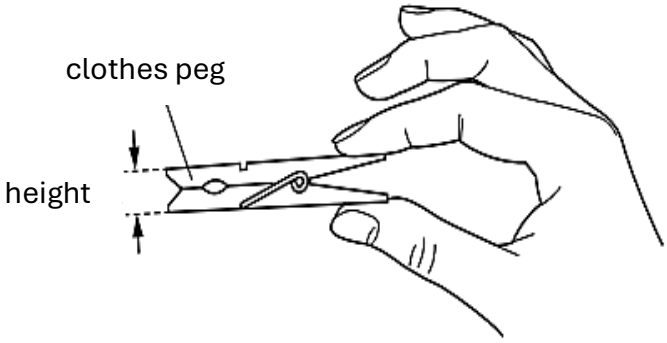
1 The diagram shows a clothes peg.



Which device is suitable for obtaining an accurate value for the height of the clothes peg?

A a digital micrometer screw gauge

B a measuring cylinder

C a metre rule

D a tape

2 What is the unit of work expressed in base unit?

A **(**kgm)/s^2

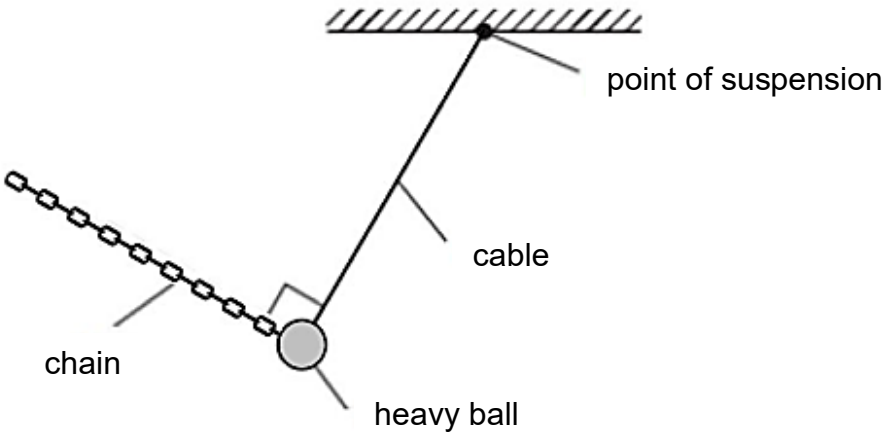
B **(**kgm^2)/s^2

C J

D Nm

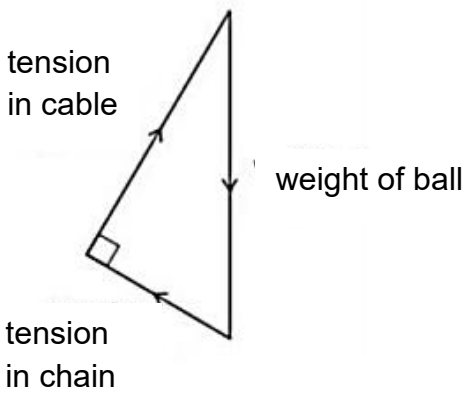
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3 A heavy ball hanging from a cable is held in equilibrium by a chain

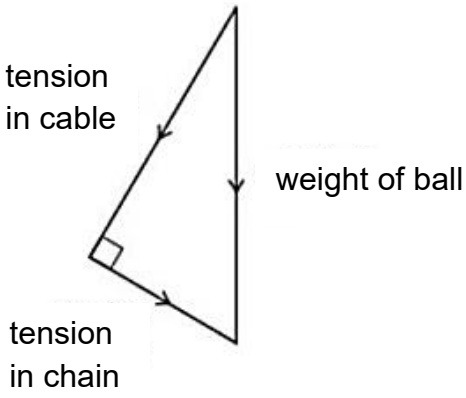


Which vector diagram shows the three forces acting on the ball?

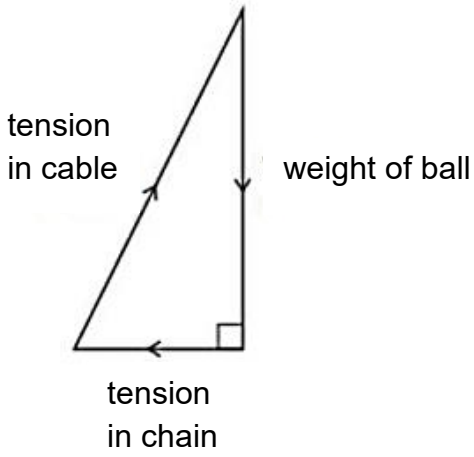
A



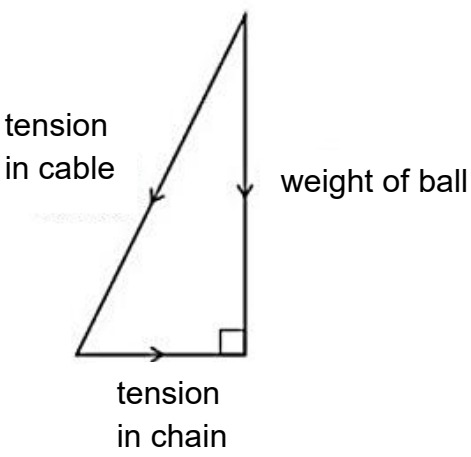
B



C

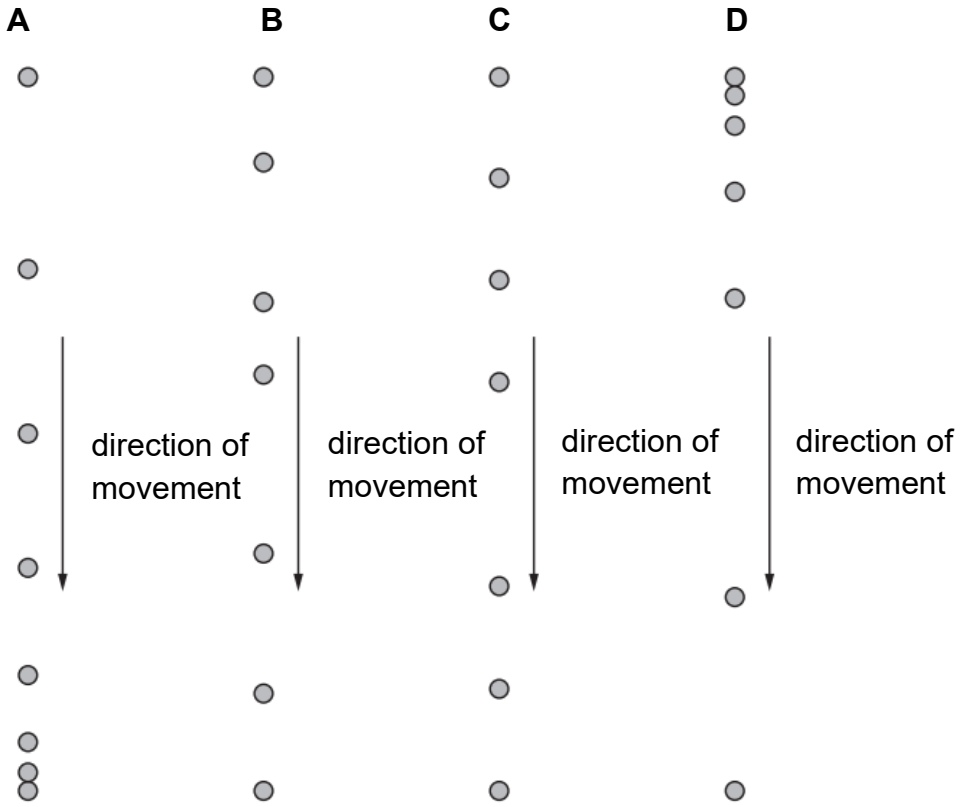


D



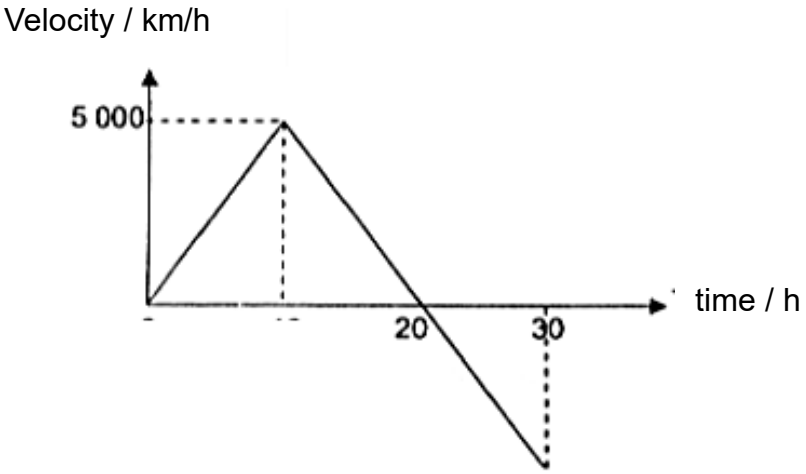
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4 An object falls without air resistance. Its position at equal time intervals is shown by a sequence of dots. Which sequence of dots is correct?



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5 A spacecraft is launched vertically. The velocity-time graph of the motion of the spacecraft is shown in the diagram.



What is the maximum height reached by the spacecraft?

A 25 000 km

B 50 000 km

C 75 000 km

D 100 000 km

6 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 9.8 m

C 20 m

D 40 m

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7 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?

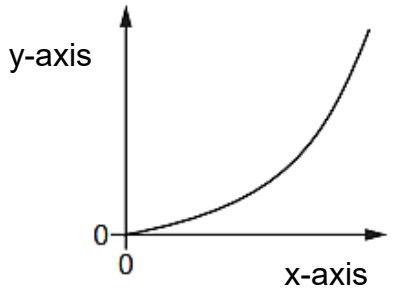
A P and Q

B P and R

C Q and S

D R and S

8 A car is at rest by a red traffic light. When the light changes to green, the car starts moving. The graph represents the motion of the car.



The car has a constant acceleration. Which quantity is plotted on the x-axis and which quantity is plotted on the y-axis?

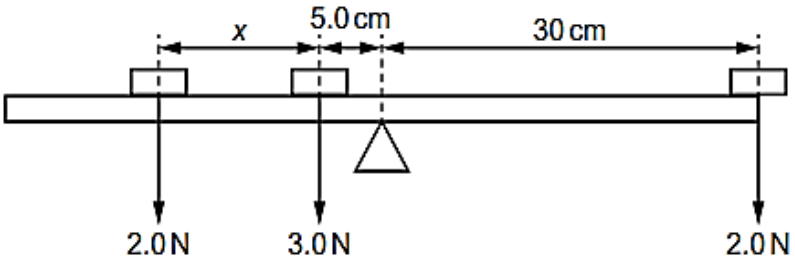
	x-axis	**y-axis**
A	distance	time
B	speed	time
C	time	distance
D	time	speed

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9 A student drops, from rest, a light ball in air. The ball experiences some air resistance as it falls. What happens to the velocity and to the acceleration of the ball during the first few seconds after release?

	velocity	**acceleration**
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

10 A uniform beam is pivoted at its centre and balanced by three weights as shown.



What is distance x?

A 17.5 cm

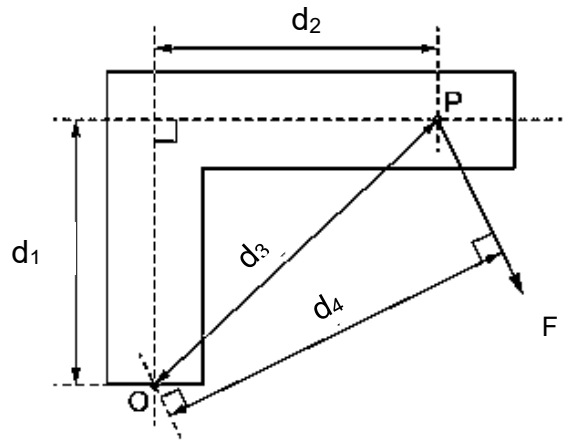
B 22.5 cm

C 35.0 cm

D 37.5 cm

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11 A force F causes a moment about point O on an L-shaped bar. The force F acts at point P.



What is the moment of F about O?

A Fd_1

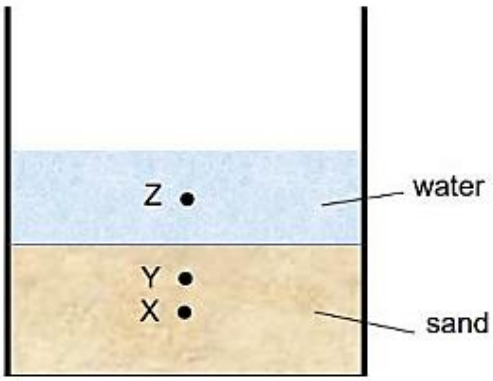
B Fd_2

C Fd_3

D Fd_4

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12 The diagram shows a pail containing approximately equal amount of water and sand.
X and Z are the centre of gravity of the sand and water respectively.

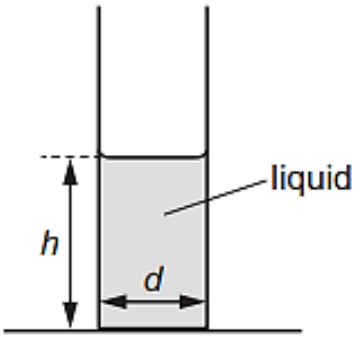


More sand is added to the pail. This affects the position of the centre of gravity of the
pail and its contents, and the stability of the pail.
Which of the following shows how the position of the centre of gravity of the pail and
its contents, and the stability of the pail will be affected?

	centre of gravity	**stability**
A	moves from X towards Y	decreases
B	moves from X towards Y	increases
C	moves from Y towards Z	decreases
D	moves from Y towards Z	increases

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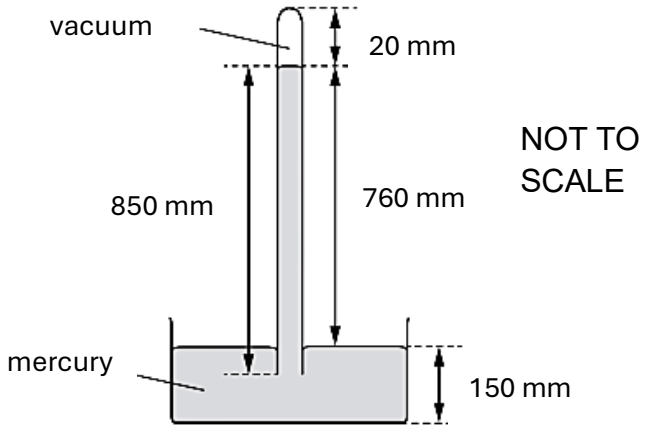
13 A liquid is held in a cylindrical container. The diameter of the base of the cylinder is d. The mass of the liquid is m and its depth is h.



Which expression gives the pressure due to the liquid on the bottom of the cylinder?

A $\frac{mg}{\pi d^2}$ **B** $\frac{mgh}{\pi d^2}$ **C** $\frac{4mg}{\pi d^2}$ **D** $\frac{4mgh}{\pi d^2}$

14 The diagram shows an instrument that is used to measure the atmospheric pressure.



The density of mercury is 1.4×10^4 kg/m^3.
What is the atmospheric pressure?

A 2.7 kPa

B 21 kPa

C 104 kPa

D 117 kPa

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15 Two cubes, X and Y, have the same mass but are made of different materials. The length of a side of X is twice that of Y.

What is the value of the ratio $\frac{\text{density of X}}{\text{density of Y}}$?

A 0.125

B 1.0

C 4.0

D 8.0

16 A rocket is launched vertically upwards by a constant force from its engines. The data for the launch is shown.

weight of rocket	1.9 MN
average air resistance	0.10 MN
force from engine	3.5 MN

How much of the work done on the rocket is used to increase its speed in the first 100 m?

A 150 MJ

B 170 MJ

C 350 MJ

D 550 MJ

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17 Energy is transferred in a filament lamp at a rate of 60W. The lamp wastes energy at a rate of 46 W. Which ratio is used to calculate the efficiency of the lamp?

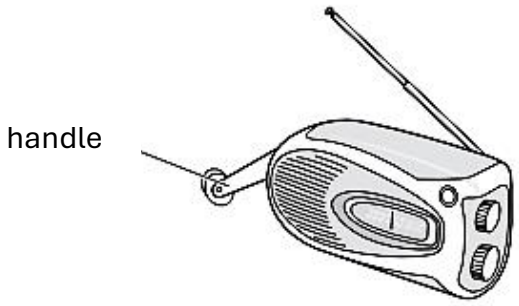
A $\frac{14}{74}$

B $\frac{14}{60}$

C $\frac{14}{46}$

D $\frac{46}{60}$

18 A wind-up radio is used in areas where mains electricity is not available.



A person winds a spring in the radio using the handle. When the spring unwinds, it makes a small coil rotate in a magnetic field. Which energy transfer is not useful for this radio?

A elastic potential energy → kinetic energy

B kinetic energy → thermal energy

C chemical energy → elastic potential energy

D kinetic energy → sound energy

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19 Which energy resource is correctly described?

	energy resource	renewable	availability
A	biofuels	yes	at all times
B	nuclear	yes	intermittent
C	solar radiation	no	at all times
D	wind	no	intermittent

20 Smoke particles in a transparent box are observed using a microscope. A small point
of light is seen to move around as shown.



What does this experiment demonstrate about air molecules?

A They move because of collisions with smoke particles.

B They can be seen through a microscope.

C They are in continuous random motion.

D They move more quickly when they are heated

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21 The table shows the melting and boiling temperatures of three elements.

element	**melting temperature/°C**	**boiling temperature/°C**
argon	-189	-185
nitrogen	-210	-196
oxygen	-218	-183

At which temperature are the three elements in different states?

A –220 °C

B –205 °C

C –190 °C

D –175 °C

22 Pot X and pot Y are both in a cool room. Pot X contains hot water below its boiling point. Pot Y is identical to pot X but contains water that is kept boiling by a hotplate underneath it.



What happens to the average kinetic energy of the particles in the liquid water in pot X and to the average kinetic energy of the particles in the liquid water in pot Y?

	kinetic energy of liquid particles in X	**kinetic energy of liquid particles in Y**
A	decreases	increases
B	decreases	does not change
C	stays the same	increases
D	stays the same	does not change

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For Questions 23 and 24, refer to the following description.

A 300 g block of lead, with a specific heat capacity of 130 J/kgK, is heated to a temperature of 50 °C. It is then dropped into a well-insulated beaker of water at 30 °C. Take the heat capacity of the water and beaker to be 300 J/K and assume that there is no heat loss to the surroundings.

23 What is the heat capacity of the block of lead?

A 39 J/K

B 130 J/K

C 1170 J/K

D 1950 J/K

24 The block of lead is dropped into the water. Its temperature decreases while the temperature of water (and the beaker) increases until they are at the same temperature.
What is the final temperature of the block of lead and the water?

A 32 °C

B 35 °C

C 40 °C

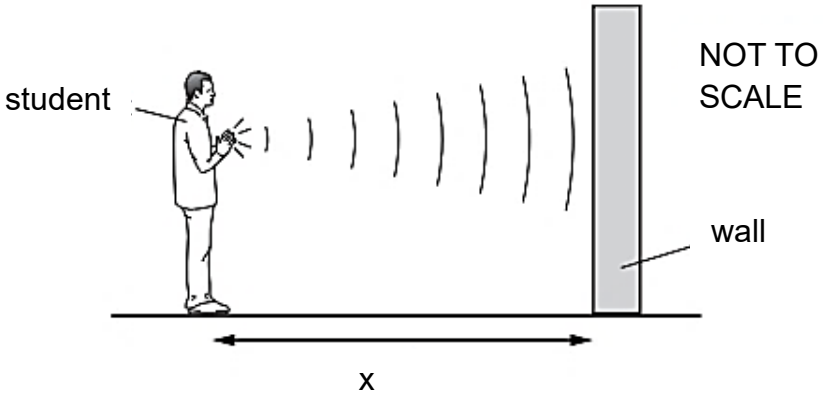
D 42 °C

25 Which components of the electromagnetic spectrum are used to communicate from a remote controller to a television set and from the Earth to a satellite?

	remote controller to TV set	**the Earth to a satellite**
A	infrared	microwave
B	infrared	ultraviolet
C	light	microwave
D	light	ultraviolet

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26 A student claps his hands in front of a wall and hears the echoes. He claps at the same moment as he hears the echo of the previous clap. Another student starts a stop-watch on the first clap and stops it on the eleventh clap. The reading on the stop-watch is 9.4 s and the speed of sound is 320 m/s.



What is the distance x between the student and the wall?

A 140 m

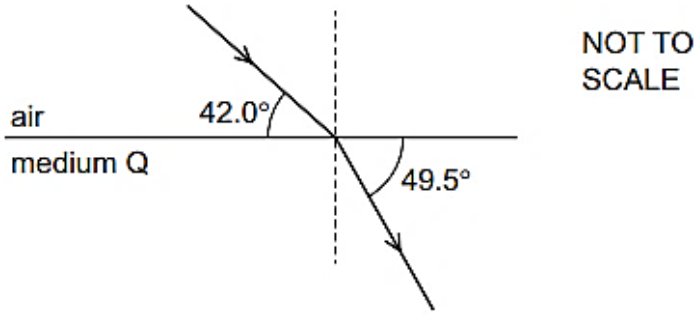
B 150 m

C 270 m

D 300 m

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27 The diagram shows a ray of light travelling from air to medium Q.



What is the critical angle for the boundary between medium Q and air?

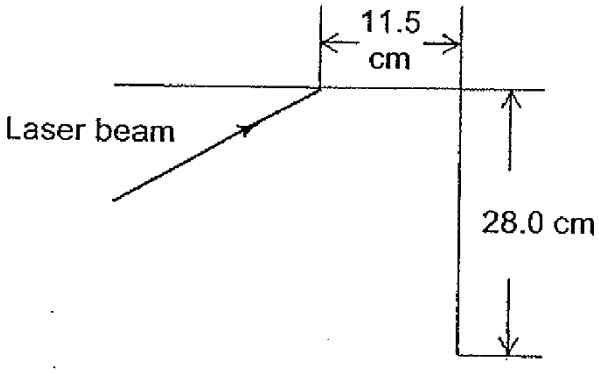
A 57.5°

B 58.0°

C 60.9°

D 61.6°

28 Two plane mirrors intersect at right angles. A laser beam strikes the first of them at a point 11.5 cm from their point of intersection as shown in the diagram below.



For what angle of incidence at the first mirror will this ray strike the midpoint of the second mirror (which is 28.0 cm long) after reflecting from the first mirror?

A 34.8°

B 39.4°

C 50.6°

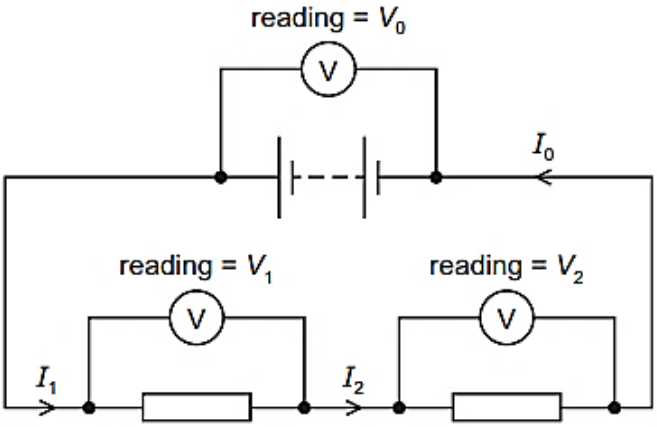
D 55.2°

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29 Plastic and wool are insulating materials. Samples of plastic and wool are rubbed together. This causes a transfer of electrons. Which row shows the direction of electron transfer and the final charge on both materials?

	plastic	**wool**	**final charge on plastic**	**final charge on wool**
A	gains electrons	loses electrons	neutral	positive
B	gains electrons	loses electrons	negative	positive
C	loses electrons	gains electrons	negative	positive
D	loses electrons	gains electrons	positive	neutral

30 Two resistors are connected in series with a battery, as shown. The readings on three voltmeters V0, V1 and V2 and the currents I0, I1 and I2 are also shown.



Which row gives values for the current I_0 and the potential difference V_0?

	I_0 **is equal to**	V_0 **is equal to**
A	I_1	V_2
B	I_2	the sum of V_1 and V_2
C	the sum of I_1 and I_2	V_1
D	the sum of I_1 and I_2	the sum of V_1 and V_2

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31 X is a piece of wire with length L, area a and resistance R. Wire Y is made from the same material and is connected to wire X to produce a component with a total resistance of R/2.
What are the dimensions of Y and how is it connected to X?

	length	**area**	**connection**
A	2L	0.25a	in parallel
B	2L	0.25a	in series
C	4L	4a	in parallel
D	4L	4a	in series

32 Two identical resistors are connected first in series and then in parallel. The two resistors in series are connected to a power supply and the current is I_s. The parallel combination is connected to the same power supply and the current supplied is I_p.
What is the ratio Is/Ip?

A 0.25

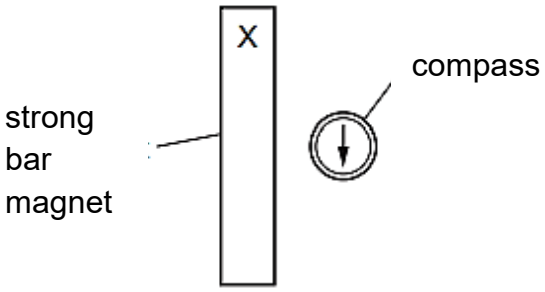
B 0.50

C 2.0

D 4.0

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33 A compass is placed close to a strong bar magnet and pivots to the position shown.



Which type of magnet is a compass needle and what is pole X?

A The needle is an induced magnet, and X is a north magnetic pole.

B The needle is an induced magnet, and X is a south magnetic pole.

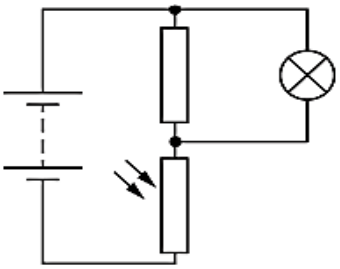
C The needle is a permanent magnet, and X is a north magnetic pole.

D The needle is a permanent magnet, and X is a south magnetic pole.

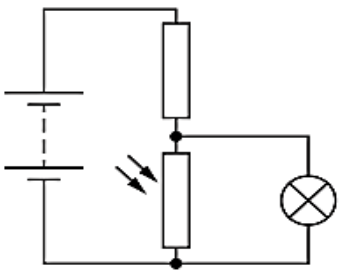
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34 A light-dependent resistor (LDR) is to be used as an input sensor for an intruder alarm circuit. When there is no light on the LDR, the lamp switches on.
The resistance of the fixed resistor is less than that of the lamp.
Which diagram shows the circuit?

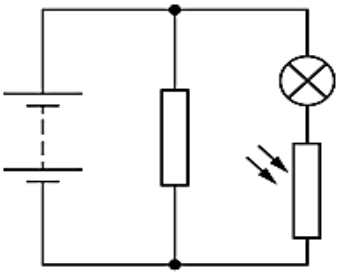
A



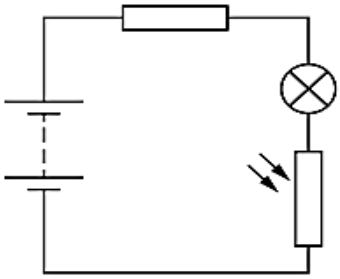
B



C

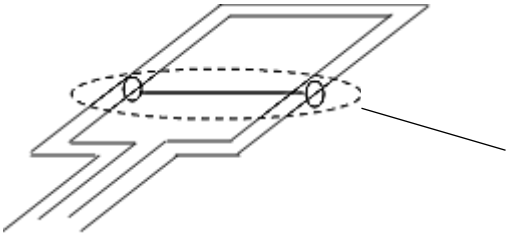


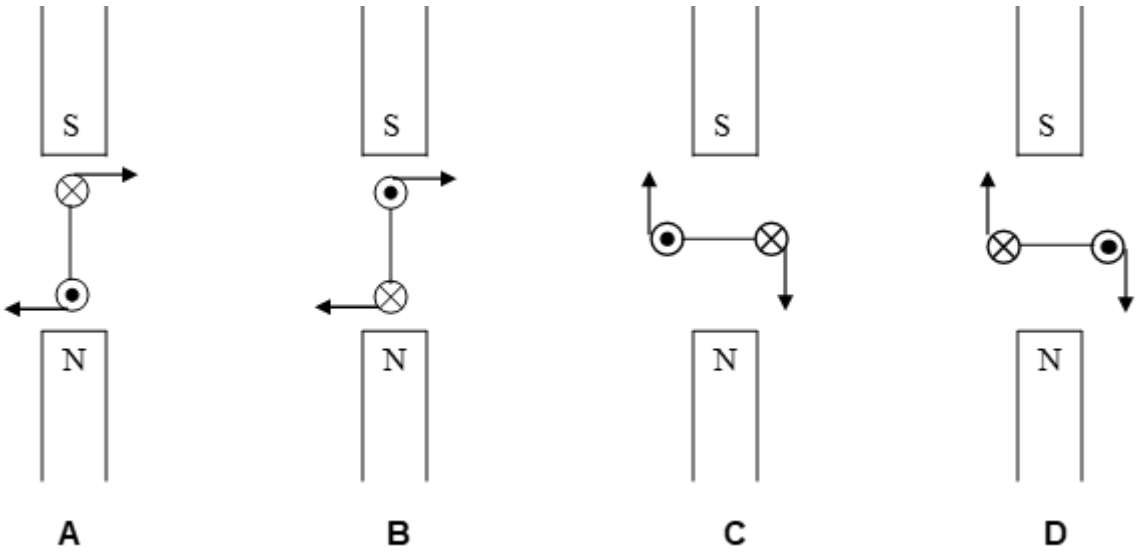
D



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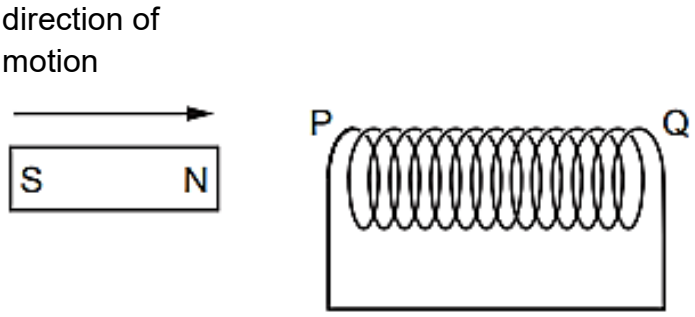
35 A rectangular coil is placed between two magnets and made to rotate by mechanical means. Which diagram indicates the direction of induced current correctly and shows the coil in a position in which the induced current will be maximum?





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36 A magnet moves through a coil of wire as shown.

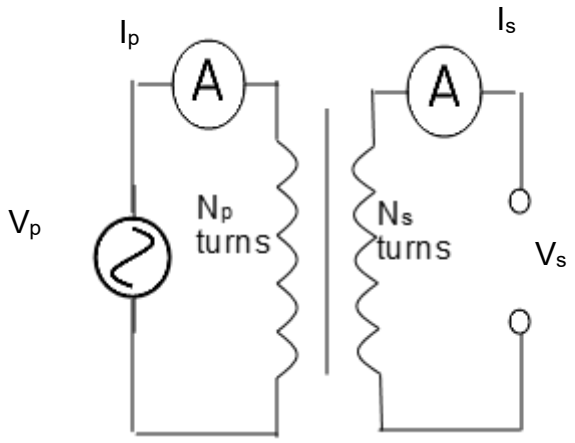


Magnetic poles are produced at the two ends of the coil as the magnet enters and as the magnet leaves the coil.
Which pole is induced at P when the magnet enters the coil and which pole is induced at Q when the magnet leaves the coil?

	pole at P when magnet enters the coil	**pole at Q when magnet leaves the coil**
A	N	N
B	N	S
C	S	N
D	S	S

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37 In a laboratory experiment to test a transformer, a student used the circuit in the diagram to take measurements.



Two of the original entries in the student's results table are missing as shown:

V_p/ V	**I_p/mA**	**N_p/turns**	**V_s/ V**	**I_s/mA**	**N_s/turns**
240	2.0	?	?	50	50

Assuming the transformer is ideal, what are the missing results?

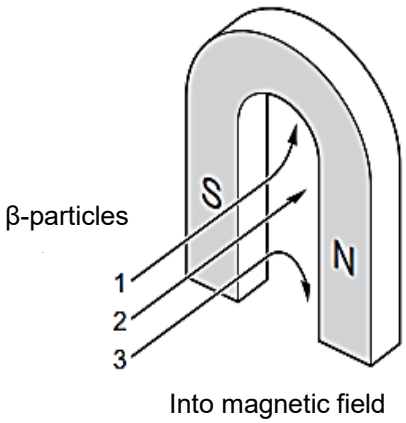
	N_p/ turns	**V_s/V**
A	2	6000
B	50	9.6
C	480	1.0
D	1250	9.6

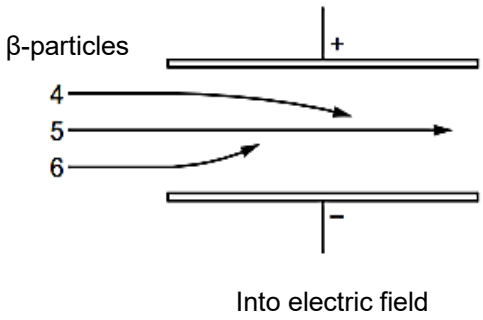
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38 A radioactive isotope is injected into a patient as part of a medical test. The radiation emitted is detected outside the body. What are suitable properties for this isotope?

	radiation type	**half-life**
A	alpha particles	a few hours
B	beta particles	a few years
C	gamma rays	a few hours
D	gamma rays	a few years

39 A beam of beta (β) particles passes into a magnetic field and into an electric field.





Which numbers show the paths of the beam through the fields?

A 1 and 4

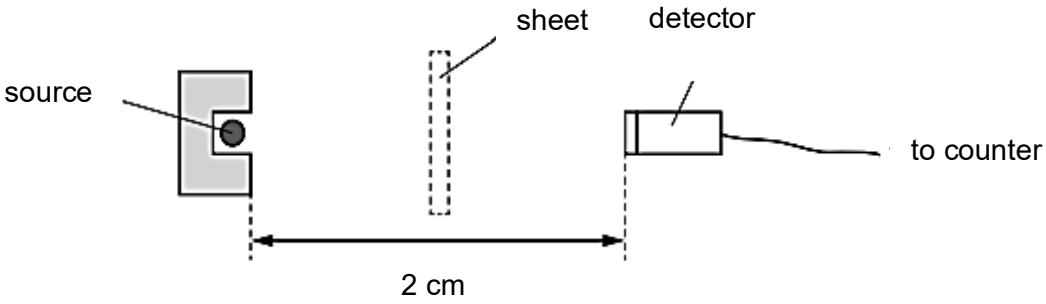
B 1 and 6

C 2 and 5

D 3 and 6

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40 During a radioactivity experiment, the background reading is 28 counts per minute. A radioactive source is placed 2 cm in front of a detector which is connected to a counter.



Counter readings are taken with and without sheets of different materials placed between the source and the detector.

type of sheet	**reading/counts per minute**
No sheet	750
thin card	750
5 mm thick aluminium	478

Which types of radiation are being emitted by the source?

A alpha particles, beta particles and gamma rays

B alpha particles and beta particles only

C alpha particles and gamma rays only

D beta particles and gamma rays only

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