



南洋女子中學校
NANYANG GIRLS' HIGH SCHOOL
Preliminary Examination 2024
Secondary Four 'O' Level

CANDIDATE
NAME

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CENTRE
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INDEX
NUMBER

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PHYSICS

6091/01

Paper 1 Multiple Choice

26 Aug 2024, Monday

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and index number on the Answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in 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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

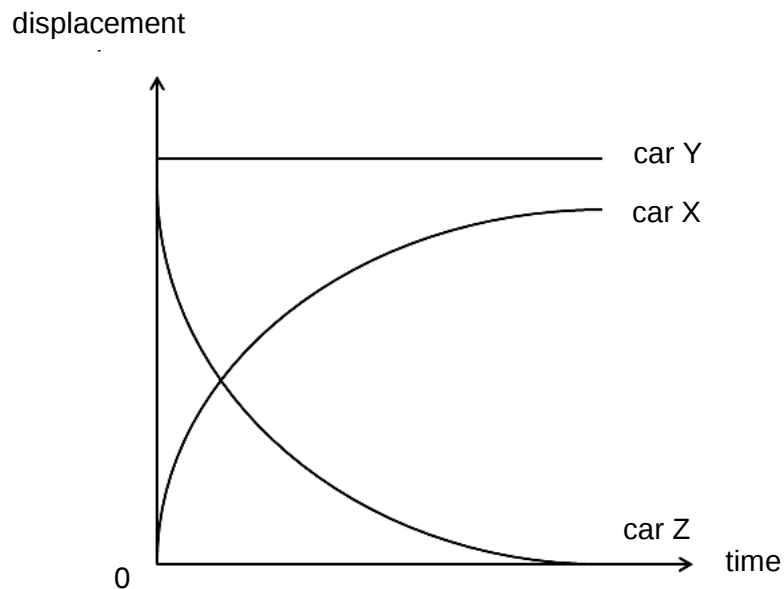
Setter:

This document consists of **18** printed pages and **2** blank pages. **[Turn over**

- 1 Which instruments are most suitable for the accurate measurement of the thickness of a 5-cent coin and the internal diameter of a test-tube?

	thickness of a 5-cent coin	internal diameter of a test-tube
A	micrometer	micrometer
B	micrometer	digital calipers
C	digital calipers	metre rule
D	digital calipers	measuring tape

- 2 The graph shows how displacement varies with time for three cars X, Y and Z.



Which statement about the 3 cars is true?

	car X	car Y	car Z
A	decreasing velocity	constant velocity	moving in the same direction as car X
B	decreasing velocity	not moving	moving in the opposite direction as car X
C	increasing velocity	constant velocity	moving in the opposite direction as car X
D	increasing velocity	not moving	moving in the same direction as car X

- 3** A parachutist falling with increasing speed opens her parachute. The parachutist slows down immediately after the parachute is opened.

What is the direction of the acceleration of the parachutist before the parachute opens and immediately after the parachute opens?

	before parachute opens	immediately after her parachute opens
A	downwards	downwards
B	downwards	upwards
C	upwards	downwards
D	upwards	upwards

- 4** The total weight of a gas-filled balloon is 2000 N. The balloon rises at an acceleration of 80 m/s^2 . Ignore air resistance.

What is the total upward force acting on the balloon?

- A** 2000 N **B** 16 000 N **C** 18 000 N **D** 162 000 N

- 5** A person of weight 600 N at the bottom of a mountain climbs to the top. The gravitational field strength changes from 9.81 N/kg at the bottom to 9.79 N/kg at the top. This mass is unchanged as he climbs.

What are his mass and his weight at the top of the mountain?

	mass at the top of the mountain / kg	weight at the top of the mountain / N
A	61.2	599
B	61.2	600
C	61.3	599
D	61.3	600

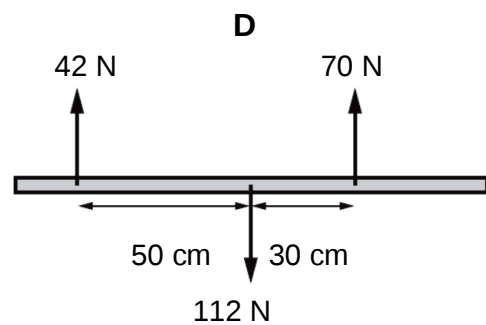
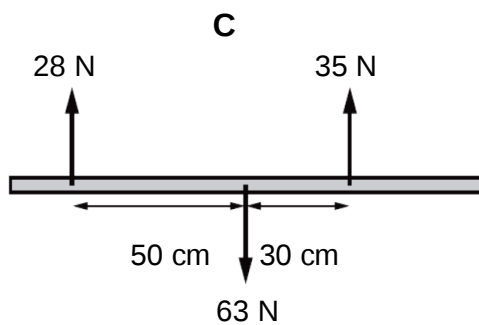
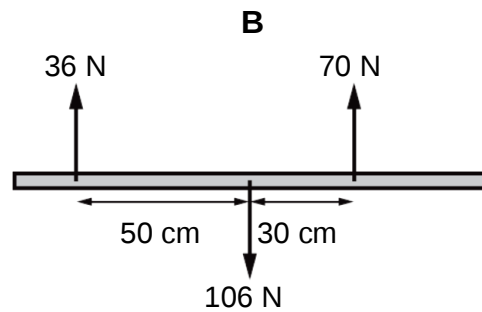
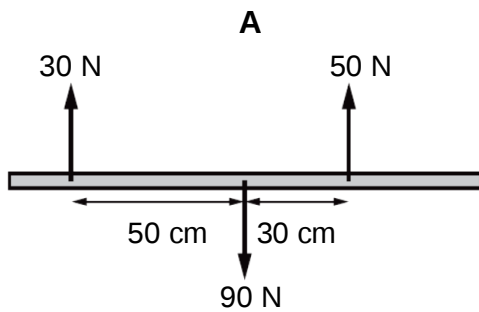
- 6 Four objects of different dimensions are made with different materials. The densities of the materials are uniform.

Which object is the most stable?

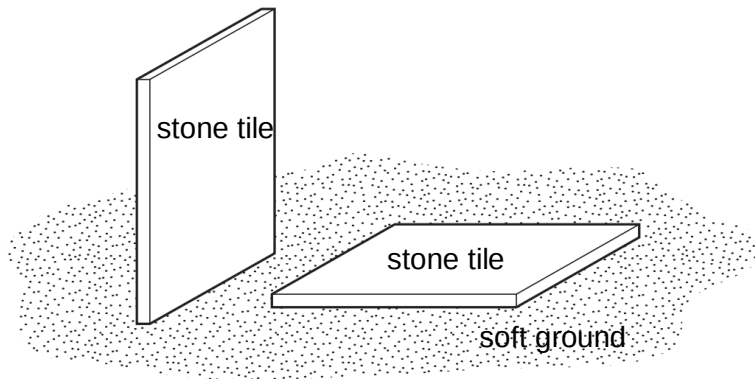
	position of center of gravity	area of base	density of material
A	high	small	high
B	high	large	low
C	low	small	low
D	low	large	high

- 7 Four identical beams have three forces acting on each of them. The beams are in equilibrium.

Which beam has both zero resultant force and zero resultant moment?



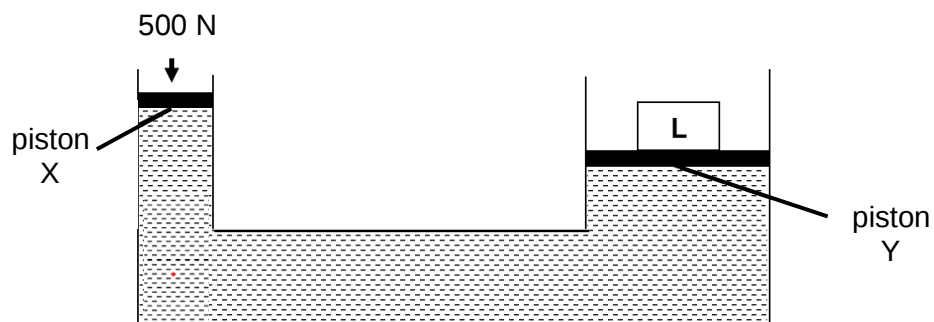
- 8 A builder leaves two identical, heavy, stone tiles resting on soft ground. One is vertical and the other is horizontal.



Which row correctly compares the forces and the pressures that the tiles exert on the ground?

	forces	pressures
A	different	different
B	different	same
C	same	different
D	same	same

- 9 The diagram below shows a hydraulic system. Piston X has a cross-sectional area of 10 cm^2 and Piston Y has a cross-sectional area of 5000 cm^2 .

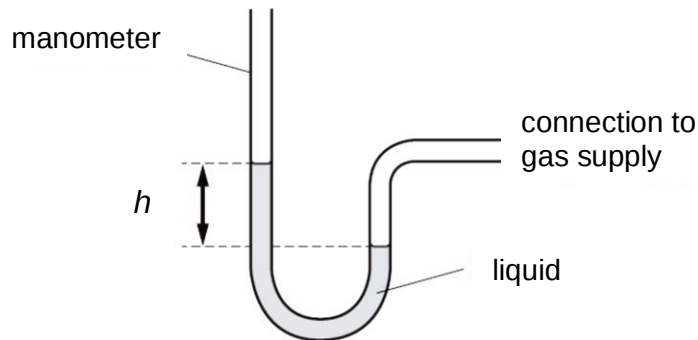


A force of 500 N is applied on piston X.

What is the maximum load L on piston Y that can be raised?

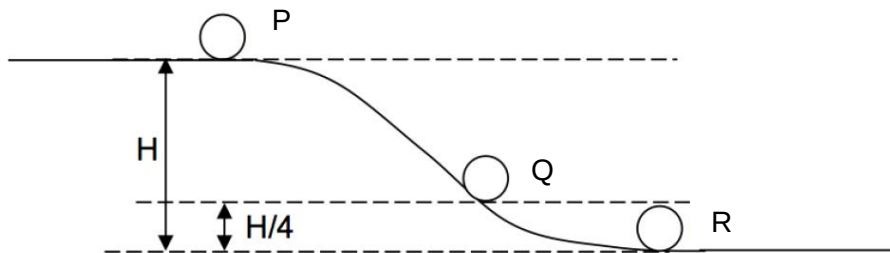
- A** 1.00 N **B** 100 N **C** 20 000 N **D** 250 000 N

- 10 A manometer is connected to a gas supply.



Which change in the manometer will give a greater change in height h for the same change in gas pressure?

- A using a less dense liquid
 - B using a denser liquid
 - C using a narrower tube
 - D using a wider tube
- 11 A ball, initially at rest at P, rolls down a smooth slope as shown in the figure below. Air resistance can be ignored. Assume that the gravitational potential energy of the object is zero at R.

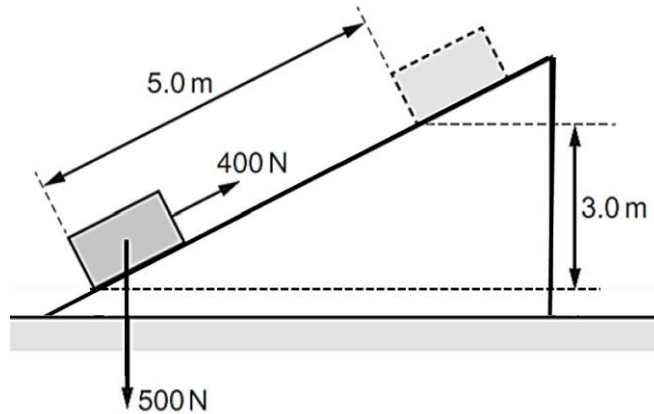


What is the ratio $\frac{\text{gravitational potential energy}}{\text{kinetic energy}}$ of the ball when it is at Q?

- A 0.25
- B 0.33
- C 2.0
- D 3.0

- 12** Work is done when a force of 400 N pulls a crate of weight 500 N at a constant speed along a ramp, as shown.

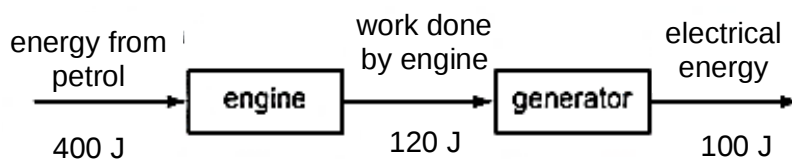
Part of the work done increases the gravitational potential energy E of the crate and the rest is work done W against friction.



What are the values of E and W ?

	E / J	W / J
A	1500	500
B	1500	2000
C	2000	2500
D	3500	500

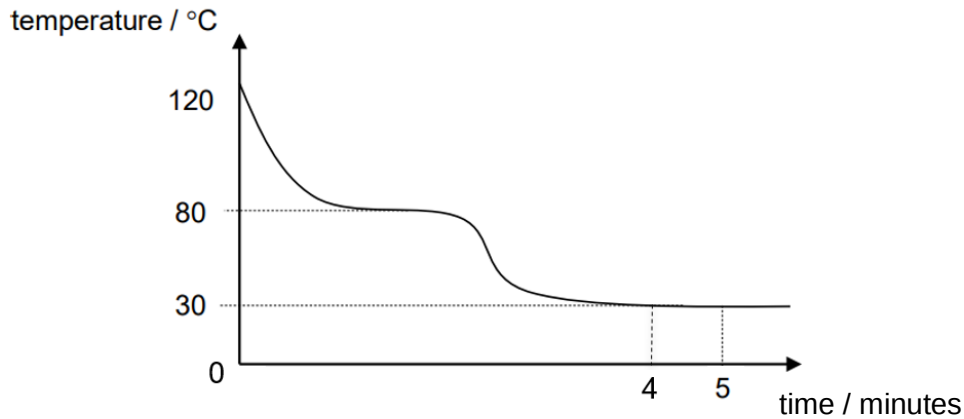
- 13** Energy from petrol is used to operate an engine. The engine drives a generator, which produces electrical energy.



What is the overall efficiency of the process in producing electrical energy from petrol?

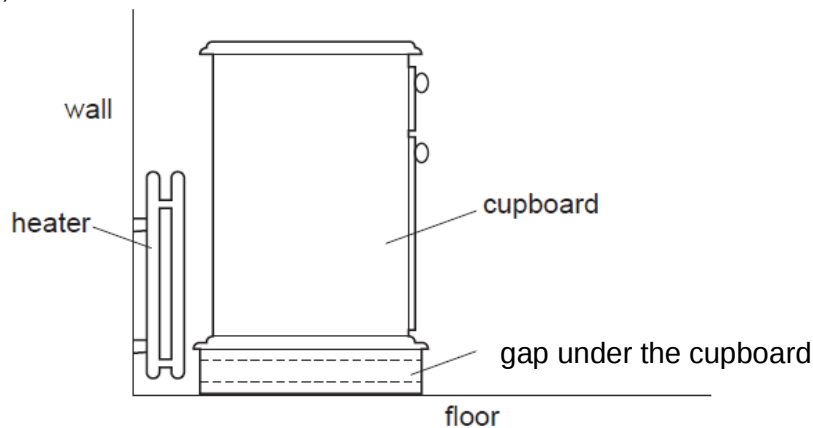
- A** 25 % **B** 30 % **C** 55 % **D** 83 %

- 14** A substance initially in liquid state at 120 °C is allowed to cool in a room.



Which statement describes the energy of the substance from 4 to 5 minutes?

- A** Energy is released by the substance to the environment as the substance is freezing.
- B** Energy is released by the substance to the environment as the average kinetic energy of the particles of the substance is decreasing.
- C** There is no change in average kinetic energy of the particles of the substance as the substance is freezing.
- D** There is no net thermal energy transferred between the substance and the surroundings.
- 15** A cupboard is placed directly in front of a heater as shown. Air can move through a gap under the cupboard,



Which option describes the direction and the relative temperature of the air that moves through the gap?

	air direction	relative air temperature
A	away from the heater	cool
B	towards the heater	cool
C	away from the heater	warm
D	towards the heater	warm

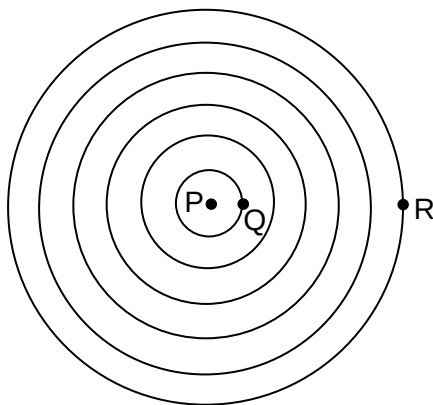
- 16** Two different liquids, P and Q with the same mass and at $30\text{ }^{\circ}\text{C}$ are heated by the same heat source. Liquid P reaches a temperature of $80\text{ }^{\circ}\text{C}$ faster than liquid Q.

Which statement explains why?

- A** Liquid P has a higher specific heat capacity than liquid Q.
 - B** Liquid P has a higher specific latent heat of vapourisation than liquid Q.
 - C** Liquid P has a lower specific heat capacity than liquid Q.
 - D** Liquid P has a lower specific latent heat of vapourisation than liquid Q.
- 17** An electric heater rated 45 W is used to melt wax. The solid wax is initially at its melting point. The specific latent heat of the wax is 220 J/g .

How much wax has melted after 3 minutes?

- A** 0.20 g **B** 0.61 g **C** 13 g **D** 37 g
- 18** The diagram shows the top view of some water waves produced from point P.

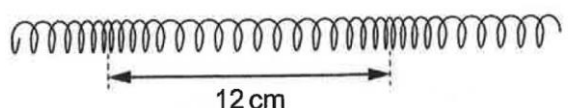


The waves have a speed of 0.50 m/s and take 2.0 s to travel from point Q to R.

What is the wavelength of the wave?

- A** 0.10 m **B** 0.20 m **C** 0.25 m **D** 1.0 m

- 19** The diagram shows part of a long stretched spring. A longitudinal wave travels along the spring. A point on the spring moves backwards and forwards between two positions that are 1.0 cm apart.



Which row describes the wave?

	amplitude / cm	wavelength / cm
A	0.50	12
B	0.50	24
C	1.0	12
D	1.0	24

- 20** Ships use ultrasound waves to find the depth of the sea. Pulses of the ultrasound waves are sent out and echoes are detected after 0.28 s. The speed of sound in water to be 1500 m /s.

What is the depth of the sea?

- A** 42 m **B** 84 m **C** 210 m **D** 420 m

- 21** The diagram shows the main sections of the electromagnetic spectrum in order of increasing frequency. One of the sections is labelled S.

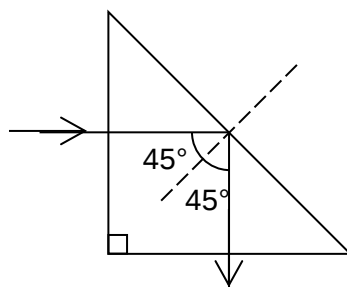
radio waves		S	visible light			gamma-rays
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—————→ increasing frequency

Which application uses the waves in the section S?

- A** sterilisation
B satellite television
C killing cancerous cells
D television remote controller

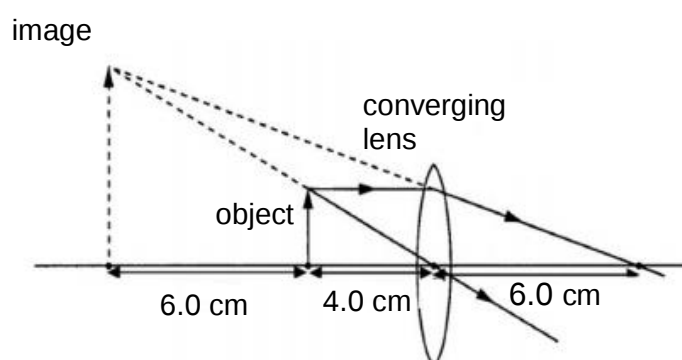
- 22 The diagram shows a right-angled prism being used to turn a ray of light through 90° .



Which row describes the refractive index and the critical angle for the light in the prism?

	refractive index	critical angle
A	$\frac{\text{speed of light in medium}}{\text{speed of light in vacuum}}$	less than 45°
B	$\frac{\text{speed of light in medium}}{\text{speed of light in vacuum}}$	equal to 45°
C	$\frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$	less than 45°
D	$\frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$	greater than 45°

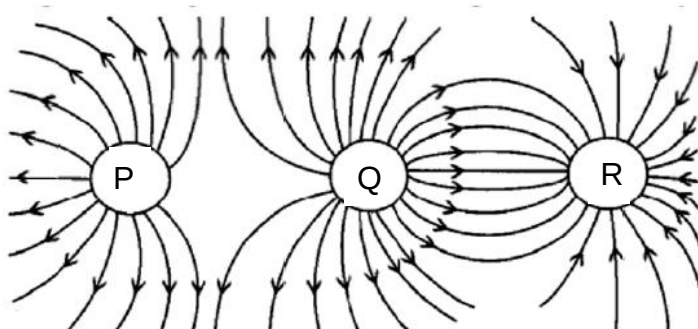
- 23 A converging lens is used as a magnifying glass when an object is 4.0 cm from the centre of the lens.



What are the characteristics of the image when the object is now placed 12 cm away from the lens?

- A real and diminished
- B real and magnified
- C real and same size
- D virtual and magnified

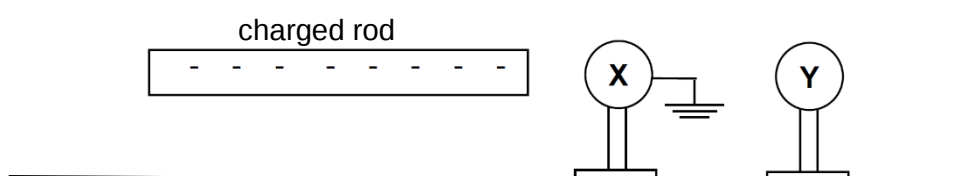
- 24 The electric field pattern between three spheres P, Q and R is shown.



Which is the correct charge on each sphere?

	P	Q	R
A	+	+	+
B	+	+	-
C	-	-	+
D	-	-	-

- 25 The figure shows two isolated conducting balls, X and Y, mounted on insulating stands. A negatively charged rod is then brought near the two conducting balls. Then X is earthed momentarily before the rod is removed.



What are the charges found on balls X and Y after the rod is removed?

	X	Y
A	negative	positive
B	negative	neutral
C	positive	negative
D	positive	neutral

- 26 The potential difference between point X and point Y in an electric circuit is 20 V.

The time taken for charge carriers to move from X to Y is 15 ms, and, in this time, the work done by the charge carriers is 1.2 J.

What is the current between X and Y?

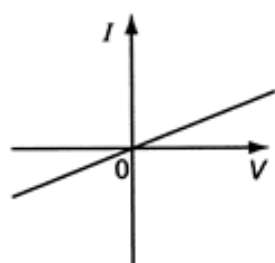
- A 4.0 A B 90 A C 110 A D 250 A

- 27 A 2.0 m long wire with a radius of 1.0 mm has a resistance of $16\ \Omega$.

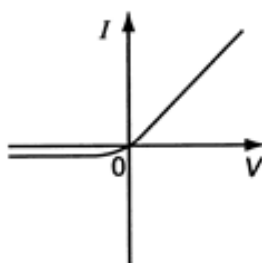
What is the resistance of a wire of the same material which is 4.0 m long and has a radius of 2.0 mm?

- A** $4.0\ \Omega$ **B** $8.0\ \Omega$ **C** $16\ \Omega$ **D** $32\ \Omega$

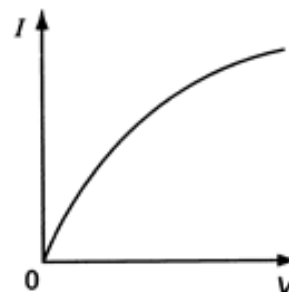
- 28 Three graphs X, Y and Z show the I-V characteristics for three different electrical components.



graph X



graph Y

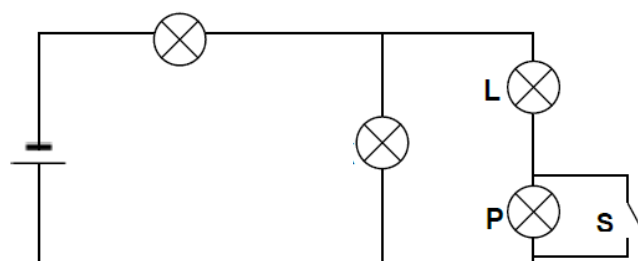


graph Z

Which electrical component does each graph represent?

	graph X	graph Y	graph Z
A	filament lamp	semiconductor diode	metallic conductor
B	metallic conductor	semiconductor diode	filament lamp
C	metallic conductor	filament lamp	semiconductor diode
D	semiconductor diode	metallic conductor	filament lamp

- 29 Four lamps and a switch are connected to a power supply.

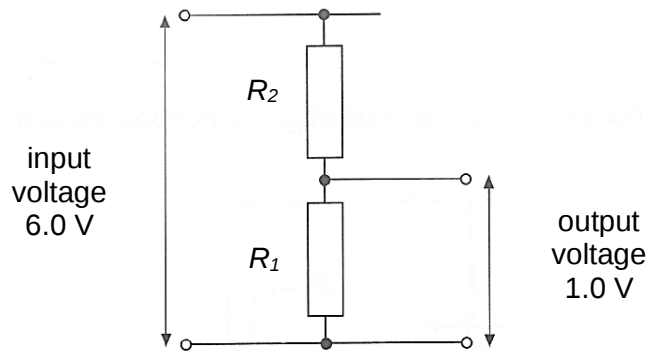


Which row describes the changes in brightness of the bulbs L and P when switch S is closed?

	L	P
A	brighter	brighter
B	dimmer	brighter
C	brighter	dimmer
D	dimmer	dimmer

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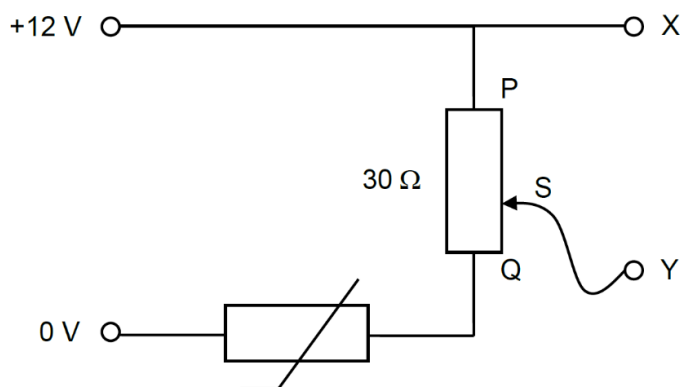
- 30 The diagram shows two resistors, of resistance R_1 and R_2 used as a potential divider. The input voltage is 6.0 V.



Which pair of values for the resistances R_1 and R_2 gives an output voltage of 1.0 V?

	R_1 / Ω	R_2 / Ω
A	1.0	5.0
B	1.0	6.0
C	5.0	1.0
D	6.0	1.0

- 31 A variable potential divider has a sliding contact S that can be moved between ends P and Q of a 1.0 m long resistance wire of 30Ω . The potential divider is connected in series to a constant 12 V power supply and a NTC thermistor. The resistance of the thermistor can vary from 10Ω to 90Ω .



The thermistor is placed at a high temperature environment.

Which is a possible description of the p.d. between X and Y when S moves from P to Q.?

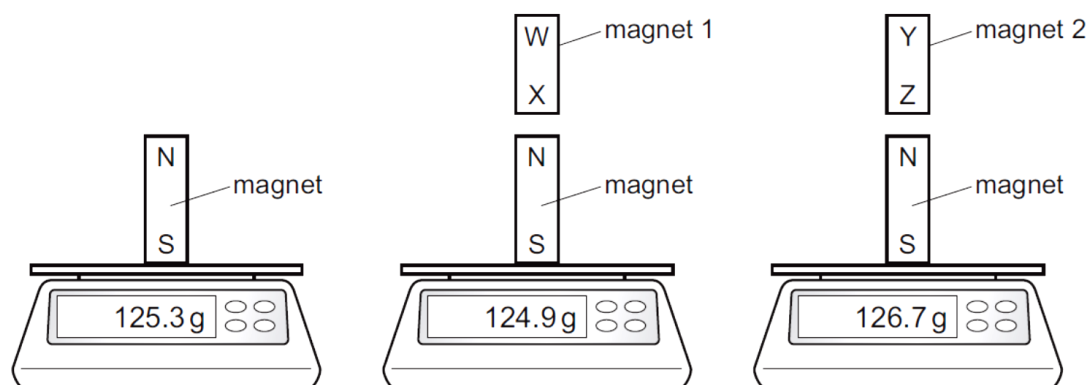
- A** It decreases from 12.0 V to 9.0 V.
- B** It decreases from 12.0 V to 3.0 V.
- C** It increases from 0.0 V to 3.0 V.
- D** It increases from 0.0 V to 9.0 V.

32 What is the purpose of a fuse and where is it wired?

	purpose	wired
A	to protect a user from electric shock	along the live wire
B	to protect a user from electric shock	along the earth wire
C	to protect the appliance from high current	along the live wire
D	to protect the appliance from high current	along the earth wire

33 A student conducts an experiment to determine the polarity of magnets 1 and 2.

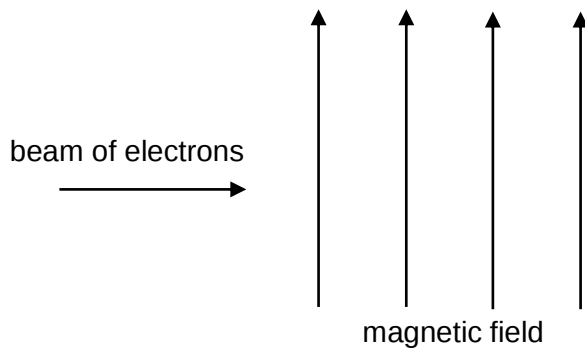
A magnet with known poles is placed on an electronic balance. Magnets 1 and 2 are placed above this magnet in turns. The readings of the balance are shown.



What are the poles at X and Z?

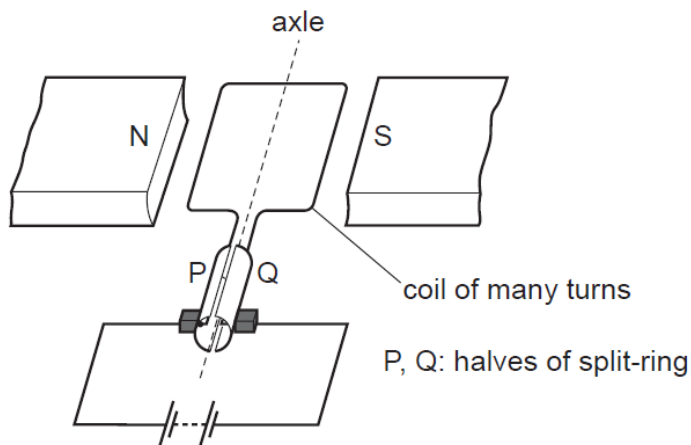
	X	Z
A	North pole	North pole
B	North pole	South pole
C	South pole	North pole
D	South pole	South pole

- 34 A beam of electrons is projected toward a magnetic field as shown.



In which direction will the beam of electrons deflect as it travels through the magnetic field?

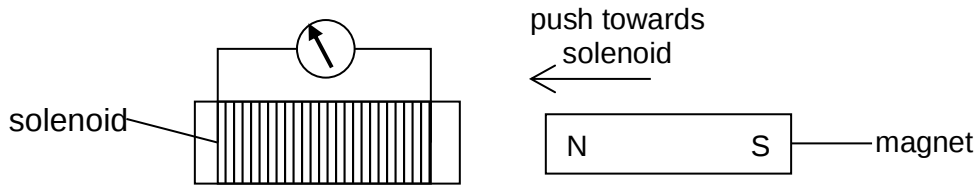
- A into the page
 - B out of the page
 - C towards the top of the page
 - D towards the bottom of the page
- 35 A D.C. motor consists of a coil of many turns rotating in a fixed magnetic field. A power source supplies current to the coil.



Which change will make the coil rotate in opposite direction?

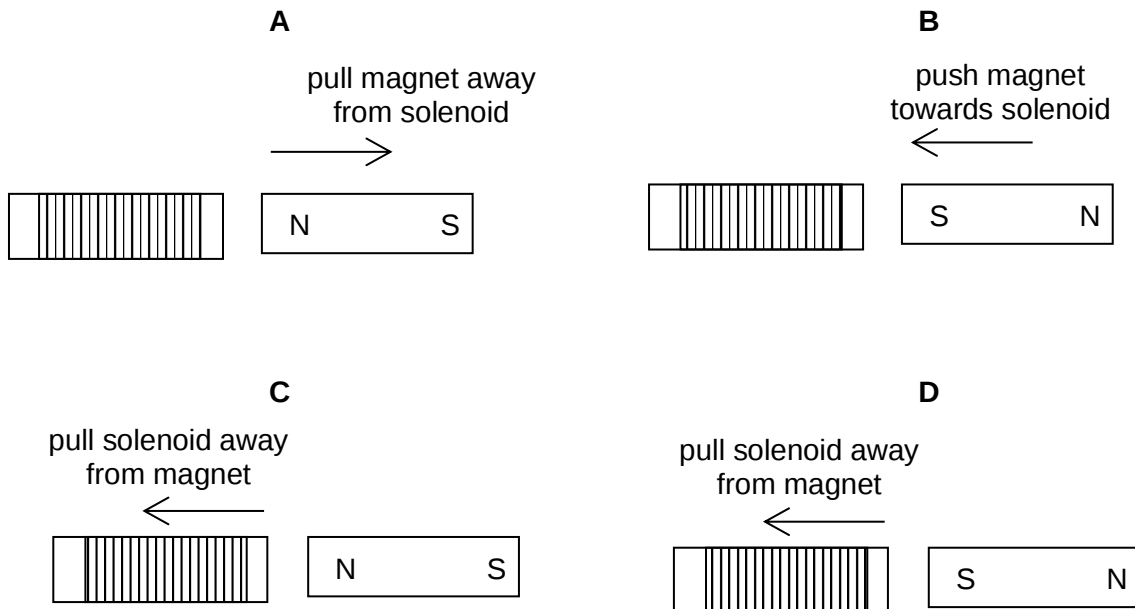
- A The poles of the magnet are reversed.
- B The turns on the coil are increased in number.
- C A rheostat is added to the circuit.
- D The coil is turned before switching on, so that P starts on the right and Q on the left

- 36** The North-pole of a bar magnet is pushed towards a solenoid.

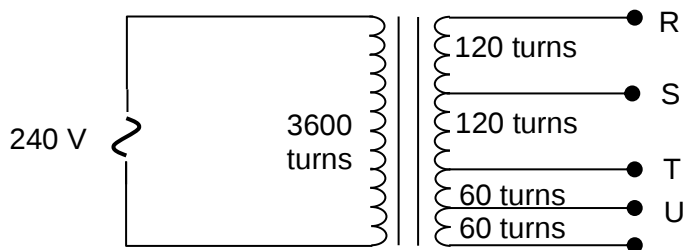


The galvanometer needle deflects momentarily to the left as shown.

Which action will cause the galvanometer needle to deflect in the same direction?



- 37** A transformer consists of a primary coil of 3600 turns. The secondary coil of 360 turns can be tapped across different terminals R, S, T and U.



Which pair of terminals would you connect a 12 V, 24 W lamp for it to be lit normally?

- A** RS **B** RT **C** RU **D** SU

- 38** Alpha-particles and beta-particles are emitted during radioactive decay.
Which particle has the stronger ionising effect and stronger penetrating power?

	stronger ionising effect	stronger penetrating power
A	alpha-particles	alpha-particles
B	alpha-particles	beta-particles
C	beta-particles	alpha-particles
D	beta-particles	beta-particles

- 39** A factory produces aluminium sheets. A radioactive isotope and a detector are used to continuously check the thickness of the aluminium sheets.

What is the most suitable source to use?

- A** an alpha source with a half-life of a few years
 - B** an beta source with a half-life of a few years
 - C** an alpha source with a half-life of a few minutes
 - D** an beta source with a half-life of a few minutes
- 40** Which statement about the production of electricity in a nuclear power station is correct?
- A** The main nuclear reaction occurs when protons hit uranium nuclei.
 - B** Nuclear energy is released through nuclear fusion.
 - C** The nuclear energy released is used to boil water to produce steam.
 - D** Carbon dioxide is the major waste product from the nuclear reaction.

1	2	3	4	5	6	7	8	9	10
B	B	B	C	A	D	D	C	D	A

11	12	13	14	15	16	17	18	19	20
B	A	A	D	B	C	D	B	A	C

21	22	23	24	25	26	27	28	29	30
D	C	C	B	D	A	B	B	C	A

31	32	33	34	35	36	37	38	39	40
D	C	C	A	A	D	D	B	B	C