Name: _____ (   )   Class: _____

YEAR FOUR INTEGRATED PROGRAMME
END-OF-YEAR EXAMINATION

PHYSICS

Paper 1 Multiple Choice   **30 September 2020**

                                                    1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the Answer Sheet in the spaces provided.

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 separate Answer Sheet.

Read 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 on this booklet.

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

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CHIJ ST NICHOLAS GIRLS' SCHOOL
Girls of Grace ● Women of Strength ● Leaders with Heart

This document consists of **18** printed pages.

1 Which quantity is **not** a base quantity?

   A charge

   B length

   C mass

   D temperature

2 A student used a vernier caliper to measure the length of a cube. The diagram on the left shows the reading when the jaws of the vernier caliper are closed without the cube in between. The diagram on the right shows the reading when the jaws are gripping the cube.
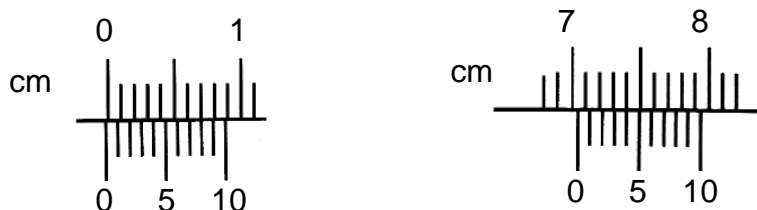

What is the actual length of the cube?

   A 7.02 cm   **B** 7.06 cm   **C** 7.38 cm   **D** 7.42 cm

3 A train travels along a track from Aytown to Beetown. The map shows the route.
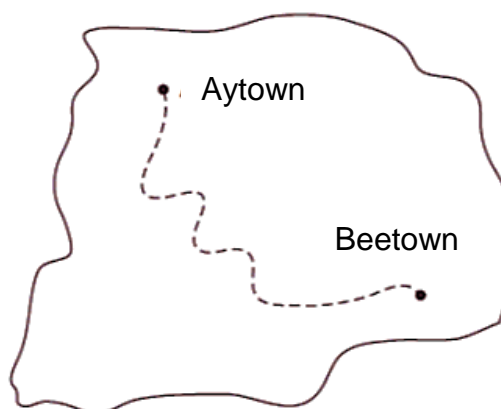


The train moves at an average speed of 80 km/h. The distance travelled by the train between the towns is 240 km. How long does the journey take?

   A exactly 0.33 hour

   B exactly 3.0 hours

   C less than 0.33 hour, because the journey is not in a straight line

   D more than 3.0 hours, because the journey is not in a straight line

**4**   The diagram shows a velocity-time graph for a moving object.

velocity
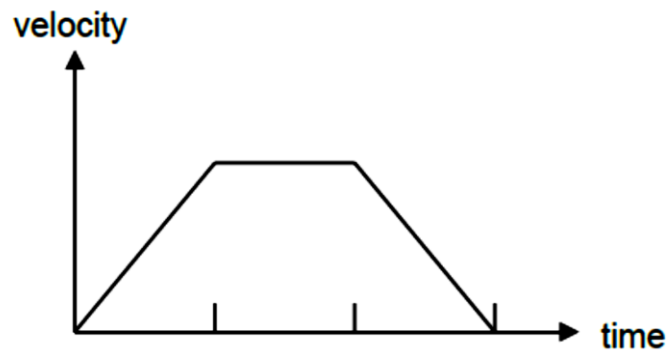
time

Which graph is the corresponding displacement-time graph for the moving object?

A

displacement

time

B

displacement

time

C

displacement

time

D

displacement

time
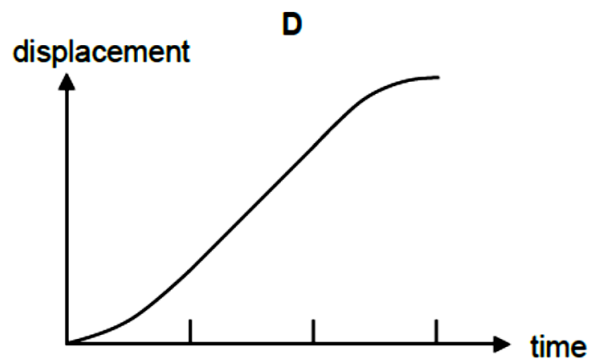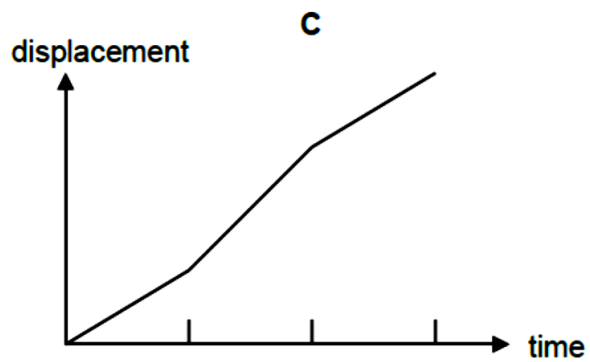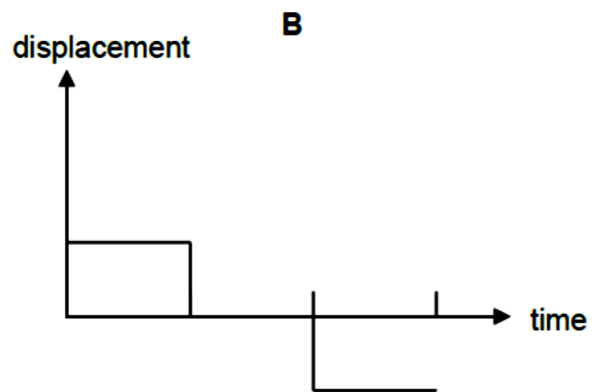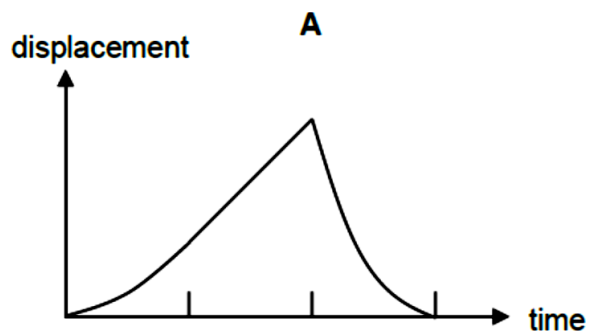
5 The diagram shows an aeroplane turning in a horizontal circle at constant speed. In which direction is the aeroplane accelerating?
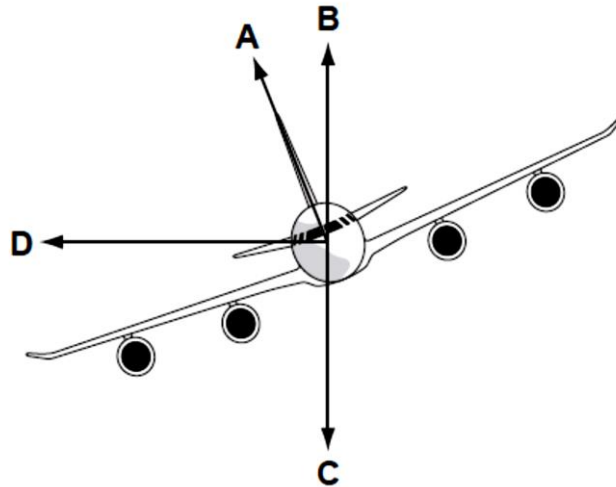

6 A stone is falling through the air. The acceleration of free fall is 10 m/s². Ignoring air resistance, what happens to the stone each second during its fall?

A The acceleration of the stone increases by 10 m/s².

B The speed of the stone increases by 10 m/s.

C The stone travels a distance of 10 m.

D The stone travels at a speed of 10 m/s.

7 Two blocks are connected by a light string S. Under the action of a constant force *F*, they move with a uniform acceleration of 2.5 m/s².
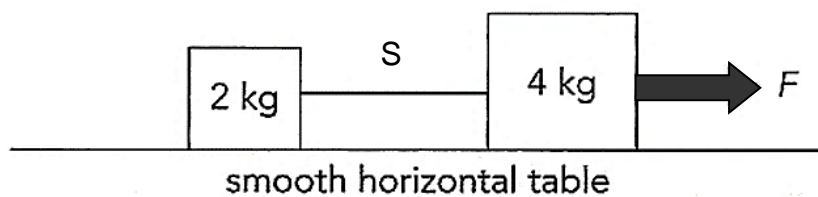
What is the acceleration of the 4 kg mass if string S suddenly breaks?

A 3.75 m/s²   **B** 5.00 m/s²   **C** 7.25 m/s²   **D** 10.0 m/s²

8 Which statement concerning the mass of a body is **not** correct?

    A The body experiences a force in a gravitational field because of its mass.

    B The mass is a measure of the amount of matter in the body.

    C The mass changes when the strength of a gravitational field changes.

    D The mass resists a change in the state of rest or motion of the body.

9 A student tries to find the density of sand by filling half a container with sand and the other half with water (assuming the sand and water do not mix). The diagrams show the set-up and data she collects in her experiment.

80 g

empty container

200 g

300 g

container filled with water

container with sand and water
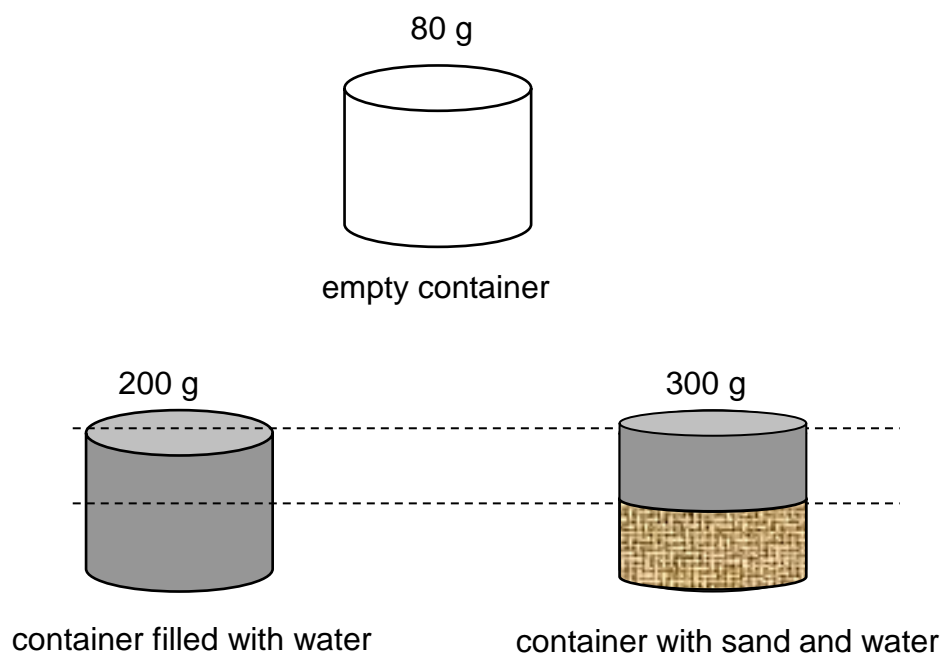
Taking the density of water as 1.0 g/cm^3, calculate the density of the sand.

    A 1.6 g/cm^3 **B** 1.9 g/cm^3 **C** 2.0 g/cm^3 **D** 2.7 g/cm^3

10   A lamina is freely suspended from point P. The weight of the lamina is 2.0 N and the centre of gravity is at C.


PC = 25 cm

PQ = 20 cm

QC = 15 cm
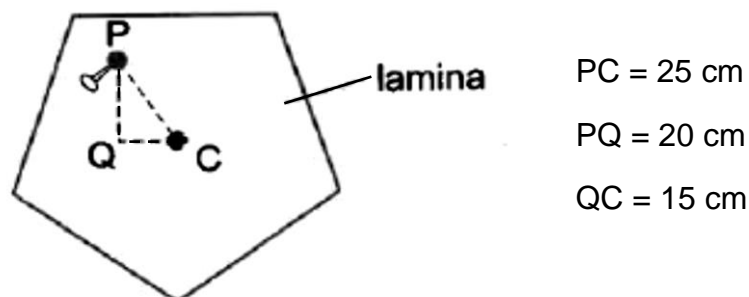
The lamina is displaced to the position shown. What is the moment about P due to the weight of the lamina?

A   0.30 Nm clockwise

B   0.40 Nm anticlockwise

C   0.50 Nm clockwise

D   1.0 Nm anticlockwise

11   A car designed to be stable. Which description of the position of centre of gravity and base area allows it to achieve good stability?

|	centre of gravity	base area
A	as high in the car as possible	large
B	as high in the car as possible	small
C	as low in the car as possible	large
D	as low in the car as possible	small

12 Two vessels are joined together with a tube and filled with water. Both vessels are open at the top.
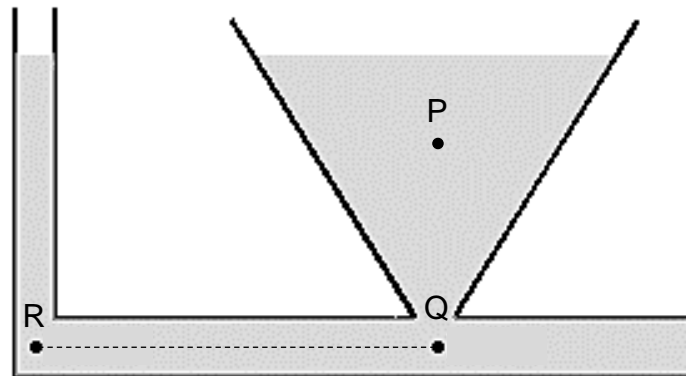
How does the water pressure at point R compare to the water pressures at points P and Q?

	pressure at R	pressure at R
A	greater than at P	lower than at Q
B	greater than at P	same as at Q
C	same as at P	lower than at Q
D	same as at P	same as at Q

13 A forked tube contains air in one branch and a vacuum in the other.
What is the pressure of the enclosed air? The lengths are measured in cm.
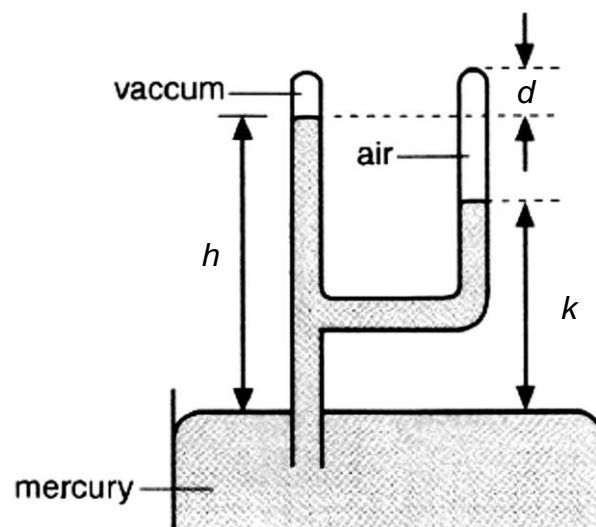
**A** d cmHg **B** $(h - d)$ cmHg **C** $(h - k)$ cmHg **D** k cmHg

14 The diagram shows a hydraulic press that is used to lift a car.
A force F_1 is exerted on the small piston with a cross-sectional area of 0.50 m². If the large piston has a cross-sectional area of 15 m², what is the ratio of the distance moved by the small piston, d_1 and the distance moved by the large piston, d_2?
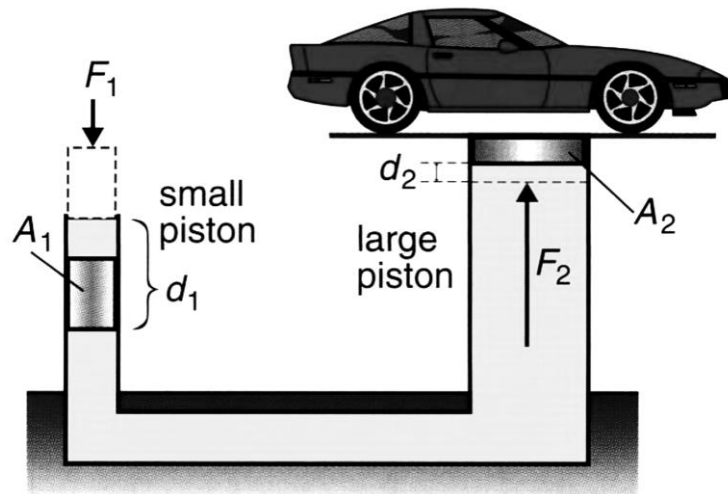

A 1:15 **B** 1:30 **C** 20:1 **D** 30:1

15 An object falls freely from rest at point X to a point Z.

What is the ratio of the kinetic energy of the object at **Y** to its kinetic energy at **Z**? Ignore the effect of air resistance.
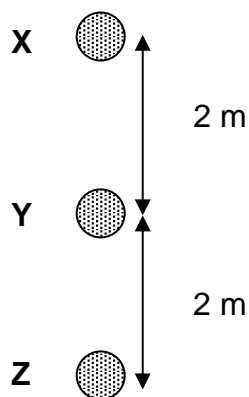
A 1:1 **B** 1:2 **C** 1:4 **D** 2:3

16 A parachutist with his parachute opened is falling to the ground at terminal velocity. What is the main energy conversion taking place as he falls?

    A   kinetic energy ⟶ potential energy

    B   kinetic energy ⟶ thermal energy

    C   potential energy ⟶ kinetic energy

    D   potential energy ⟶ thermal energy

17 A box of mass 25 kg is pulled up a rough inclined plane at a constant speed by a force of 70 N. When the distance moved along the plane is 10.0 m, the increase in height is 1.2 m.
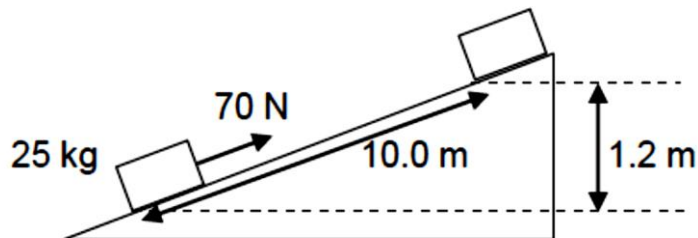
What is the work done against friction? The gravitational field strength is 10N/kg.

    A   300 J   **B**   400 J   **C**   700 J   **D**   840 J

18 A truck is travelling at a steady speed along a road. The forward force of the truck is 3000 N and the power produced is 80 kW.

How far does the truck travel in one minute?

    A   1333 m   **B**   1600 m   **C**   2250 m   **D**   4000 m

19 According to kinetic theory, matter is made up of very small particles in constant state of motion.

Which row best describes the particle behaviour in the gaseous state?

	forces between particles	arrangement of particles
A	strong	close but packing is more disorderly than in a liquid
B	strong	far apart in a disorderly arrangement
C	weak	close but packing is more disorderly than in a liquid
D	weak	far apart in a disorderly arrangement

20 A student measures the resistance of a metal wire at the ice point and at the steam point. She records her results.

temperature	resistance / Ω
ice point	20.0
steam point	40.0

What is the temperature when the resistance of the wire is 18.0 Ω?

A -10 ºC   **B** -12 ºC   **C** 10 ºC   **D** 18 ºC

21   The diagram shows four identical cans with their outside surfaces either polished silver or painted dull black. Each can contains the same volume of water, initially at 80 °C.

After 5 minutes in a cool room, which can contains water with the least internal energy?
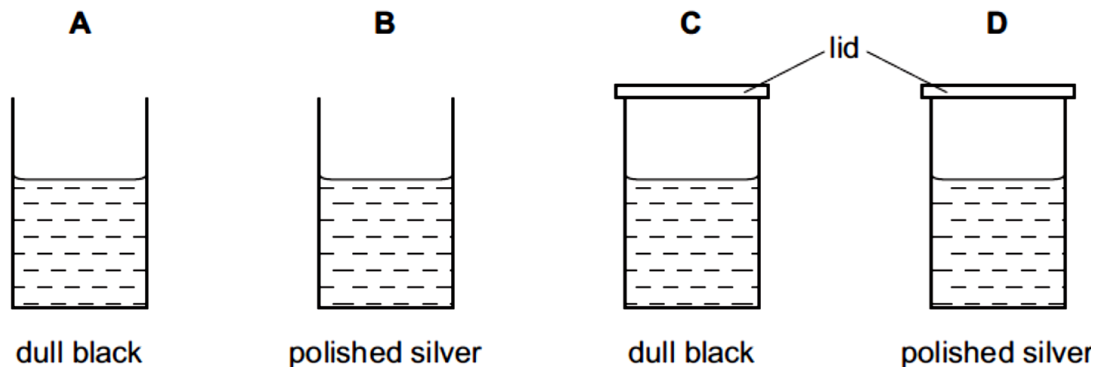
22   A gas stove is used to boil some water in a metal pan.

Which row describes how thermal energy is transferred through the metal pan and throughout the water?

	metal pan	water
A	conduction	conduction
B	conduction	convection
C	convection	conduction
D	convection	convection

23   When some steam at 100 °C is passed into a beaker of water, all the steam condenses in the water. The mass of the water in the beaker rises from 120 g to 124 g. The specific latent heat of vapourisation of water is 2250 J/g.

How much thermal energy is lost by the steam as it condenses?

A 1.1×10^3 J

B 9.0×10^3 J

C 2.8×10^5 J

D 4.5×10^5 J

24 Equal masses of two different liquids are poured into identical beakers. They are heated from 20 °C to 40 °C by heaters of the same power. Liquid 2 takes twice as long to heat as liquid 1.
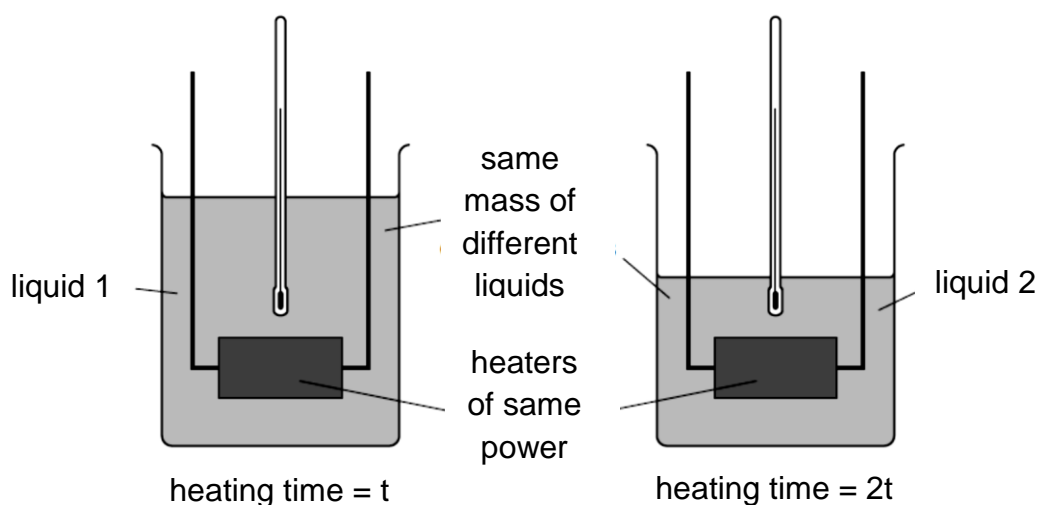
Which statement is correct?

A Both liquids receive the same amount of energy.

B Liquid 1 receives more energy than liquid 2.

C The heat capacity of liquid 1 is less than the heat capacity of liquid 2.

D The specific heat capacity of liquid 1 is more than the specific heat capacity of liquid 2.

25 Which statement about electromagnetic waves is true?

A Gamma rays are used to kill bacteria in water treatment plant.

B Microwaves are used to transmit signals in satellite TV.

C Ultra-violet waves are used in remote controllers to switch on ceiling fans.

D X-rays are used in forgery detection of bank notes.

26 Which waves travel at the same speed in air?

A gamma rays and infra-red

B infra-red and sound

**C** microwave and sound

D ultrasound and ultra-violet

27 A pulse of sound is transmitted vertically downwards from bottom of a ship. The pulse is reflected from the seabed and returns to the ship. The depth of the water under the ship is 3000 m. The speed of sound in water is 1500 m/s.

What is the time taken between transmitting and receiving the pulse?

A 0.50 s   **B** 2.0 s   **C** 1.0 s   **D** 4.0 s

28 A sound wave passes through air. The diagram represents the arrangement of air molecules at one instant.

Which distance is the wavelength of the sound wave?
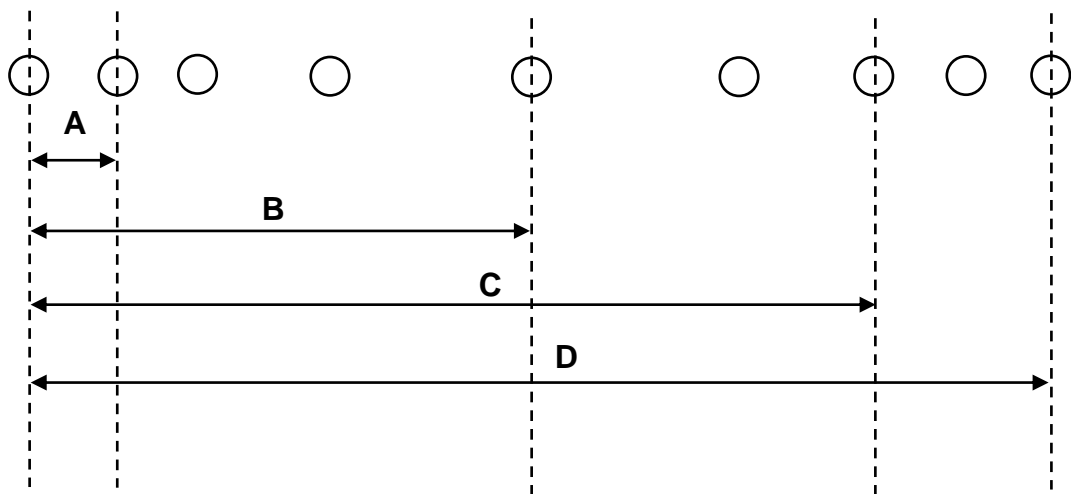
29 A student holds a sheet of paper with letters on it, facing a plane mirror. The letters on the paper are shown.


What does the student see in the mirror?

30 L represents a thin converging lens. Point F is the principal focus (focal point) of the lens. A real image of an object is formed at point U. Which position should the object be placed to form the image?
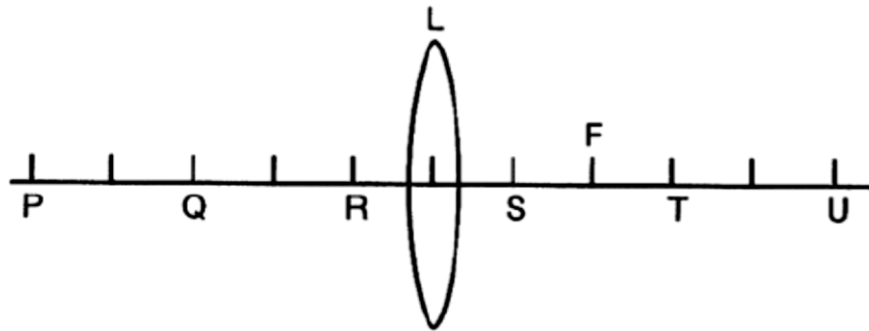

A position P   **B** position Q   **C** position R   **D** position S

31 The diagram shows the action of a magnifying glass.

Which point is the principal focus (focal point) of the lens?
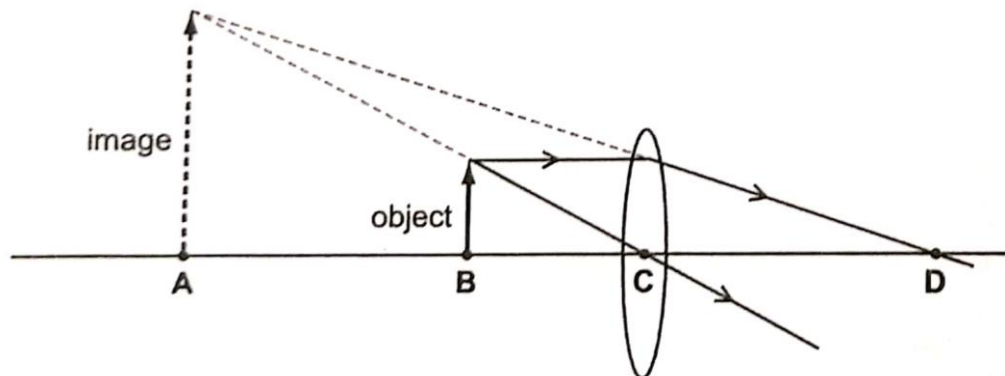
32 A battery moves a charge of 120 C around the circuit in a time of 0.50 mintues.

What is the current in the circuit?

A   4.0 A   **B**   15 A   **C**   240 A   **D**   900 A

33 Which quantity is equal to the electromotive force (e.m.f.) across a battery in a circuit?

A   the power used in driving one electron through the whole circuit

B   the power used in driving unit charge through the whole circuit

C   the work done used in driving one electron through the whole circuit

D   the work done used in driving unit charge through the whole circuit

34 Two uncharged metal spheres P and Q are mounted on insulating stands and are touching each other. A positively-charged metal sphere on an insulating handle is brought close to P but does not touch it.


positively
charged metal
sphere
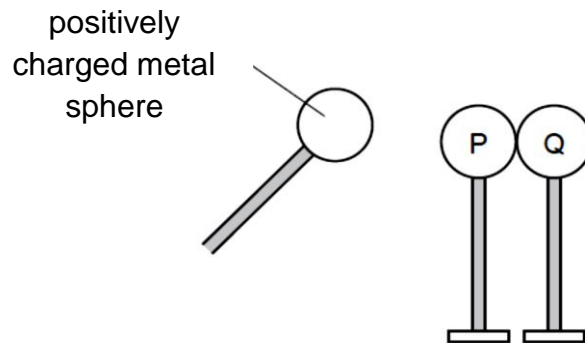
The positively-charged metal sphere is held in this position and sphere Q is moved to the right, away from sphere P.

What are the charges on P and Q and how do the sizes of these charges compare?

|	charge on P	charge on Q	sizes of the charges
A	negative	positive	equal
B	negative	positive	unequal
C	positive	negative	equal
D	positive	negative	unequal

35 The diagram shows a circuit in which all the switches are open.
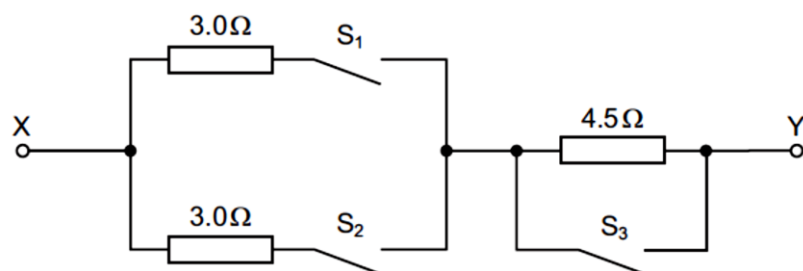
Which switch positions give a resistance of 1.5 Ω between X and Y?

	S_1	S_2	S_3
A	closed	closed	closed
B	closed	closed	open
C	closed	open	closed
D	closed	open	open

36 The diagram shows a potential divider consisting of a light dependent resistor and a fixed resistor of 500 Ω.
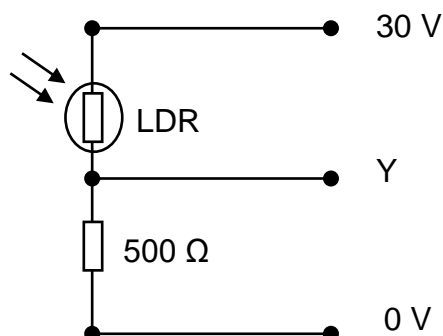
The LDR receives increasing light intensity from a nearby lamp The resistance of the LDR falls from 1000 Ω to 100 Ω.

What is the corresponding change in potential at Y?

A a fall from 20 V to 5 V

B a fall from 25 V to 10 V

C a rise from 5 V to 20 V

D a rise from 10 V to 25 V

37 The metal case of an electric heater is earthed. The plug to the heater contains a 5A fuse. There is a current of 4A when the heater works normally.

The cable to the heater becomes so worn that the live wire makes electrical contact with the case. What will happen?

A The current flows to earth and the fuse is not affected.

B The fuse melts and switches off the circuit.

C The metal case becomes live and dangerous.

D The metal case becomes very hot.

38 X and Y are parallel wires carrying electric current at right angles to the plane. Three plotting compasses are placed between the two wires.

What is the direction and size of the currents flowing in X and Y?
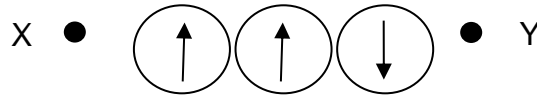
|	direction of currents	size of currents
A	different	larger in X than in Y
B	different	larger in Y than in X
C	same	larger in X than in Y
D	same	larger in Y than in X

39 The diagram shows an insulated copper wire PQ, coiled around a U-shaped electromagnet. A current flows from P to Q. A current-carrying wire XY lies in the magnetic field between the two poles of the electromagnet.
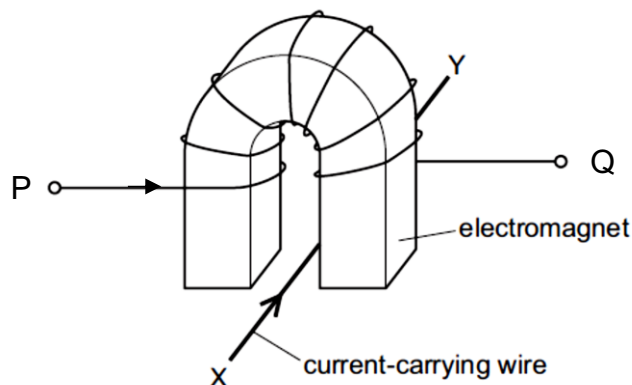
What is the direction of the force acting on wire XY?

A Wire XY moves downward.
B Wire XY moves to the left.
C Wire XY moves to the right.
D Wire XY moves upward.

40 The diagram shows a current-carrying coil rotating in a magnetic field.

power supply
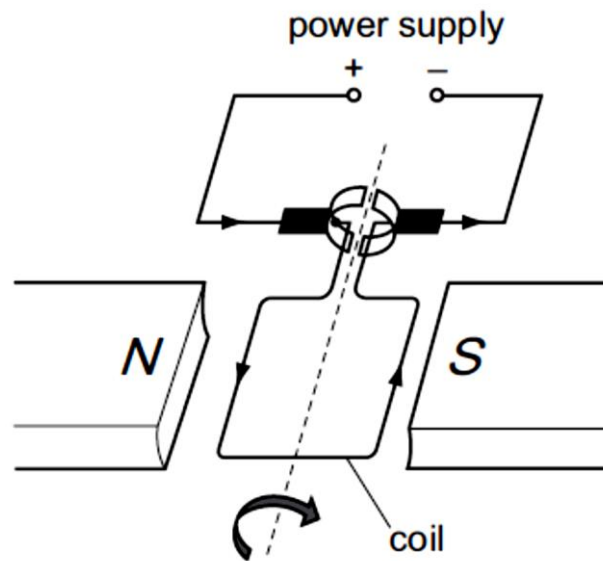
Each of the following actions is carried out separately.

- Increase the number of turns on the coil.
- Increase the width of the coil.
- Reverse the direction of the magnetic field.
- Use thinner wire for the coil.

How many of these actions cause the coil to rotate at a faster speed?

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

END OF PAPER