FUCHUN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024
SECONDARY 4 EXPRESS

CANDIDATE NAME		CLASS	
CENTRE NUMBER	S	INDEX NUMBER	

PHYSICS 6091/01

Paper 1 Multiple Choice

28 August 2024
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, Centre number, class and index number on the Question Paper and Answer Sheet in the spaces provided unless this has been done for you.

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.

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

Name of setter: Mrs Koh-Teh Yi Wen

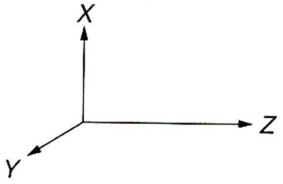
1 The average mass of a feather is 8.2 mg.

What is the mass in microgram?

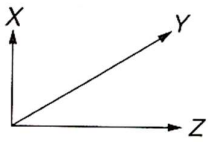
A 8.2×10^{-9} µg **B** 8.2×10^{-3} µg **C** 8.2×10^{3} µg **D** 8.2×10^{9} µg

2 Which diagram represents the directions of vectors X and Y and their resultant Z?

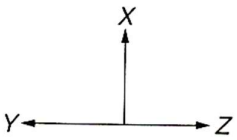
A



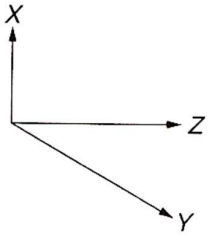
B



C



D



3 Which of the following pairs of physical quantities have the same unit?

A energy and power

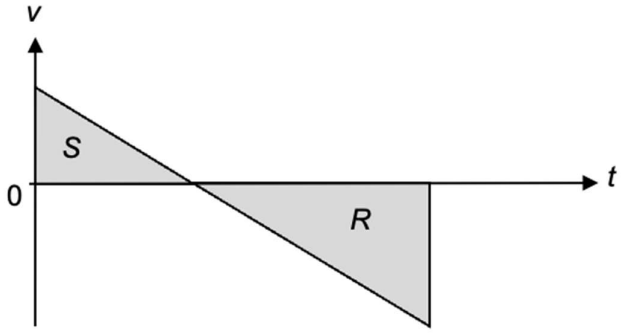
B heat capacity and latent heat

C pressure and friction

D work done and gravitational potential energy store

4 A stone is thrown upwards from the top of a cliff. After reaching its maximum height, it falls past the cliff-top and into the sea.

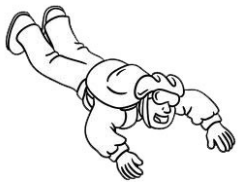
The graph below shows how the vertical velocity *v* of the stone varies with time *t* after being thrown upwards. *R* and *S* are the magnitudes of the areas of the two triangles.



Which of the following represents the height of the cliff?

A *S* **B** *R* **C** *S* + *R* **D** *R* – *S*

5 A skydiver falls from rest through the air and eventually reaches terminal velocity.



What is the acceleration of the skydiver during his fall?

A constant at 0 m/s^2

B constant at 10 m/s^2

C starting at 0 m/s^2 and increasing to 10 m/s^2

D starting at 10 m/s^2 and decreasing to 0 m/s^2

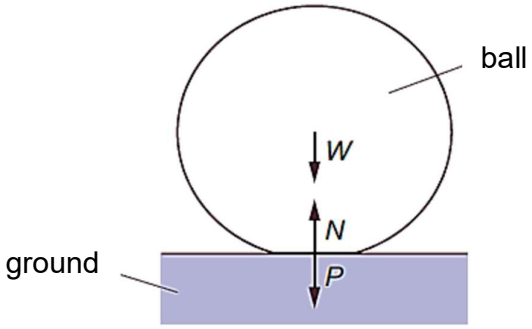
6 A body weighs 100 N on Earth where the gravitational field strength is 10 N/kg.

If the body falls on freely near the moon's surface with an acceleration of 1.6 m/s^2, what is the weight of the body on the moon?

A 16.0 N **B** 62.5 N **C** 100 N **D** 160 N

7 A ball is dropped onto horizontal ground and bounces vertically upwards. When the ball is in contact with the ground, the following forces are present:

- the weight *W* of the ball
- the contact force *P* exerted on the ground by the ball
- the contact force *N* exerted on the ball by the ground.



At a particular instant, the ball is in contact with the ground and the ball is momentarily stationary.

At this instant, which relationship is correct?

A $N = P + W$ **B** $N = P$ **C** $N = W$ **D** $W = P$

8 Which statement concerning the mass of a body is correct?

A Mass is a measure of the gravitational pull on the body.

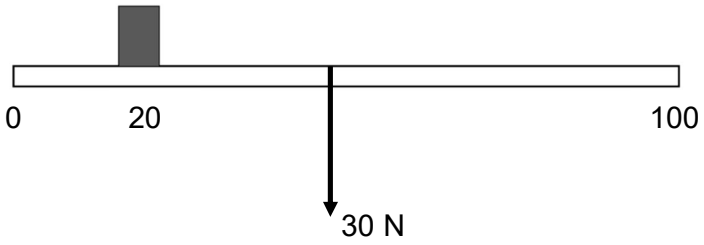
B The mass of the body is a measure of the body's resistance to a change in motion.

C The SI unit of mass is the gram.

D When gravitational field strength changes, the mass of the body changes.

9 A uniform beam of weight 30 N has a length of 100 cm.

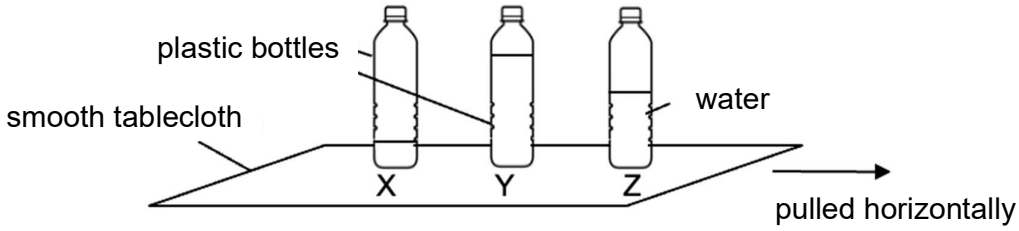
A box of 15 N is placed at the 20 cm mark. The beam can be balanced on a pivot.



At which mark should the pivot be placed?

A 10 cm **B** 30 cm **C** 40 cm **D** 60 cm

10 Three plastic bottles, X, Y and Z, containing different amount of water, are placed on a smooth tablecloth. A waiter attempts to pull away the tablecloth in one quick horizontal motion without lifting these bottles.



Which statement best explains the outcome of his attempt?

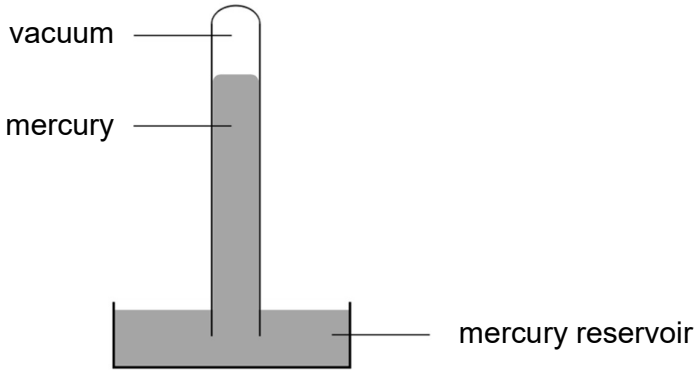
A Bottle X is likely to topple easily as it has the least inertia.

B Bottle Y is least likely to topple as it has the lowest position of centre of gravity.

C Bottle Y is likely to topple easily as it has the least inertia.

D Bottle Z is likely to topple easily as it is nearest to the pulling force.

11 The diagram shows a simple mercury barometer.



Which factor will not change the height of the mercury?

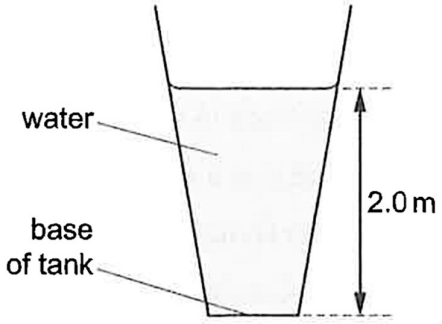
A Changes in atmospheric pressure.

B Changes in the temperature of mercury.

C Changes in the value of gravitational field strength.

D Changes in the volume of the mercury in the barometer reservoir.

12 A tank with sloping sides contains water to a depth of 2.0 m.



The gravitational field strength *g* is 10 N/kg.

The density of water is 100kg/m^3.

The base of the tank has an area of 4.0 m^2.

What is the force caused by the water on the base of the tank?

A 800 N **B** 5000 N **C** 8 000 N **D** 20 000 N

13 An experiment is carried out to estimate the useful power output of a student running up some stairs, ignoring the work done against friction.

What is not required for this experiment?

A the time taken to run up the stairs

B the total horizontal distance of the stairs

C the total vertical height of the stairs

D the weight of the student

14 Which of pair of energy resources are renewable?

A coal and oil

B hydropower and geothermal

C hydropower and oil

D nuclear fuel and solar power

15 In an experiment to demonstrate Brownian motion in a gas, a cell containing smoke is brightly illuminated from the side and is viewed under a microscope. Bright specks of light are seen to be undergoing random motion.

A list of statements is presented below.

I. The average speed of the smoke particles is much less than that of the air molecules.
II. The motion is random because air molecules bombarding the smoke particles from different directions.
III. The specks of light are produced by light which is scattered (or reflected) from the smoke particles.

Which statement(s) is/are correct?

A I only

B I and II only

C II and III only

D I, II and III

16 A piece of ordinary kitchen aluminium foil is used to wrap around food to be cooked in a barbeque fire.

The foil has a shiny side and a dull side.

Which side should be outside, and why?

A The dull side should be outside because it absorbs heat radiation faster.

B The dull side should be outside because it is a good conductor of heat.

C The shiny side should be outside because it is a bad emitter of heat.

D The shiny side should be outside because it is able to create convection current with the surrounding.

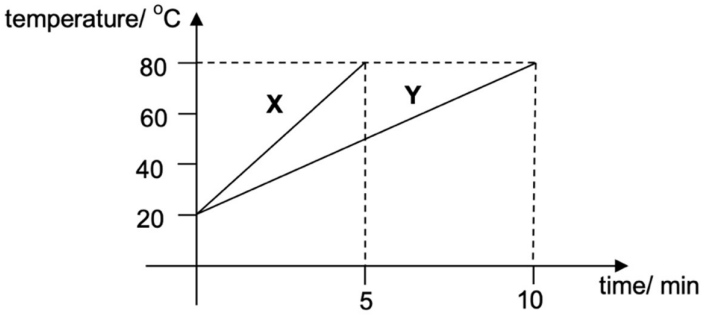
17 Some water is heated in a metal kettle over an electric stove.

Which row best describes how thermal energy is transferred from the stove through the metal kettle and throughout the water?

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

18 The ratio of the masses of two metal blocks X and Y is 2 : 1. They are both heated uniformly using identical heaters.

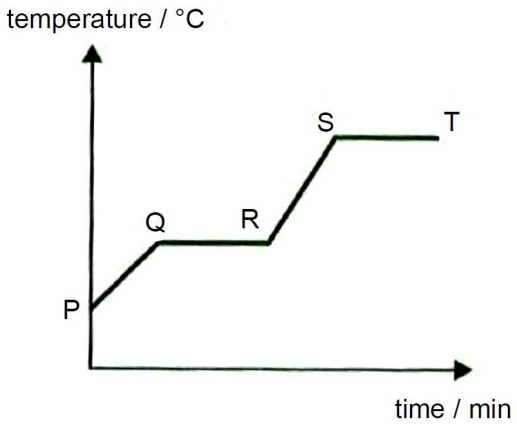
Assuming there is no heat loss to the surroundings, the temperature-time graphs of the blocks are shown below.



What is the ratio of the specific heat capacities of X and Y respectively?

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

19 A solid substance is placed in a boiling tube and heated steadily. The temperature-time graph of the substance is shown below.



At which region(s) do the substance gain internal kinetic energy?

A PQ and RS

B QR and ST

C PR, QR and RS

D All regions

20 Which statement about boiling and evaporation is correct?

A Boiling only occurs at the surface of a liquid.

B Bubbles of air are produced throughout the liquid during boiling.

C Evaporation is not affected by the surface area of the liquid.

D Evaporation occurs at any temperature.

21 An exploding star gives out energy in the form of waves. The waves travel to Earth through space.

Which of these waves could not be received from the star?

A Infrared waves

B Light waves

C Radio waves

D Sound waves

22 The diagram shows the main sections of the electromagnetic spectrum in a specific order. Some of the sections are labelled.

Gamma ray			light	R		radio wave

What of the following are applications of section R?

I. thermal imaging
II. satellite television
III. sterilisation
IV. television remote controller

A I and III

B I and IV

C III only

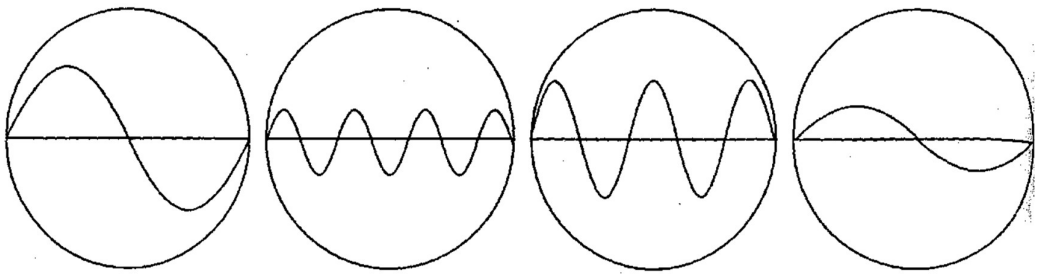
D IV only

23 An oscilloscope is an electronic test instrument that allows you to observe varying signal voltages.

The diagrams represent sound waves displayed on an oscilloscope. The settings of the oscilloscope remain the same for each sound.

Which diagram represents the quietest sound with the highest pitch?

A **B** **C** **D**



24 The speed of light is 3×10^8 m/s and the speed of sound is 330 m/s.

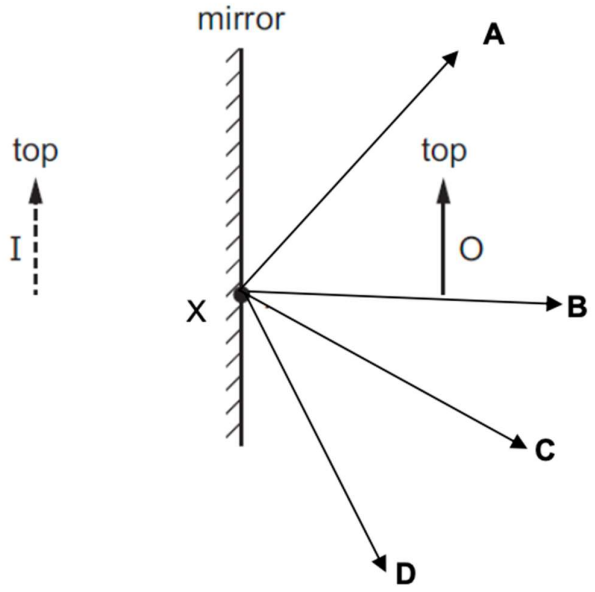
What is the time interval between seeing a flash of lightning and hearing a clap of thunder, if you lived 5 km away from a thunderstorm?

A 1.66×10^{-5} s **B** 15 s **C** 30 s **D** 55 s

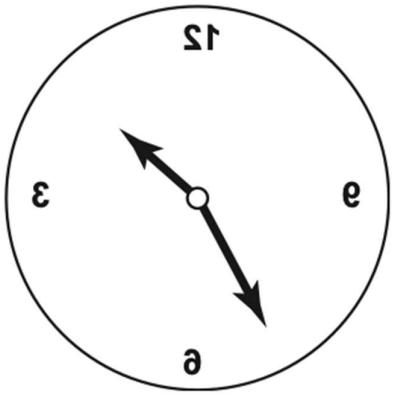
25 An object O is placed in front of a plane mirror. I is the image formed.

A light ray from the top of the object is incident on the mirror at point X and it reflects.

Which is the reflected ray from point X?



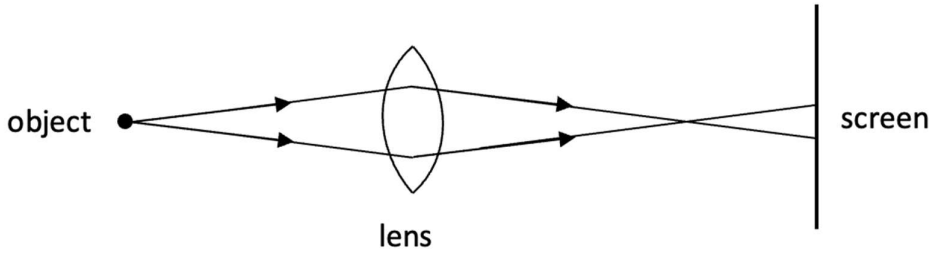
26 The image of a clock face as seen in a plane mirror is shown.



What is the time of the clock?

A 1.25 **B** 1.35 **C** 10.25 **D** 10.35

27 A lens forms a blurred image of an object on a screen as shown below.



Which of the following steps will not allow the image of the object to be focused on the screen?

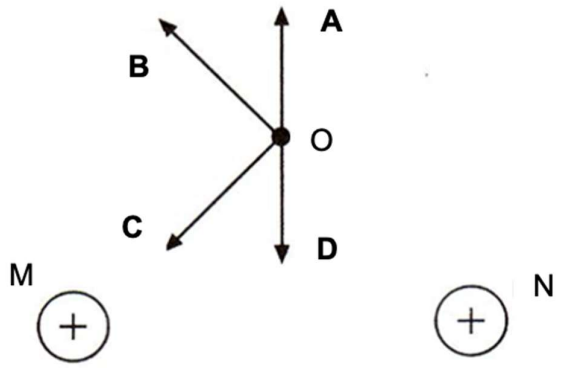
A shift the screen closer towards the lens

B shift the object nearer towards the lens

C shift the lens nearer towards the object

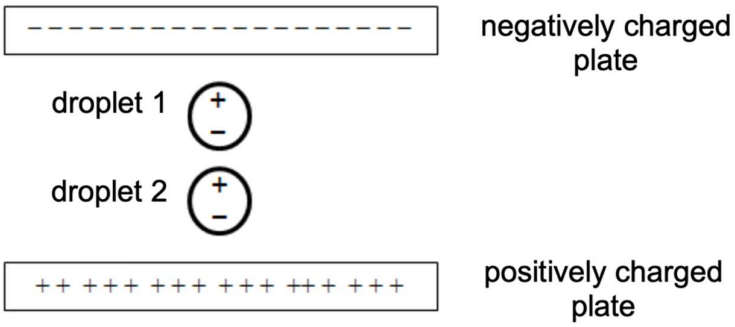
D use a lens of shorter focal length

28 M and N are two spheres with the same quantity of electric charge. O is a point equidistant from M and N.



In which direction does the electric field act at the point O?

29 Two tiny water droplets are suspended in the space between two charged particles as shown below.



What will happen to the charge distribution when both water droplets touch each other?

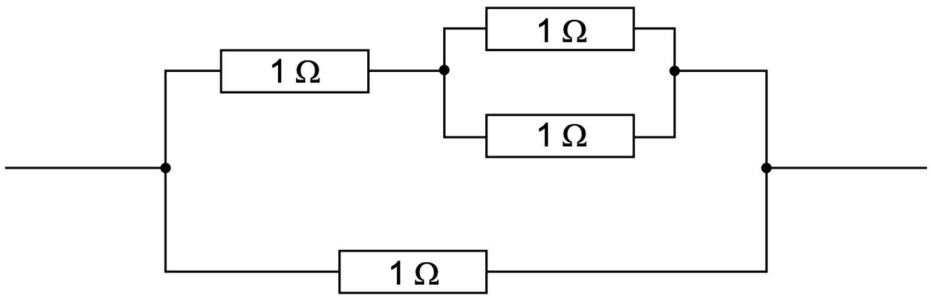
	droplet 1	droplet 2
A	negative	positive
B	neutral	neutral
C	positive	negative
D	positive	positive

30 A charged cloud carrying a charge of 15 C passes all its charge to the earth through a bolt of lightning. The lightning lasts for 0.4 ms.

How much electric current is carried by the bolt of lightning?

A 60 A **B** 3.75×10^2 A **C** 6.0×10^4 A **D** 3.75×10^4 A

31 What is the effective resistance of the four 1 Ω resistors connected as shown?

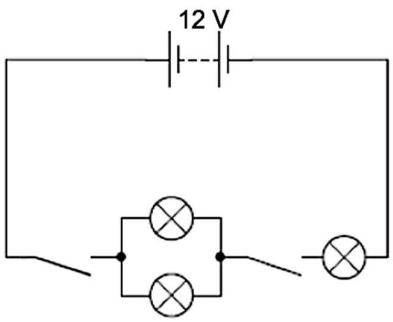


A 0.25 Ω **B** 0.60 Ω **C** 0.67 Ω **D** 4 Ω

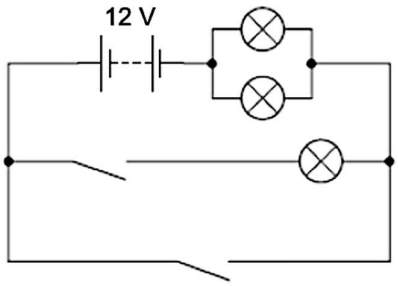
32 Jane connected three identical bulbs and two switches to a 12 V battery.

When the two switches are closed, which circuit would allow all the bulbs to work at full brightness of 12 V each?

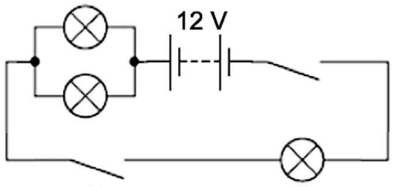
A



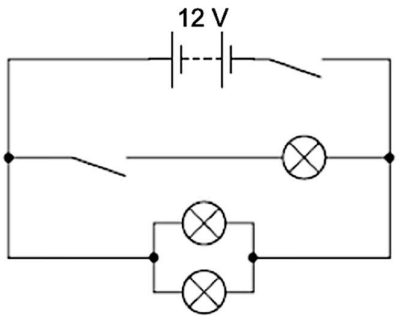
B



C



D



33 An electric kettle has a power rating of 240 W. It is used for 15 minutes every day.

Given that one unit of electricity costs 25 cents, calculate the cost of using the kettle for 30 days.

A $0.02 **B** $0.45 **C** $27.00 **D** $450.00

34 Which of the following statement is correct?

A There is no current flowing in the neutral wire when an appliance is in operation.

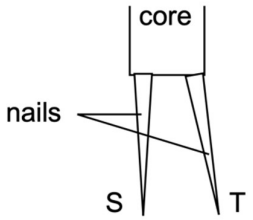
B When there is excess current, a fuse connected to the neutral wire will not melt.

C There is no current flowing in the live wire when a fuse connect to the live wire has melted.

D The live wire is connected to the metal casing of an appliance.

35 Two iron nails are attracted to the core of an electromagnet which is connected to a D.C. power supply as shown below.

The ends S and T repel each other when the power supply is switched on.



What will be observed about the ends S and T if the electromagnet is connected to an a.c. power supply?

A They will stay repelled throughout.

B They will stay attracted throughout.

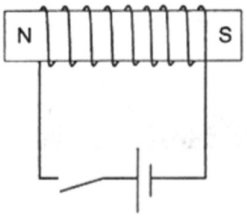
C There will be a continuous cycle of repulsion and attraction between S and T.

D There will be no repulsion or attraction between S and T.

36 A permanent magnet can be demagnetised by using a solenoid and switching the current on then off.

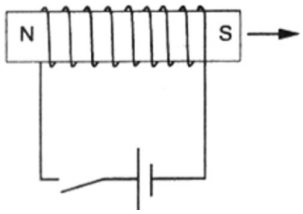
Which diagram shows the most effective method of demagnetisation? The diagram shows a bar magnet placed in a uniform magnetic field.

A



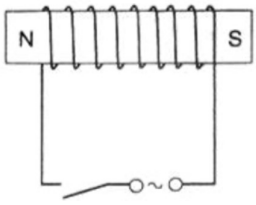
magnet left in place

B



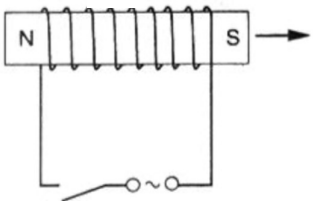
magnet withdrawn before switching off

C



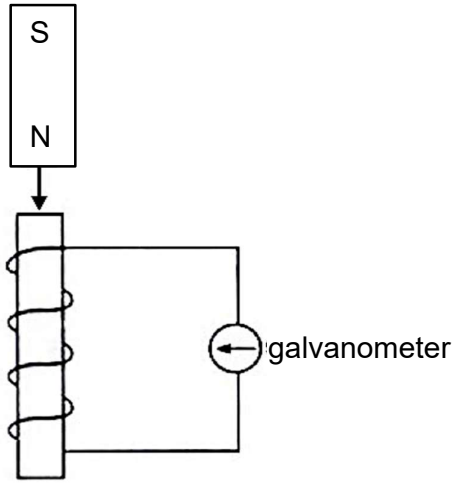
magnet left in place

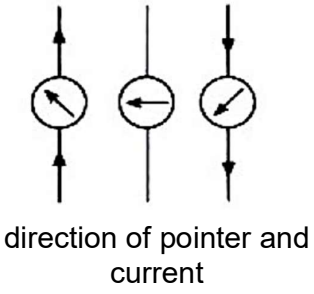
D



magnet withdrawn before switching off

37 A magnet falls down into a solenoid and then falls out at the other end. The diagram on the right shows the directions of current and the galvanometer pointer deflection.





What will be the deflections of the galvanometer pointer during the process?

	falling into	inside	falling out
A	←	↙	↖
B	↙	↖	←
C	↖	←	↙
D	↙	←	↖

38 A transformer has 500 turns on the primary coil and 1500 turns on the secondary coil.

The current in the primary coil is 0.60 A.

Losses in the transformer cause the current in the secondary coil to be 90% of the value in an ideal transformer.

What is the current in the secondary coil?

A 0.18 A **B** 0.20 A **C** 1.60 A **D** 1.80 A

39 The equation shows the decay of nuclide X.

$$^{226}_{88}X \rightarrow {}^{P}_{Q}Y + {}^{4}_{2}\alpha$$

What are the values of P and Q?

	P	Q
A	230	90
B	230	86
C	222	90
D	222	86

40 The count rate from a radioactive isotope is recorded every hour. The count rate is corrected for background radiation.

The table shows the readings.

time / hours	0	1	2	3	4	5
$\frac{\text{corrected count rate}}{\text{counts/s}}$	800	620	480	370	290	220

What is the estimate of the half-life of the isotope can be obtained from the readings in this table?

A between 1 and 2 hours

B between 2 and 3 hours

C between 3 and 4 hours

D between 4 and 5 hours

Fuchun Secondary School
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Preliminary 2024 Physics 6091

Paper 1 ANSWERS

1	C	**11**	D	**21**	D	**31**	B
2	D	**12**	C	**22**	B	**32**	D
3	D	**13**	B	**23**	B	**33**	B
4	D	**14**	B	**24**	B	**34**	C
5	D	**15**	C	**25**	C	**35**	A
6	A	**16**	A	**26**	B	**36**	D
7	B	**17**	B	**27**	D	**37**	D
8	B	**18**	B	**28**	A	**38**	A
9	C	**19**	A	**29**	C	**39**	D
10	A	**20**	D	**30**	D	**40**	B