CONVENT OF THE HOLY INFANT JESUS SECONDARY
Preliminary Examination 2 in preparation for
the General Certificate of Education Ordinary Level 2016

CANDIDATE NAME

CLASS

REGISTER NUMBER

PHYSICS

5059/01

Paper 1 MCQ

23 August 2016

1 hour

Additional Materials: Multiple Choice Answer Sheet (OMR)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and index number on the 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.

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

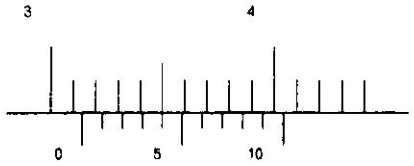
This document consists of **13** printed pages and **1** blank page.

[Turn over

1 Which list of SI units contains only base units?

A candela, second, kelvin, watt
B candela, Joule, metre, second
C ampere, kelvin, second, pascal
D ampere, metre, second, kelvin

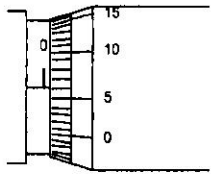
2 The diagram shows the scale of the vernier callipers that is used to measure the diameter of a coin.



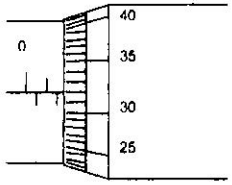
What is the radius of the coin?

A 1.57 cm **B** 3.14 cm **C** 3.15 cm **D** 3.55 cm

3 The diameter of a piece of wire is measured using a micrometer screw gauge. A student takes an initial zero reading followed by a reading of the diameter. The following diagrams show enlargements of the micrometer screw gauge reading.



Zero reading



Diameter reading

What is the diameter of the wire?

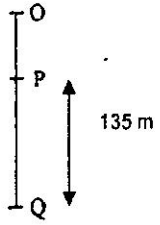
A 1.26 mm **B** 1.38 mm **C** 1.76 mm **D** 1.88 mm

4 A car driver takes a total of four hours to make a journey of 160 km. She has a coffee break and spends half an hour stationary in a traffic jam. During the remaining time, she is travelling at a speed of 60 km/h.

How long was her coffee break?

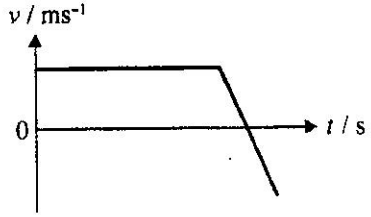
A 30 minutes **B** 50 minutes **C** 60 minutes **D** 90 minutes

5 An object released from rest at O falls freely under gravity and passes through P and Q as shown.
If the object takes 3 s to move from O to P and PQ = 135 m, how much time does it take to fall from O to Q?

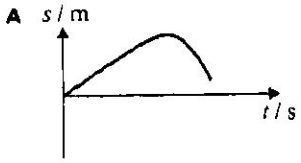


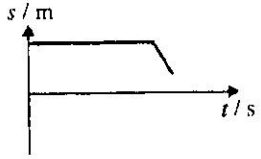
A 3 s
B 4 s
C 5 s
D 6 s

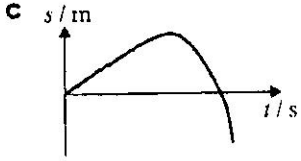
6 The velocity-time graph of a moving object is shown.

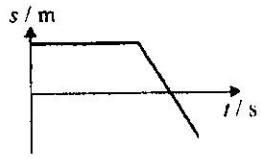


Which of the followings is the corresponding displacement-time graph?

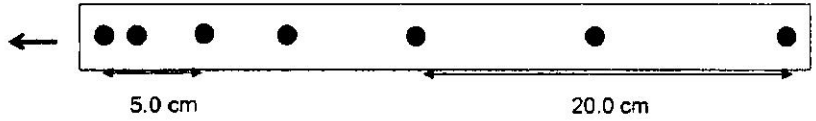
A 

B 

C 

D 

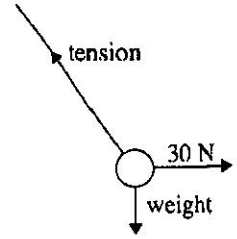
7 Celine used a ticker tape timer to investigate the acceleration of a remote control car. The ticker tape timer is set to vibrate at 50 Hz and a portion of the tape obtained is shown below.



What is the acceleration of the remote control car during the portion shown?

A -9375 cm/s² B -4688 cm/s² C 4688 cm/s² D 9375 cm/s²

8 A pendulum bob of mass 5 kg is pulled horizontally to the right by a 30 N force as shown. What will be the approximate tension in the string when the bob is in equilibrium?

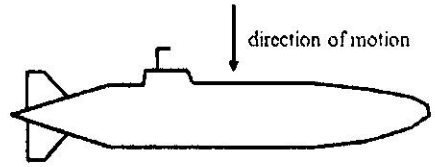


A 50 N B 58 N C 60 N D 68 N

9 A bottle full of water has a mass of 200 g. When the same bottle is filled with liquid X, the mass becomes 180 g. If the mass of the empty bottle is 100 g, what is the density of liquid X? Take density of water as 1.0 g/cm³.

A 0.2 g/cm³ B 0.8 g/cm³ C 0.9 g/cm³ D 1.2 g/cm³

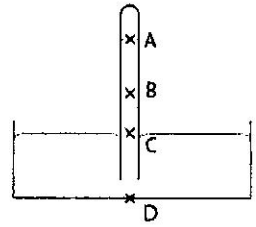
10 An object experiences upthrust whenever it is in water.
A submarine is sinking vertically through the water at a constant velocity.



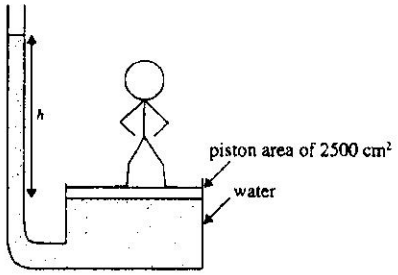
Which statement is correct?

A Resultant force in the downward direction is not zero.
B Upthrust is zero.
C Weight is equal to the upthrust.
D Weight is more than the upthrust.

11 An ideal barometer is used to measure the atmospheric pressure in a room. At which point is the pressure slightly less than the atmospheric pressure?



12 A person of 60 kg is standing on a platform over the piston of area 2500 cm^2. Given that the liquid is water, what will be the height, h? (Assume that the density of water is 1000 kg/m^3 and the atmospheric pressure is 10^5 Pa)



A 2.4 m **B** 0.24 m **C** 2.4 cm **D** 0.024 mm

13 A fixed mass of gas is cooled in a cylinder with a movable piston. The piston is pushed inward into the cylinder by the gas to maintain a constant pressure in the piston.

Which of the following about the gas molecules is correct?

	Average speed	Frequency of collision with the inner wall of container
A	no change	increase
B	no change	decrease
C	decrease	decrease
D	decrease	increase

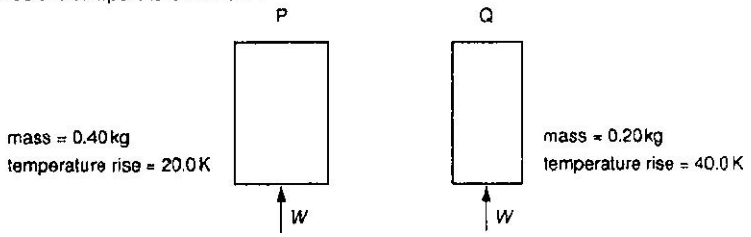
14 Which of the following is a possible unit for power?

A J s **B** kg m^{-1} s^{-2} **C** kg m^2 s^{-3} **D** kg m^2 s^{-2}

15 What is 178 K in degree Celsius?

A 451°C **B** − 95°C **C** − 105°C **D** − 125°C

16 The diagram represents two blocks, P and Q. Each of them received the same amount of energy, W. The mass of P is twice the mass of Q. The temperature rise of Q is 2 times the temperature rise of P.

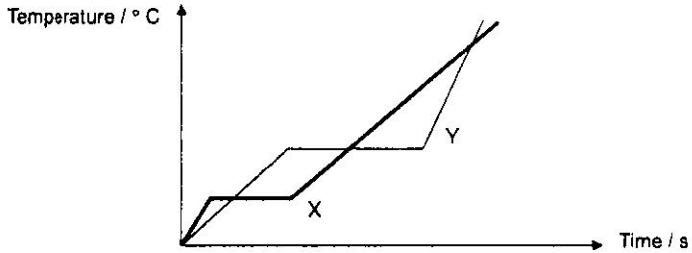


Which statement about P and Q is correct?

A The heat capacity of P is half the heat capacity of Q.
B The heat capacity of P is twice the heat capacity of Q.
C The specific heat capacity of P is half the specific heat capacity of Q.

D The specific heat capacity of Q is half the specific heat capacity of P.

17 Equal mass of two solids X and Y are heated successively in a well-lagged calorimeter. Heat energy is supplied to each of them at the same rate. A temperature-time graph for the process is shown below.



Which statement below is correct about X and Y?

A Liquids X has a lower specific heat capacity than liquid Y.
B Liquid X has a lower boiling point than liquid Y.
C Solid Y has a lower specific heat capacity than solid X.
D Solid X has a lower specific heat capacity than solid Y.

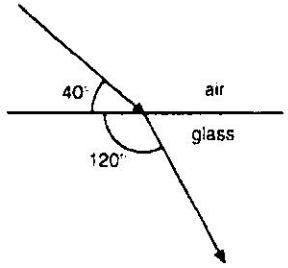
18 The distance between the 20 °C mark and the 100 °C mark on a mercury thermometer is 25.0 cm. When the mercury level is 5.0 cm below the 100 °C mark, the temperature is

A 64 °C **B** 75 °C **C** 80 °C **D** 84 °C

19 A piece of aluminium foil is shiny on one side and dull on the opposite side. When it is used to wrap around food to be cooked in a barbecue fire, which side of the foil should face the fire and why?

	side facing the fire	reason
A	dull	better conductor of thermal energy
B	dull	better absorber of thermal energy
C	shiny	better reflector of thermal energy
D	shiny	better conductor of thermal energy

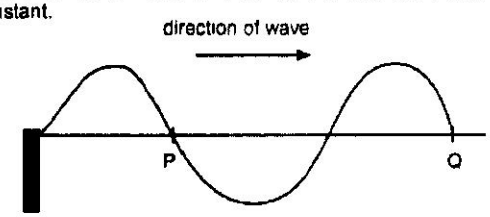
20 The diagram below shows a ray of light passing from air into glass.



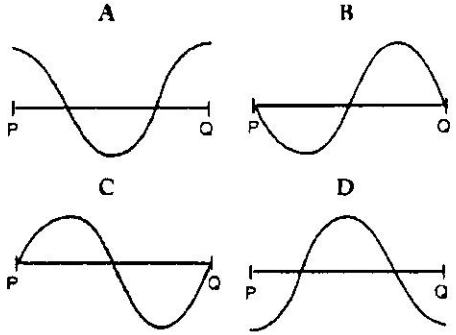
What is the critical angle for glass?

A 31° **B** 41° **C** 51° **D** 61°

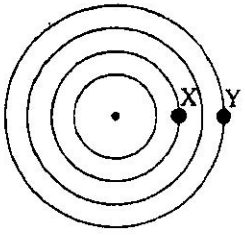
21 A vibrator generates a travelling wave on a string. The diagram shows the shape of the string at a certain instant.



Which of the following shows the shape of the string between P and Q after half of a period?



22 A series of circular wavefronts are created in a ripple tank as shown in the diagram.



Given that the speed of wave is 6.0 cm/s and the wavelength is 1.6 cm, what is the time taken for the wavefront to travel from X to Y?

A 3.75 s **B** 0.80 s **C** 0.53 s **D** 0.27 s

23 What is meant by '*the refractive index of the medium is 1.7*'?

A The speed of light in the medium is 1.7 times the speed of light in vacuum.
B The speed of light in the medium is 1.7 times the speed of light in air.
C The speed of light in vacuum is 1.7 times the speed of light in the medium.
D The speed of light in air is 1.7 times slower than the speed of light in the medium.

24 Ultra-violet waves, microwaves and X-rays are all part of the electromagnetic spectrum.

What is the correct order of increasing frequency?

	Lowest	⟶	Highest
A	X-rays	microwaves	ultra-violet waves
B	X-rays	ultra-violet waves	microwaves
C	microwaves	X-rays	ultra-violet waves
D	microwaves	ultra-violet waves	X-rays

25 Which of the following statements about the electromagnetic spectrum is true?

A All parts of the electromagnetic spectrum is invisible to the human eye.
B The frequencies of electromagnetic spectrum vary directly with wavelength.
C Their wavelength decrease as they propagate into an optically denser medium.
D It is possible to reflect all electromagnetic spectrum except for infra-red radiation.

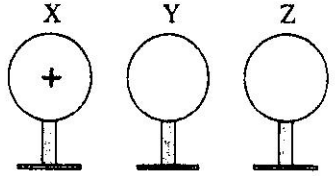
26 A man stands between two vertical walls. After making a loud clap, he hears two echoes at an interval of 1s. If the distance between the two walls is 1000 m, what is his distance from the nearest wall? Speed of sound in air is 300 m/s.

A 213 m **B** 425 m **C** 850 m **D** 1700 m

27 Which of the following frequencies cannot be heard by a normal human being?

A 10^2 Hz **B** 10^3 Hz **C** 10^4 Hz **D** 10^5 Hz

28 Three conductors are placed close to each other. Conductor X is positively charged. Both conductor Y and Z are neutral.



What will be the charge in conductor Z after it is being earthed momentarily?

A neutral **B** positive **C** negative **D** no charge

29 A resistor with resistance **R** is made from a length **L** of resistance wire with a cross-sectional area **A**.

A second resistor with resistance halved of **R** is made from wire of the same material and same cross-sectional area of **A**.

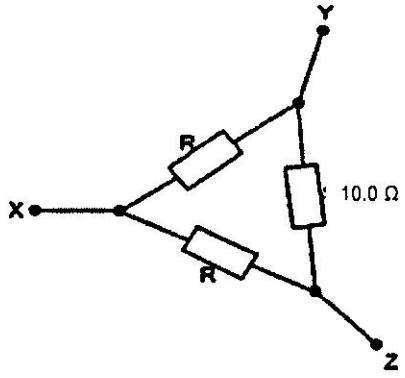
What length of wire is needed for the second resistor?

A L/2 **B** L **C** 2L **D** 4L

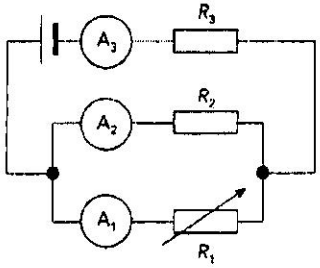
30 The diagram below shows a network of three resistors. Two of these, marked R, are identical. The other one has a resistance of 10.0 Ω.

The effective resistance between Y and Z is found to be 5.0 Ω. What is the resistance between X and Z?

A 0.26 Ω
B 1.9 Ω
C 2.5 Ω
D 3.75 Ω



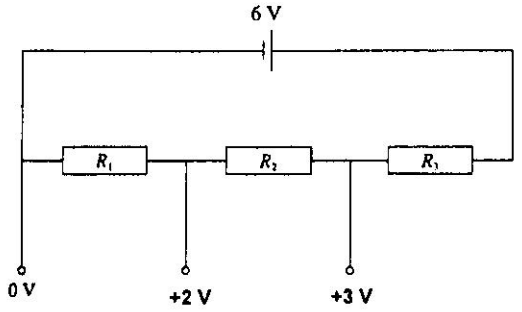
31 In the circuit shown, resistors R_2 and R_3 are both 100 Ω fixed resistors.



What will be the effect on the readings of the three ammeters if the resistance of R_1 is decreased from 100 Ω to 50 Ω?

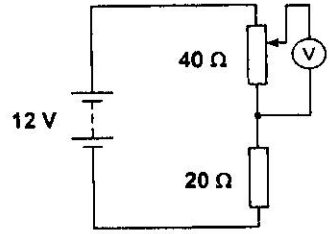
	A_1	A_2	A_3
A	increases	decreases	increases
B	decreases	unchanged	decreases
C	decreases	increases	increases
D	decrease	increases	decreases

32 Three resistors are connected in series to form a potential divider. Which of the following combination of resistances, R_1, R_2 and R_3 will provide the required output voltages of 2 V and 3 V from the 6 V d.c. source as indicated in the figure?



	R_1 / Ω	R_2 / Ω	R_3 / Ω
A	2	2	8
B	2	2	6
C	2	4	6
D	4	2	6

33 The diagram shows a circuit with a potential divider joined in series with a fixed resistor.



What are the minimum and maximum readings that can be obtained on the voltmeter when the potential divider is adjusted?

	minimum reading / V	maximum reading / V
A	0	4
B	0	8
C	2	8
D	4	12

34 Which of the following will be the cheapest to operate?
(Cost of 1 kWh is 25 cents)

	Appliance	*Power rating / W*	*Time switched on*
A	Computer	1500	8 hours
B	Table lamp	800	18 hours
C	Lights	3000	3 hours

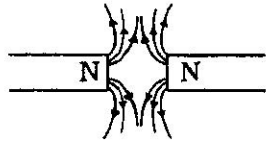
D Water heater 2500 6 hours

35 During the process of magnetic induction,

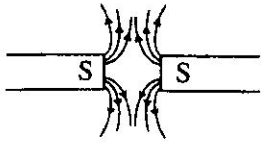
A a coil of wire must be present.
B an induced current is formed.
C soft iron is magnetised.
D there must be the presence of a changing magnetic field.

36 Which of the following indicates the correct magnetic field pattern between the poles of two bar magnets?

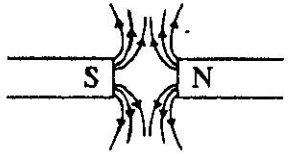
A



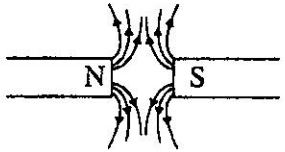
B



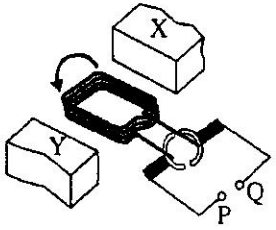
C



D



37 The diagram shows a simple d.c. motor.

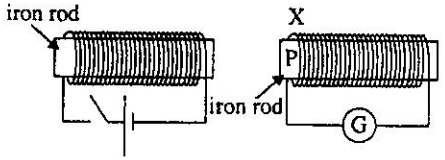


Which combination will achieve the direction of rotation shown in the diagram?

	Polarity	Direction of current
1	X is S-pole, Y is N-pole	P is +, Q is –
2	X is N-pole, Y is S-pole	P is -, Q is +
3	X is N-pole, Y is S-pole	P is +, Q is –

A 2 only
B 1 and 2 only
C 2 and 3 only
D 1 and 3 only

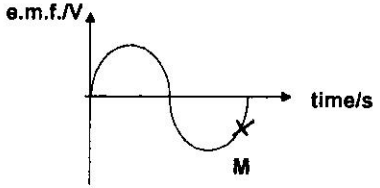
38 An electromagnet is placed near a coil connected to a galvanometer as shown.



Given that X is the magnetic pole induced on the solenoid and P is the magnetic pole induced in the iron rod, what will the polarities of X and P be when the switch is closed?

	X	P
A	N-pole	N-pole
B	N-pole	S-pole
C	S-pole	S-pole
D	S-pole	N-pole

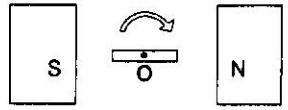
39 The graph below shows how the e.m.f. of an A.C. generator varies with time.



The diagrams below show the front view of the coil of an A.C. generator. The coil is being rotated about an axis through O in an uniform magnetic field. Which of them shows the position of the coil when the value of the induced emf is at M?

A

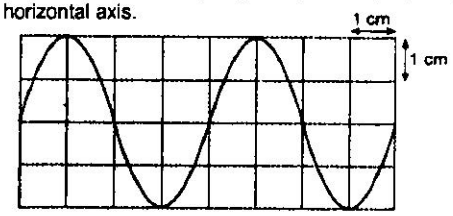
B



C

D

40 The diagram shows a trace on an oscilloscope set at 2.0 V/cm on the vertical axis and 20 ms/cm on the horizontal axis.



What is the peak voltage and frequency of the alternating voltage applied across the Y-input terminals?

	Peak voltage / V	Frequency / Hz
A	4.0	6.25
B	4.0	12.5
C	8.0	12.5
D	8.0	6.25

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CONVENT OF THE HOLY INFANT JESUS SECONDARY
Preliminary Examination 2 in preparation for
the General Certificate of Education Ordinary Level 2016

CANDIDATE NAME

CLASS

INDEX NUMBER

PHYSICS

5059/02

Paper 2 Theory

22 August 2016

1 hour 45 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black ink.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Section A
Answer **all** questions.

Section B
Answer **all** questions. Question 11 has a choice of parts to answer.

Candidates are reminded that **all** quantitative answers should include appropriate units.
The use of an approved scientific calculator is expected, where appropriate.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of physics than for correct answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **20** printed pages.

[Turn over

Section A
Answer **all** the questions in this section.

1 Fig. 1.1 shows the velocity-time graph of an object moving in a straight line for 10 minutes.

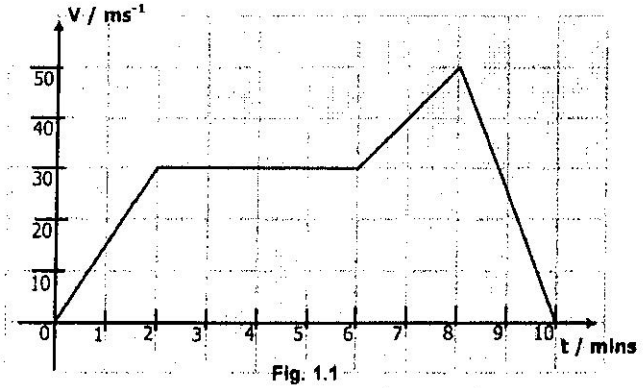


Fig. 1.1

(a) Describe the motion of the object for the first 6 minutes of the journey.

.....

.....[2]

(b) Calculate the deceleration of the object during the last minute of the journey.

deceleration = ...
[2]

(c) How far did the object travel during the last 4 minutes of the journey?

distance travelled = ...
[2]

(d) What is the average speed of the object during the last 4 minutes of the journey?

average speed = ...
[2]

2 A pole-vaulter runs along a track, reaching a maximum speed of 8.4 m/s. At the end of the track, he places a pole into the ground as shown in Fig. 2.1, and uses the pole to push himself vertically upwards.

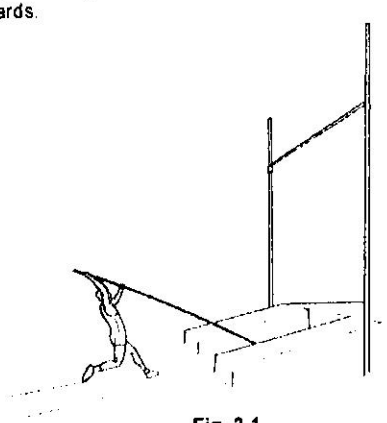


Fig. 2.1

When the pole-vaulter runs along the track, there is a constant forward force of 320 N on him and a backwards resistive force that varies with his speed as shown in Fig. 2.2.

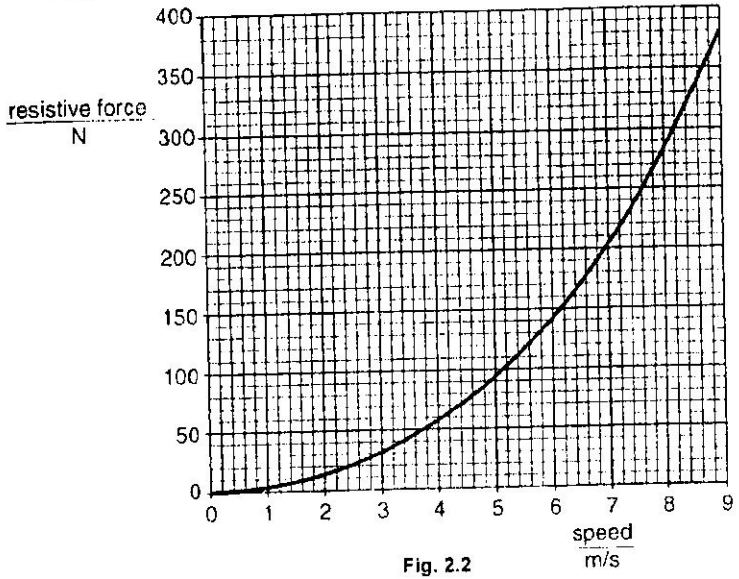


Fig. 2.2

(a) Explain why the maximum speed that he can reach is 8.4 m/s.

.....

.....[1]

The mass of the pole-vaulter is 60 kg.

(b) Calculate the maximum kinetic energy of the pole-vaulter as he runs along the track.

kinetic energy = ...
[2]

(c) The pole is used to convert all this kinetic energy into gravitational potential energy. Calculate the height through which the pole-vaulter rises.
The gravitational field strength is 10 N/kg.

height = ...
[2]

3 Fig. 3.1 shows a non-uniform cue stick suspended horizontally by two spring balances, S_1 and S_2. The centre of gravity of the cue stick is closer to B.

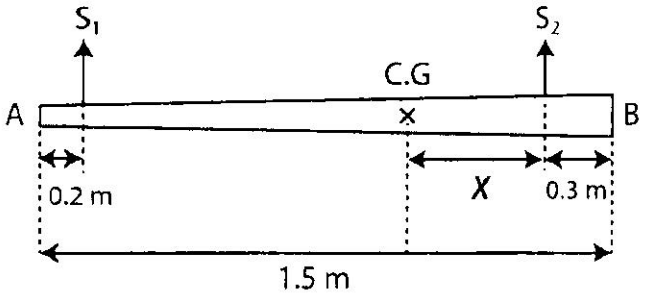


Fig. 3.1

(a) By taking moments about the centre of gravity of the cue stick, show why the cue stick will not balance in this particular position shown in Fig. 3.1, when the force exerted by the two spring balances S_1 and S_2 are equal in magnitude.

[3]

(b) The cue stick is then placed vertically upright on its end at point A. State the type of equilibrium the cue stick is in. Explain your answer.

.....

.....

.....[2]

4 Fig. 4.1 shows a water manometer used to measure the pressure inside a gas pipe.

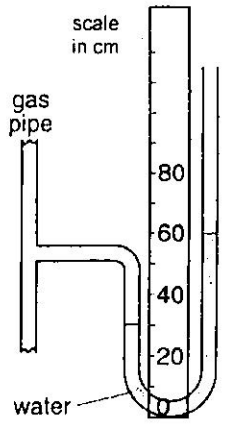


Fig. 4.1

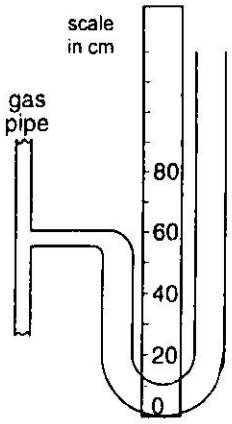


Fig. 4.2

(a) Explain how the manometer in Fig 4.1 shows that the pressure inside the gas pipe is greater than the atmospheric pressure.

.....

.....[1]

(b) The density of water is 1000 kg/m^3, the gravitational field strength is 10 N/kg and the atmospheric pressure is 10^5 Pa. Calculate the pressure of the gas inside the pipe.

gas pressure = ...
[3]

The manometer shown in Fig. 4.2 is connected to the same gas pipe at the same pressure as shown in Fig. 4.1.

(c) On Fig. 4.2, draw the levels of the liquid in the manometer if the manometer contains a liquid with density half that of water and has tubes with twice the diameter of the tubes in Fig. 4.1.

[1]

5 (a) When light travels from air into glass, it changes direction.
State and explain how two other physical quantites changes when light travels from air into glass.

1. .....

.....

2. .....

.....[2]

(b) On Fig. 5.1, draw a ray diagram to show how a converging lens is used as a magnifying glass.

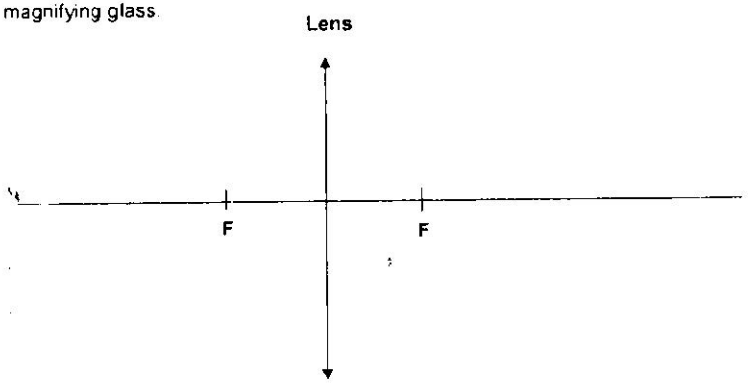


Fig. 5.1 [2]

(c) On Fig. 5.2, draw a ray diagram to show how a converging lens is used in an overhead projector.

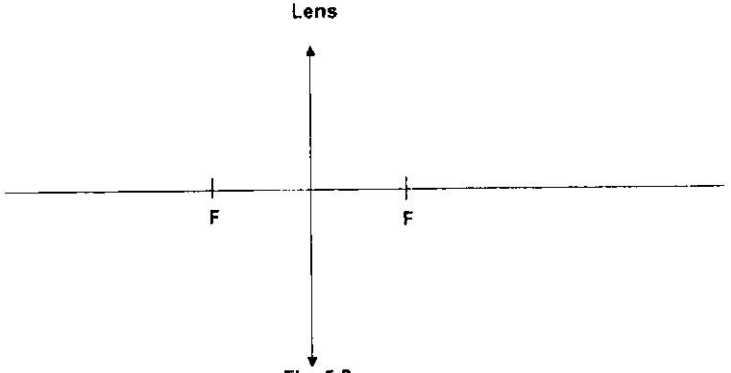


Fig. 5.2

[2]

6 A battery with an e.m.f. of 20 V is connected to three resistors, a light bulb, an ammeter and a voltmeter as shown in Fig. 6.1. A switch S is connected across points K and L.

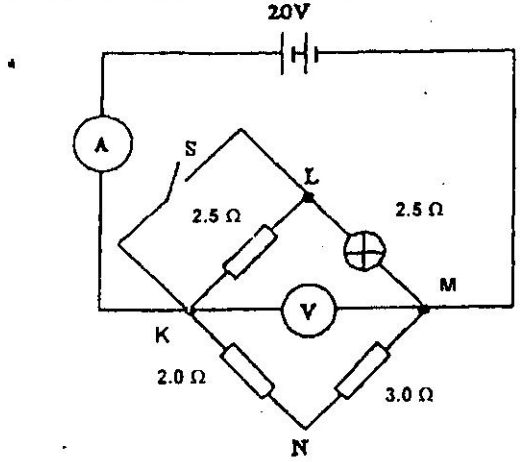


Fig 6.1

When the switch is closed,

(a) calculate the effective resistance of the entire circuit.

effective resistance = ... [2]

(b) determine the amount of current flowing through the light bulb.

current = ... [2]

(c) What will be the effect on the brightness of the bulb if the switch S is opened? Support your answer with numerical calculations.

.....

.....

.....

.....[2]

7 Fig. 7.1 shows part of the lighting circuit of a house.

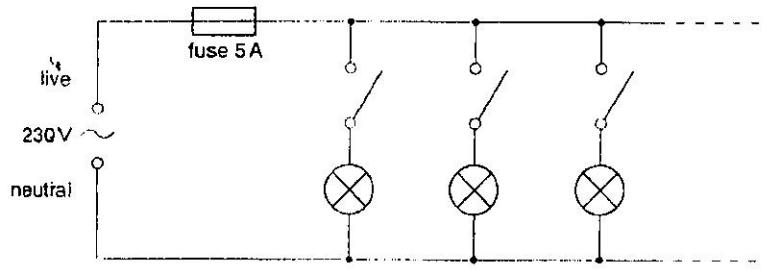


Fig. 7.1

(a) Explain why a fuse is included in the circuit.

.....

.....

.....[1]

(b) Explain why the fuse is placed on the live wire rather than on the neutral wire.

.....

.....

.....[1]

(c) Each lamp draws 250 mA from the power supply. The fuse has a rating of 5 A. Calculate the maximum number of lamps that can be connected and switched on without the fuse blowing.

maximum number of lamps = ...[1]

The table shows the maximum current that may be carried safely by wires of various diameter.

wire diameter / mm	maximum current / A
0.50	3
0.75	6
1.00	10
1.25	13
1.50	15

(d) From the table, select the smallest diameter of wire that can be used safely in wiring up the lighting circuit in the house.

.....[1]

(e) Explain why it is dangerous to use a wire thinner than that in **(d)**

.....

.....[1]

(f) Suggest a reason why the earth wire is not connected to the lighting circuit.

.....

.....[1]

8 Fig 8.1 below shows a simple a.c. generator.

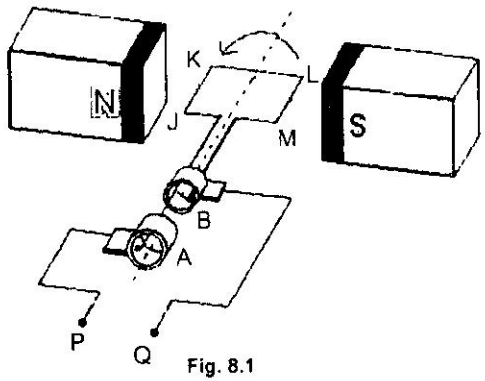


Fig. 8.1

(a) Explain how an electromotive motive force is formed across the terminals, PQ, as the coil rotates

.....

.....

.....[2]

(b) The coil of the generator makes 4 complete turns in one second. At this speed, the maximum induced e.m.f. is 0.4 V. Sketch a graph of induced e.m.f. against time for a time interval of 1s from the instant shown in Fig. 8.1. Label your axes appropriately.

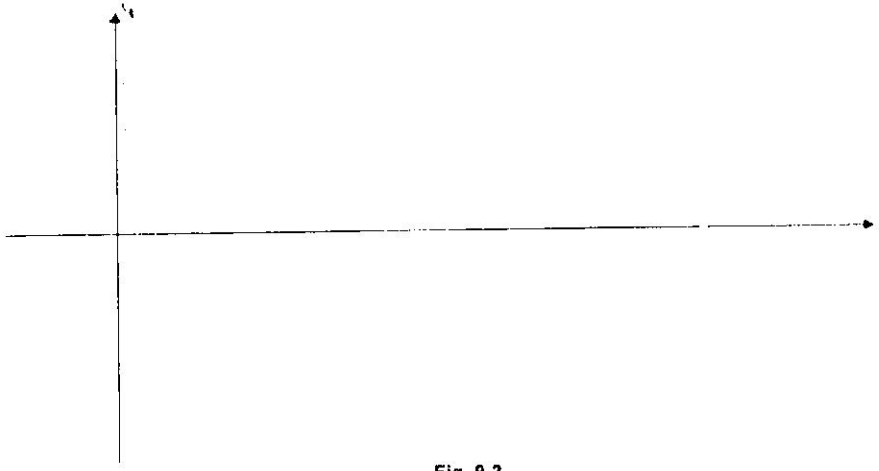


Fig. 9.2

[3]

(c) Without changing the frequency of the output waveform, state 2 ways to increase the maximum induced e.m.f.

1.....

.....

2.....

.....[2]

(d) On Fig. 8.1, indicate the direction of the induced current along JK.
Hence, indicate the polarity of the induced e.m.f. formed at the terminals, PQ, at that particular instant.

[2]

Name:	Index number:	Class:

Section B

Answer **all** the questions from this section.
Answer only one of the two alternative questions in **Question 11**.

9 Two blocks of mass 5 kg and 8 kg are attached and pulled on top of a table in the direction as shown in Fig. 9.1.

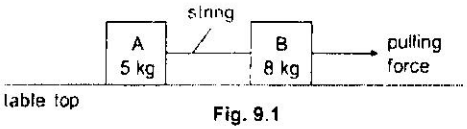


Fig. 9.1

The experiment is repeated on the same table but with a different pulling force. The velocity for both experiments is measured and tabulated in Fig. 9.2.

	velocity / cms^{-1}	
time / s	experiment 1	experiment 2
1	3	3
2	6	3
3	9	3
4	12	3
5	15	3

Fig. 9.2

(a) Explain why the velocity of the blocks in experiment 1 changes over time but remains unchanged in experiment 2.

.....

.....

.....

..... [2]

(b) Given that the friction between the table and block A is 2.0 N, calculate the tension in the string for experiment 1.

tension in string = ... [3]

(c) The blocks are now pulled by 2 forces, A and B, as shown in Fig. 9.3.

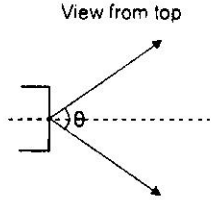


Fig. 9.3

Given that Force A = 1000 N, Force B = 1200 N and the angle θ between the forces is 80°, draw a scale diagram to determine the magnitude of the resultant force on the block.

scale = ...

resultant force = ... [5]

10 Fig. 10.1 shows an electric kettle.

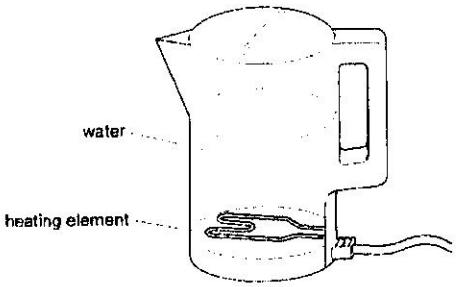


Fig. 10.1

(a) The specific heat capacity of water is 4200 J/kg°C.

Using this value for the specific heat capacity of water, describe an experiment to determine the electrical power of the kettle. You should state clearly how the readings are obtained and how the power is calculated. You may assume that the energy lost to the surrounding is negligible.

Suggested apparatus: kettle, thermometer, electronic balance, stopwatch.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

10 (b) Explain the meaning of "specific heat capacity of water is 4200 J/kg°C".

.....

.....

.....

.....[1]

(c) When the kettle is switched off, the water cools down as evaporation takes place. The latent heat of vaporisation is taken in by the water molecules as they leave the water surface.

(i) State one difference between boiling and evaporation.

.....

.....[1]

(ii) Explain how do the components of the internal energy of the water molecules change as they evaporates.

.....

.....

.....[2]

(d) The 2.5 kW electric kettle was containing 1.5 kg of water at 25.0 °C before it was switched on. It was switched on for 8 minutes.
Assuming there is no energy lost to the surrounding and the kettle, what is the mass of the water in the kettle at the end of the 8 minutes?
Specific latent heat of vaporisation of water is 2260 000 J/kg.

mass of water after 8 minutes = ...

[2]

11 **EITHER**

A lamp marked 6.0 V, 36 W is to be run from a power supply. The power supply can provide either direct current or alternating current.

To operate at normal brightness, the lamp needs an effective potential difference across it of 6.0 V.

(a) Explain what is meant by potential difference.

.....

.....[1]

(b) Determine the current through the lamp when it is operating normally.

current = ...

[2]

(c) Explain why the lamp should not be connected directly across a 10 V power supply.

.....

.....

.....[1]

Two students A and B suggest different ways to run the lamp at normal brightness using a 10 V power supply.

Student A suggests that the lamp is used with a series resistor R, as shown in Fig. 11.1.

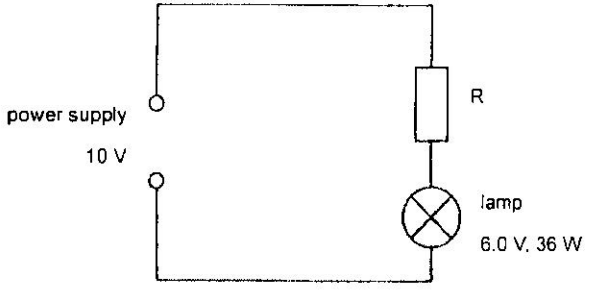


Fig. 11.1

(d) State values for the potential difference across resistor R and the current through it, when the lamp is at normal brightness.

Potential difference = ...

current = ...

[1]

Student B suggests that a transformer is used to transform the power supply voltage down to 6 V.

(e) Draw a labelled diagram of a transformer that could be used with a 10 V a.c. supply to operate the lamp normally. Suggest suitable values for the number of turns in each coil. Indicate these values clearly on your diagram.

[2]

(f) Explain how the transformer produces an output voltage.

.....

.....

.....[1]

(g) Suggest and explain which student, A or B, has the better solution.

.....

.....

.....[2]

OR

A student designs an electrical circuit to turn on a fan motor when the temperature is high. The motor is designed to operate normally from a 12 V supply, and has a resistance of 4.0 Ω.

The student's first design is shown in Fig. 11.2

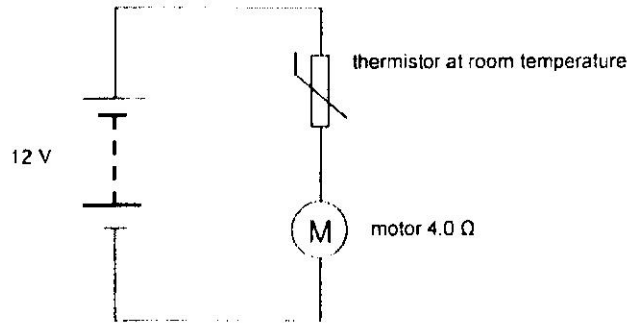


Fig. 11.2

(a) Describe and explain what happens to the current in the circuit when the temperature in the room rises.

.....

.....

.....[2]

(b) For the thermistor of resistance 500 Ω, calculate

1. the current in the circuit,
2. the potential difference across the motor.

current = ...

potential difference = ...

[3]

The student improves the design and uses a relay, as shown in Fig. 11.3.

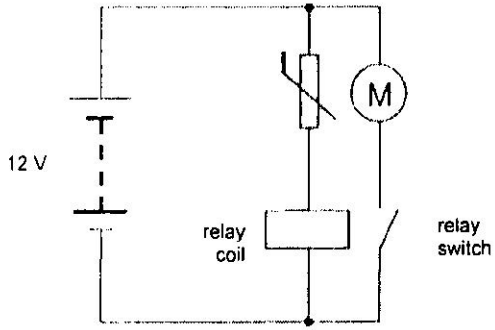


Fig. 11.3

(c) Explain how the motor is made to operate as the temperature rises.

.....

.....

.....[2]

The relay switches when the current through the relay coil is 0.10 A and the potential difference across the relay coil is 2.0 V.

(d) Calculate, for the conditions when the relay switches,

1. the potential difference across the thermistor,
2. the resistance of the thermistor.

potential difference = ...

resistance = ...

[2]

(e) Explain why the circuit in Fig. 11.3 is better than the circuit in Fig. 11.2.

.....

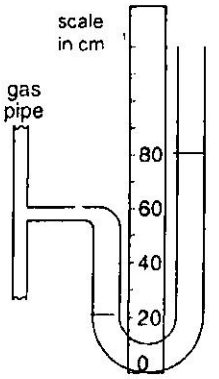
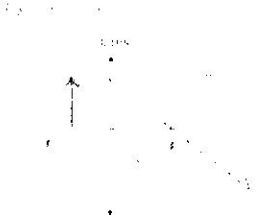
.....[1]

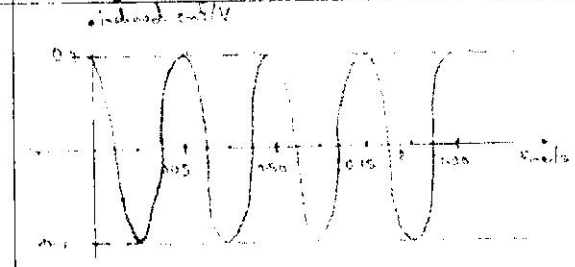
CHIJ SECONDARY (TOA PAYOH)
PRELIMINARY TWO EXAMINATION 2016
SECONDARY 4(EXPRESS)

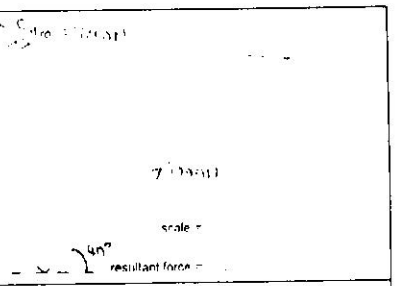
PHYSICS **5059/01**
Paper 1

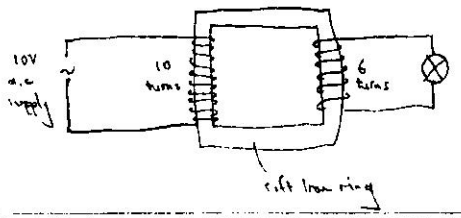
1	D	11	B	21	C	31	A
2	A	12	B	22	C	32	D
3	C	13	D	23	C	33	B
4	B	14	C	24	D	34	C
5	D	15	B	25	C	35	C
6	A	16	B	26	B	36	A
7	C	17	D	27	D	37	B
8	B	18	D	28	C	38	B
9	B	19	B	29	A	39	C
10	C	20	B	30	D	40	B

Paper 2 **5059/02**

Qn	Answers
1(a)	First 2 minutes, object is accelerating uniformly. Next 4 minutes, object is travel at constant velocity.
1 (b)	Acceleration = gradient of graph = 0-50/[2x60] = - 0.417 m/s^2 Deceleration = 0.417 m/s^2
1(c)	Distance = area under graph = ½ x[30+50]x[2x60] + ½ x 50 x[2x60] = 7.8 km
1(d)	Average speed = total distance / total time = 7800 / [4x60] = 32.5 m/s
2(a)	At his maximum speed, constant forward force = resistive force = 320 N. (resultant force = 0 N) From the graph, when resistive force is 320 N, speed is 8.4 m/s.
2(b)	Maximum K.E = ½ mv^2 Maximum K.E = ½ x 60 x 8.4^2 = 2120 J
2(c)	P.E at top = K.E at bottom mgh = 2116.8 60 x 10 x h =2116.8 h = 3.53 m
3(a)	Taking moment about X, Sum of clockwise moment = S_1 x [1.5-0.2-0.3-X] = S_1 x [1.0-X] Nm Sum of anti-clockwise moment = S_2 x X = S_2X Nm If S_1 and S_2 are equal, sum of clockwise moment will not be equal to sum of anti-clockwise moment. Hence, the cue stick will not balance.
3(b)	Unstable equilibrium When tilted slightly, the line of action of the weight will fall out of the small base area of the cue stick and cue stick will topple.
4(a)	The water level on the left side of the manometer exposed to the gas is much lower than the water level on the right side of the manometer exposed to the atmosphere.
4(b)	Pressure of gas = phg + atmospheric pressure = [1000x0.3x10] + 10^5 = 103000 Pa
4(c)	
5(a)	1. Speed of wave decreases as the wave is traveling through an optically less dense medium to an optically denser medium. 2. Wavelength of wave decreases as the speed decreases and frequency remains constant, wavelength will decrease..
5(b)	 - Dotted enlarged image behind object - Correct pair of rays passing through lens
5(c)	 - Correct pair of rays passing through lens - Correct real, diminished invert image
6(a)	Effective resistance = 1/[1/2.5 +1/5.0] = 1.67 Ω
6(b)	Current = I = V /R = 20 / 2.5 = 8 A
6(c)	When switch S is opened, voltage across bulb = 10 V Current through bulb = I = V / R = 10 / 2.5 = 4 A

	Since current is reduced when switch S is opened, brightness of bulb will reduce.
7(a)	The fuse is a safety device. When the current exceeds the fuse rating, the fuse wire will melt, protecting the electrical appliances and the user from damage and electrical shock.
7(b)	On the live wire, the fuse will be able to break open the circuit when the incoming current exceeds the safety limit, preventing it from entering the circuit to damage the electrical appliance. If placed on the neutral wire, the appliance may still be connected to the live wire even when the fuse has melted. Note: Unacceptable answer: "Fuse blow when current is too high or too large"
7(c)	Maximum number of lamps = 5/0.25 -1 = 19
7(d)	0.75 mm
7(e)	If a thinner wire (higher resistance) is selected and the maximum current flows through it, it might heat until the insulation starts to melt. The insulation might catch fire.
7(f)	Earth wire is not used in the lighting circuit as there are no metal casing used.
8(a)	When coil rotates between the magnetic poles, it will experience a rate of change of magnetic line of force linked with it. By Faraday's Law of Electromagnetic Induction, an induced e.m.f. is formed on the coil.
8(b)	 - Correct amplitude of 0.4 V - Correct period - 4 complete waves, starting from maximum value
8(c)	Any two: 1. Use stronger magnets 2. Increase the number of turns on the coil 3. Insert a soft iron core at the centre of coil.
8(d)	Current direction: K to J P is +, Q is -
	END OF SECTION A
9(a)	- In experiment 1, there is an resultant force. - In experiment 2, there is zero resultant force.
9(b)	$a = [v-u]/t = [15-3]/4 = 3\ cm/s^2$ T – Friction = Resultant Force T = 2 N + (5 kg)(0.03 ms^{-2}) T = 2.2 N
9(c)	- Appropriate scale - Correct resultant force with double arrow indicated - Correct vector triangle - Correct magnitude for resultant force = 1690 N

	
10(a)	- Place empty kettle on electronic balance. - Pour 1 kg of water into kettle. - Place thermometer into kettle. - Record initial temperature of water, θ_1 °C. - Switch on the kettle and start the stopwatch at the same time. - Record the time taken for the temperature of the water to increase by 10 °C, t s. - Power = Energy x time Power = mcθ x t = 1 x c 10 x t = 10ct W
10(b)	It means that 4200 J of energy is required to increase the temperature of 1 kg of water by 1 °C.
10(c)(i)	Any one: - Boiling is a fast process, evaporation is slow. - Boiling occurs throughout the liquid, evaporation occurs only at the surface of liquid. - Boiling requires a heat source, evaporation absorbs energy from the surrounding. - During boiling, bubbles are formed within the liquid. During evaporation, nothing visible happens.
10(c)(ii)	During evaporation, Kinetic energy of molecules remain constant. Potential energy of the molecules increases.
10(d)	Energy supplied by kettle = Power x time = 2500 x 8 x 60 = 1200 kJ Let m be the mass of water boiled into steam. Energy absorbed = mcθ + ml_v = 1200 kJ 1.5 x 4200 x [100-25] + m x 2260 000 = 1200 000 m = 0.322 kg Amount of water remaining = 1.5 – 0.322 = 1.18 kg
11	**EITHER**
11(a)	Potential difference is defined as the amount of work done in driving a unit charge through an electrical component.
11(b)	Current = Power / Voltage = 36 / 6 = 6 A
11(c)	If connected directly across the 10 V supply, the current drawn from the supply will be higher than the rated current. This might result in the breaking of the filament wire inside the lamp.
11(d)	Potential difference = 10 – 6 = 4 V Current = 6 A (Both answers must be correct to obtain the mark)

11(e)	$V_s / V_p = N_s / N_p$ $10 / 6 = N_s / N_p$ - Correct turn ratio - Primary and secondary coil wound around a soft iron ring with ac supply connected to primary coil and bulb connected to secondary coil. 
11(f)	When the a.c. supply is switched on, an alternating electromagnetic forms on the primary coil. By Faraday's Law of electromagnetic Induction, the secondary coil experience a rate of change of magnetic field lines link with it. Hence, an induced voltage is formed on the secondary coil.
11(g)	Student B's solution is better because it will reduce the amount of energy lost as heat as it does not require a resistor is connected in series with the lamp as shown in A's solution. **OR**
11(a)	- As temperature increases, the resistance of the thermistor decreases. - The current in the motor will start to increase.
11(b)	1. Current in the circuit = $I = V / R$ $= 12 / [500+4] = 23.8$ mA 2. Pd across motor = $V = IR = 23.8 \times 10^{-3} \times 4 = 95.2$ mV
11(c)	- As temperature rises, resistance of thermistor decreases. - Current through the relay coil increases until it reaches a level that would activate the relay switch. - When activated, the relay switch will switch on the motor.
11(d)	1. Pd across thermistor = $12 - 2 = 10$ V 2. Resistance of thermistor = $R = V / I = 10 / 0.10 = 100\ \Omega$
11(e)	Fig 11.3 is better because when the relay switch is activated, the pd across the motor is 12 V, which is required for the motor to work normally. In Fig 11.2, when motor is switched on, the pd across the motor will be lower than 12 V.
	END OF PAPER 2