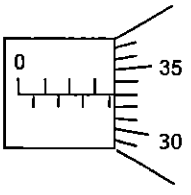
CHUNG CHENG YISHUN

Section A [40 marks]

1 What is the reading of the micrometer screw gauge?

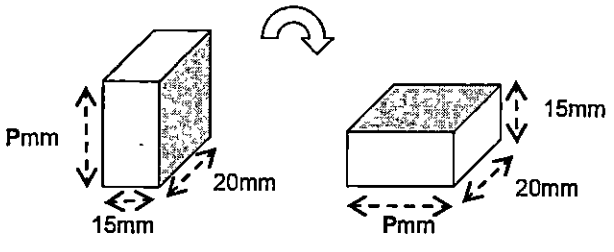


A 3.33 mm
B 3.83 mm
C 4.33 mm
D 4.83 mm

2 An object is launched from the Earth into an orbit.
What happens to the density and the weight of the satellite ?

	Density	*Weight*
A	stays constant	stays constant
B	stays constant	decreases
C	decreases	stays constant
D	decreases	decreases

3 A block of metal is shown below standing on the floor. It is than turned onto one of its longer faces.



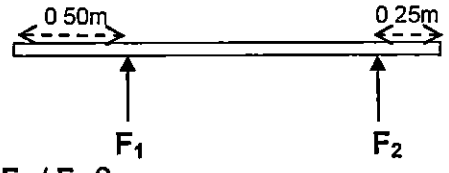
If the pressure between the block and the floor is reduced by 4 times as a result, what is the length of P ?

A 40 mm
B 60 mm
C 75 mm
D 80 mm

4 An aircraft moves to the start of the runway at 5.0ms^{-1} and from this speed it accelerates at 8.0ms^{-2} for the 10s until it takes off. What is the length of the runway ?

A 85 m
B 320 m
C 400 m
D 450 m

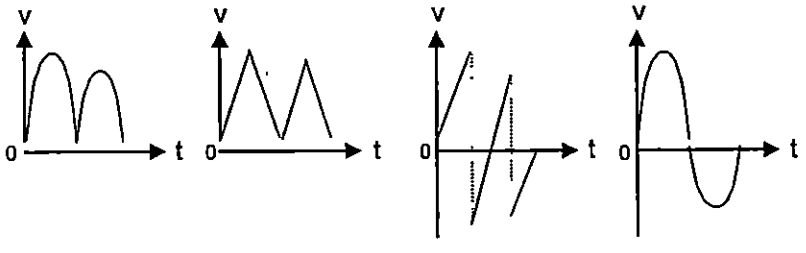
5 A heavy uniform plank of length 2.0m is supported by 2 forces F_1 and F_2 at 2 points of distance 0.25m and 0.50m from both ends of the plank as shown in the diagram below.



What is the ratio of F_1 / F_2 ?

A 2 / 1
B 3 / 2
C 5 / 2
D 15 / 4

6 Assuming **negligible air resistance,** which of the following most likely show the velocity-time graph for a bouncing ball ?

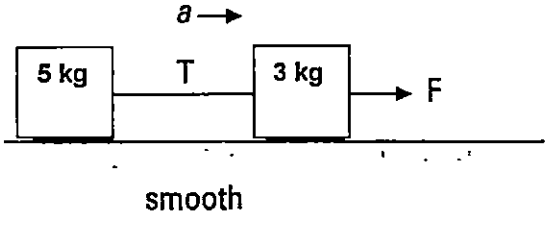


A B C D

7 When a wooden box of mass 10 kg was pushed along a floor with a force of 40N, it moved with a constant speed of 0.4 m/s. When the box was pushed along the same floor with a force of 100 N, it moved with a constant _____.

A speed of 4.0 m/s.
B speed of 6.0 m/s.
C acceleration of 0.6 m/s^2.
D acceleration of 6.0 m/s^2.

8 A force F pulls two blocks connected by a string as shown below:

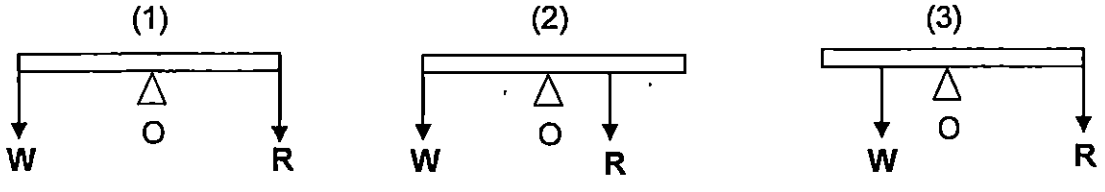


If the blocks are moving with **acceleration of 2 m/s^2**, find the **force F** and **the tension T** in the string,

A F = 10N, T = 16N
B F = 16N, T = 10N
C F = 10N, T = 10N
D F = 16N, T = 16N

9 In the following figures, the metre rule is pivoted at the middle **O**. A fixed weight **W** is loaded on one side and a **variable** weight **R** is loaded on the other side in order to balance the rule horizontally.

Arrange the magnitude of the reaction force at **O** in **descending** order ?

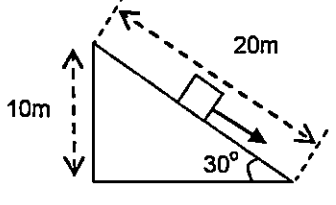


A (1),(2),(3)
B (1),(3),(2)
C (2),(1),(3)
D (2),(3),(1)

10 A block of mass 4kg slides from rest through a distance of 20m down a frictionless slope, as shown in the diagram.

What is the speed of the block at the bottom of the slope?

A 8m/s
B 10m/s
C 12m/s
D 14m/s



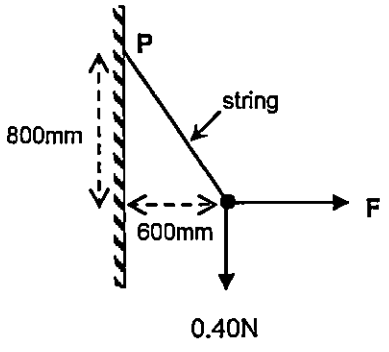
11 If a boy of mass 90kg takes 3 minutes to run up a flight of 60 steps of height 20cm each, what is his average power?

A 60W
B 360W
C 3600W
D 6000W

12 A small pendulum bob , weight 0.40N, is suspended by a string from a point **P**. The bob is drawn aside by a horizontal force **F**, as shown in the diagram, so that the string makes an angle with the vertical. The bob remains at rest in this position.

What is the magnitude of the force F?

A 0.13N
B 0.25N
C 0.30N
D 0.53N

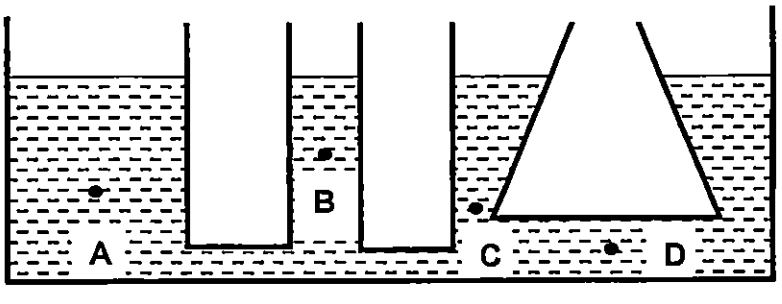


13 The volume of a constant mass of gas in a cylinder is increased at constant temperature.

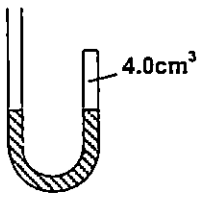
The pressure exerted by the molecules of the gas decreases because

A the density of the gas decreases.
B the gas molecules collide with each other less often.
C the gas molecules strike the cylinder walls less often.
D there is a smaller area of cylinder in contact with the gas.

14 The diagram shows a container with openings of different shapes filled with a liquid. Which of the points **A** to **D** has the greatest pressure ?



15 A J-shaped tube below contains 4.0cm^3 of air trapped by mercury at the same level in both arms of the tube. The atmospheric pressure is equivalent to 76cm of mercury.

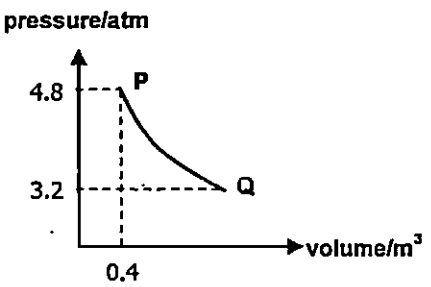


If more mercury is poured into the open tube until the volume of air trapped is 3.8cm^3, what is the eventual difference in the mercury levels ?

A 3.80cm
B 4.00cm
C 5.20cm
D 8.00cm

16 The graph below shows the changes of pressure and volume of a fixed mass of gas. **PQ** represents a change taking place at constant temperature of 30°C.

What is the volume of **Q** ?



A 0.26 m^3
B 0.38 m^3
C 0.60 m^3
D 1.28 m^3

17 When ice changes into water at 0°C,

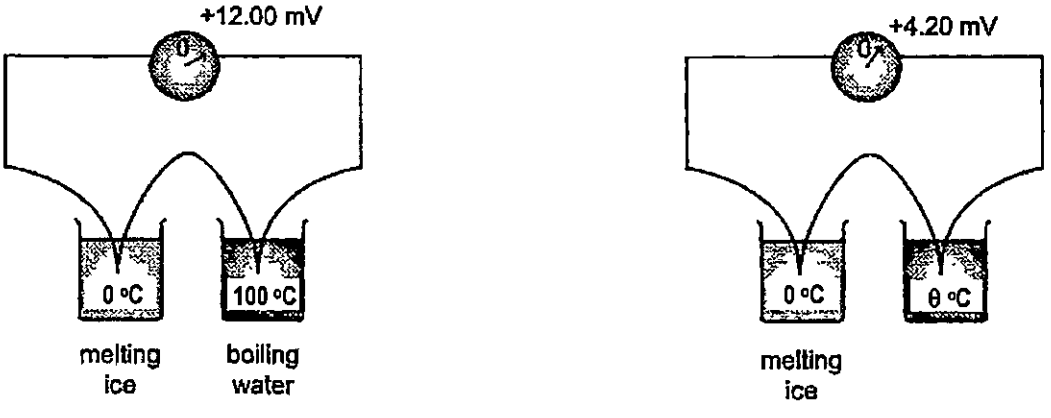
I work is done in breaking the molecular structure of ice in solid state.
II internal energy is increased.
III energy is absorbed to raise the temperature.

A I only
B II only
C I and II only
D I, II and III

18 A gas **Y** expands linearly with temperature change. If the volume is $25cm^3$ when the temperature is -10°C and $50cm^3$ when the temperature is 190°C, what is the temperature when the volume indicates $60cm^3$?

A 180°C
B 200°C
C 250°C
D 270°C

19 The figure below show a thermocouple set up with the cold junction placed in melting ice at 0°C. When the hot junction is placed in boiling water, the e.m.f. measured is 12 mV. When the hot junction is placed in liquid with temperature θ, the e.m.f. measured is 4.20 mV. What is the temperature of the liquid?



A 3.5 °C **B** 35.0 °C **C** 50.4 °C **D** 286 °C

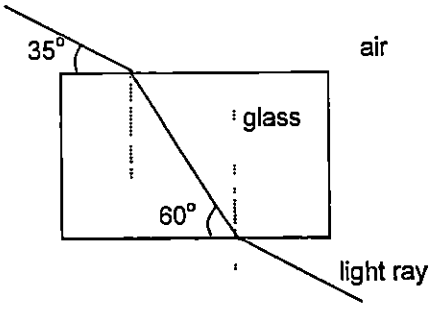
20 Two different liquids, **P** and **Q** with the same mass and initial temperature, are heated by the same heat source. Liquid **P** reaches a temperature of 80°C faster than liquid **Q**. This shows that _____.

A liquid **P** has a higher specific heat capacity than liquid **Q**.
B liquid **P** has a lower specific heat capacity than liquid **Q**.
C liquid **P** has a higher specific heat of vapourisation than liquid **Q**.
D liquid **P** has a lower specific heat of vapourisation than liquid **Q**.

21 In the process of convection, energy is transferred _____.

A because of temperature differences.
B because of density differences in a fluid.
C by the diffusion of molecules through a fluid.
D by the vibration of molecules about a mean position.

22 Light is incident on a rectangular block of glass as shown in the diagram below.



What is the refractive index of the glass ?

A 0.66
B 0.94
C 1.51
D 1.64

23 Which of the following statement is **true** about **R** in the following electromagnetic spectrum?

Radiowave	**P**	**Q**	Visible light	**R**	**S**	Gamma ray

A It comes from radioactive materials.
B It has the shortest wavelength.
C It is given out by a hot object.
D It causes tanning of the skin.

24 Water waves were produced in a ripple tank using a vibrator of frequency 4Hz. Which of the following values of speed and wavelength could the waves have had ?

	speed (m/s)	***wavelength(m)***
A	4	2
B	8	4
C	6	4
D	16	4

25 A marine survey ship sends a sound wave straight to the sea bed. It receives an echo 1.5s later. The speed of the sound in sea water is 1.5km/s. How deep is the sea at this position?

A 500 m
B 1000 m
C 1125 m
D 2250 m

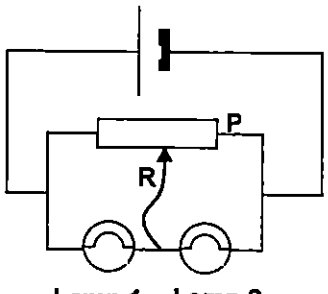
26 When an ebonite rod is rubbed with a duster, the rod becomes negatively charged. The reason is because _____.

A the duster gains protons.
B the duster loses electrons.
C the rod gains protons.
D the rod loses electrons.

27 A wire has a current of 500mA in it. How much charge passes a point in the wire in 3 minutes ?

A 25 C
B 90 C
C 167 C
D 1500 C

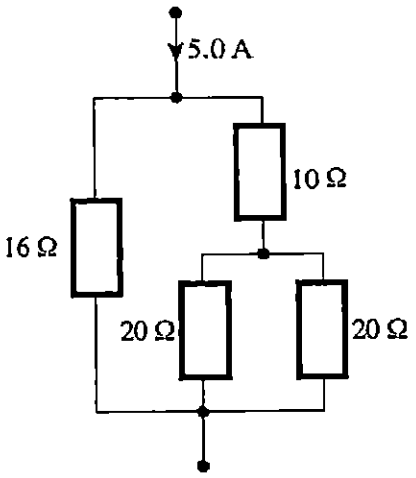
28 The diagram below shows a potential divider circuit.



What happens to the brightness of the lamps as the contact, **R**, is moved towards the P on the potential divider ?

	Lamp 1	*Lamp 2*
A	brighter	brighter
B	brighter	stays same
C	brighter	dimmer
D	dimmer	brighter

29 The following diagram shows part of a complete circuit. What is the current through the 16 Ω resistor?



A 1.11 A **B** 1.39 A **C** 2.22 A **D** 2.78 A

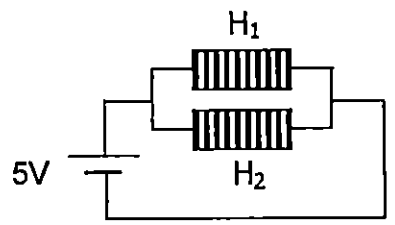
30 An electric heater converts 300kJ of electrical energy from a 250V supply in 5 minutes when operating normally.

What is the current used by the heater ?

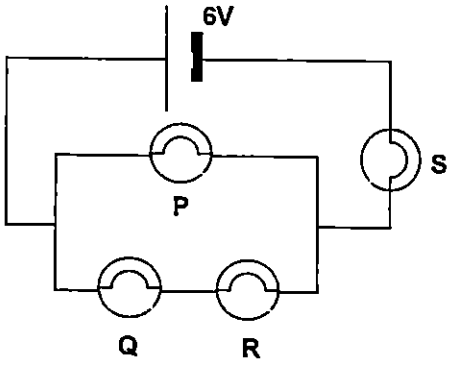
A 3.5 A
B 4.0 A
C 6.0 A
D 7.5 A

31 The diagram below shows a 10V, 50W heater H_1 connected in parallel to a 10V, 25W heater H_2. If P_1 and P_2 are the powers dissipated H_1 in H_2 and respectively. Which is correct ?

	P_1	P_2
A	50W	25W
B	25W	50W
C	25W	12.5W
D	12.5W	6.25W



32 The circuit below shows 4 identical light bulbs connected to a 6V battery. Which of the bulb(s) is(are) the dimmest ?



A S only
B P only
C Q and R only
D P, Q and R only

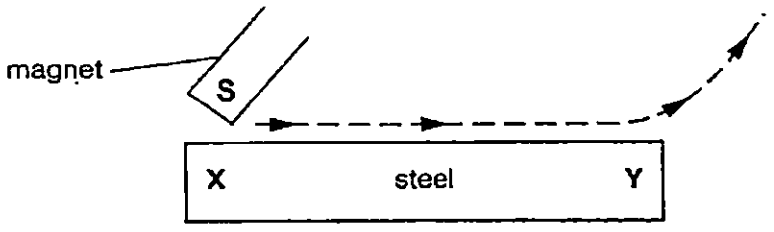
33 Which of the following changes to a wire will increase its resistance by four times ?

	Diameter	*Length*
A	double	double
B	halve	no change
C	no change	halve
D	halve	double

34 Electricity cost 15 cents per kilowatt-hour. What is the cost of using a 900W hi-fi set for 45 minutes?

A 10 cents
B 15 cents
C 25 cents
D 45 cents

35 A piece of steel can be magnetised by stroking it with a magnet.



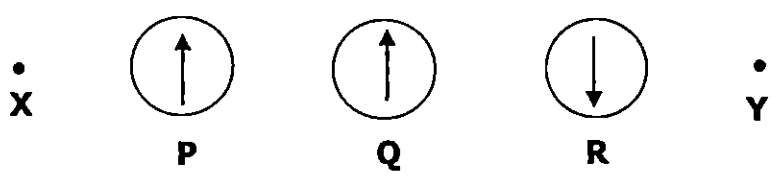
When the magnet is moved in the direction shown, which poles are produced at **X** and at **Y**?

	X	Y
A	north	north
B	north	south
C	south	north
D	south	south

36 Which of the following proves that a piece of metal is already a magnet?

A A magnet is attracted to it.
B A copper wire is attracted to it.
C Both ends of a compass are attracted to it.
D One end of the compass needle is repelled by it.

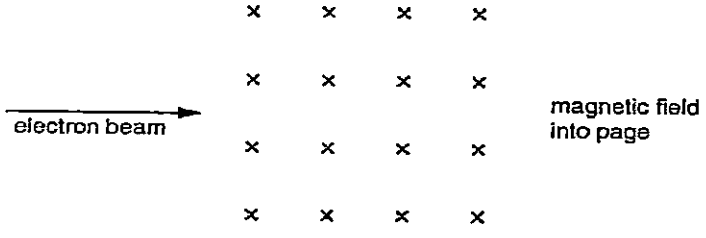
37 X and Y are wires carrying electric currents at right angles to the paper. P, Q and R are plotting compasses. Q is placed mid way between X and Y. Any effect of the earth magnetic field has been ignored.



What is true about the direction and size of the currents?

	Direction of currents	Size of currents
A	Same	Larger in X than in Y
B	Same	Same in X as in Y
C	Same	Smaller in X than in Y
D	Different	Larger in X than in Y

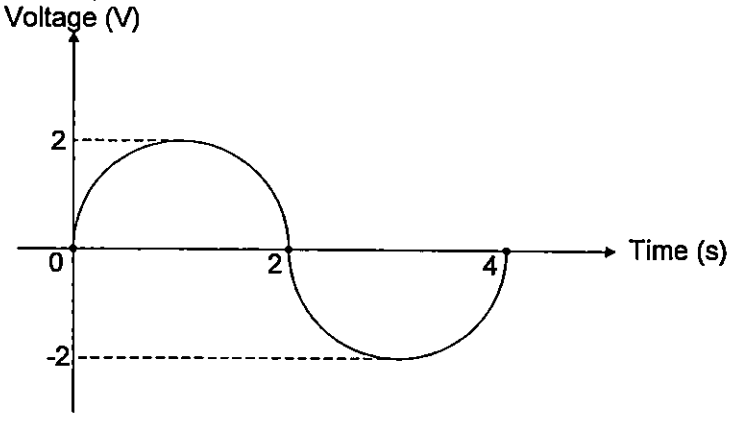
38 The diagram below shows a beam of electrons entering a magnetic field. The direction of the field is into the page.



What will be the initial direction of the deflection of the electrons as the beam passes?

A Down towards the bottom of the page
B Up towards the top of the page
C Into the page
D Out of the page

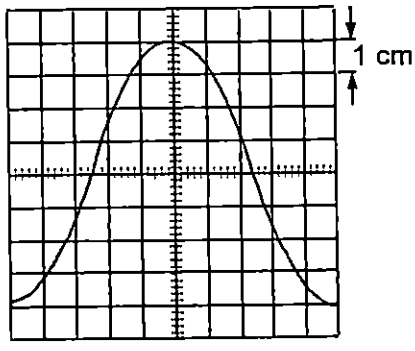
39 A simple a.c. generator produces a voltage which varies with time as shown in the graph below.



Which of the following reflects how the correct voltage varies with time when the generator rotates at half the original speed?

	Maximum Voltage (V)	Frequency (Hz)
A	1	0.125
B	1	0.50
C	4	0.125
D	4	0.50

40 The diagram shows a waveform obtained on a CRO screen with a peak value of 1 V, 50 Hz a.c. input.



What is the setting of the Y-gain control? What is the time-base setting?

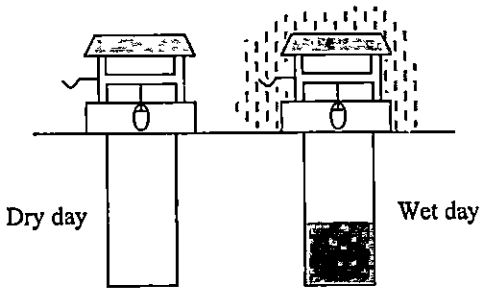
	Y-gain setting	Time-base setting
A	0.25 V/cm	2 ms/cm
B	0.50 V/cm	4 ms/cm
C	1.00 V/cm	2 s/cm
D	4.00 V/cm	10 s/cm

- End of Paper -

SECTION A [50 marks]

Answer all of the following questions in the spaces provided

1. (a) When a well is dry, a stone dropped from rest at the top takes 4.0 s to hit the bottom (Assuming there is negligible air resistance).



(i) What is the speed of the stone just before hitting the bottom of the well? [2]

(ii) What is the depth of the well? [2]

(iii) On a day when there is some water in the well, a stone dropped from rest at the top takes 2.0 s before hitting the water surface. How deep is the water in the well? [2]

(b) A soccer player accelerates a 0.50-kilogram soccer ball by kicking it with a net force of 5.0 N.

(i) Calculate the magnitude of the acceleration of the ball. [2]

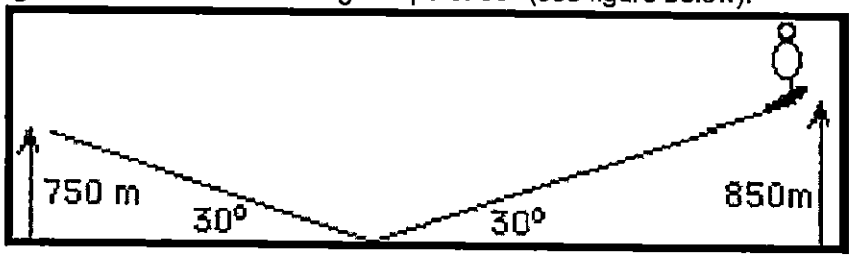
(ii) Suggest the magnitude of the force applied by the player's foot on the soccer ball if [2]

1. there is no air resistance. .....

2. the air resistance acting on the ball is 1.0 N.

.....

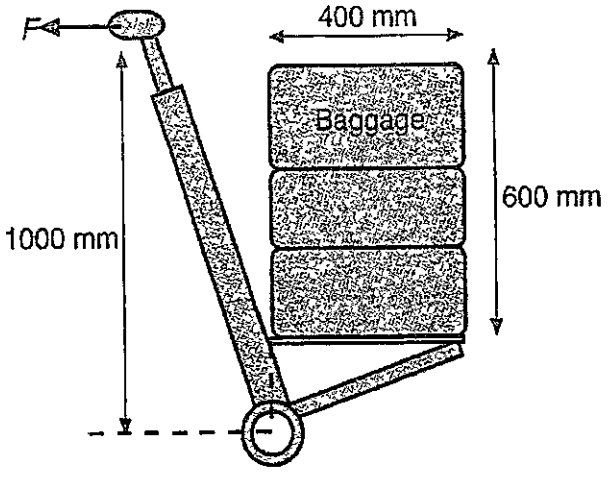
2. Two snowy peaks are 850 m and 750 m above the valley between them. A ski run extends from the top of the higher peak and back up to the top of the lower one, a total length of 3.2 km and an average slope of 30° (see figure below).



(a) A 80 kg skier starts from rest on the higher peak. At what speed will he arrive at the top of the lower peak if he just coasts without using the poles? Ignore friction. [3]

(b) Now consider the effects of friction on the skier. If the skier arrives at the top of the 750 m hill with no kinetic energy, what amount of energy has been dissipated by friction? [1]

3. An airplane passenger places his baggage, of mass 60 kg, onto a trolley as shown below. He applies a force F at the handle to raise the cases to the horizontal position shown. (Acceleration due to gravity = 10 Nkg^{-1})

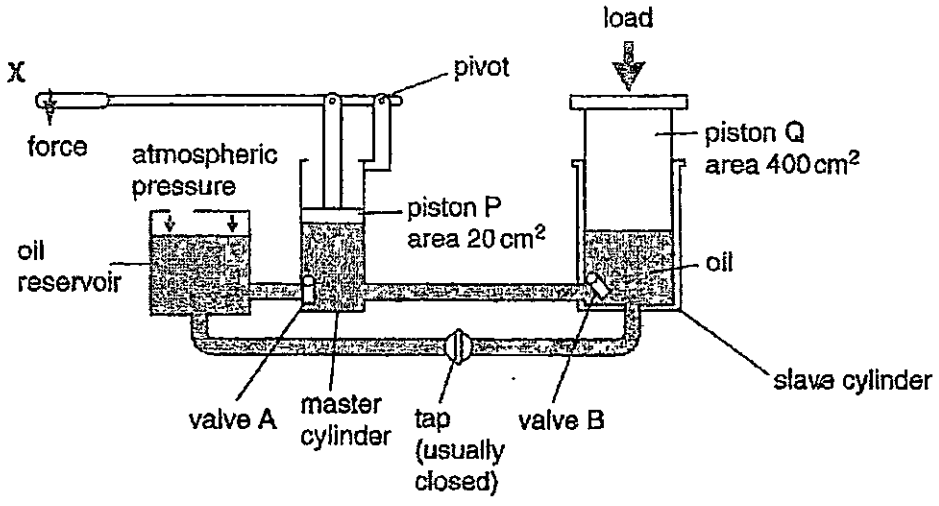


(a) On the diagram, draw an arrow to represent the weight W of the luggage. [1]

(b) The axle of the wheels acts as a pivot. Calculate the moment of the weight of the luggage about this axle. [2]

(c) Calculate the force F required on the handle to keep the luggage horizontal as shown. [2]

4. The figure below shows a hand – operated hydraulic press.



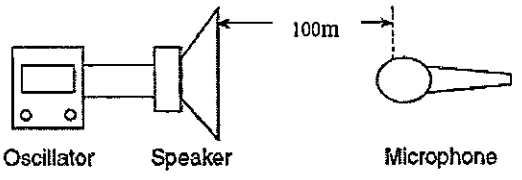
A force is applied downwards at **X** as shown. When piston P moves downwards, valve A closes, valve B opens and oil is forced through to raise piston Q in the slave cylinder.

(a) The area of piston P is 20cm^2 and the area of piston Q is 400 cm^2. Piston P exerts a downward force of 400N on the oil.
Calculate the pressure in N/cm^2, exerted by piston P on the oil. [2]

(b) State the value of the pressure in the slave cylinder [1]

(c) Calculate the force exerted by the oil on piston Q. [2]

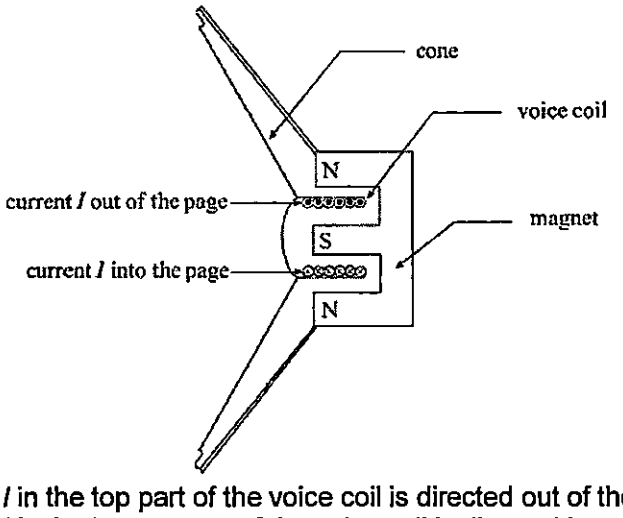
5. (a) A system consists of an C.R.O. and a speaker that emits a 1,000 hertz sound wave. A microphone detects the sound wave 100 meter from the speaker.



(i) Which type of wave is emitted by the speaker? [1]

(ii) The microphone is moved to a new fixed location 0.50 meter in front of the speaker. What is the main difference shown in the C.R.O. display and, why? [2]

(b) The main components of a moving-coil loudspeaker are shown in the diagram below:

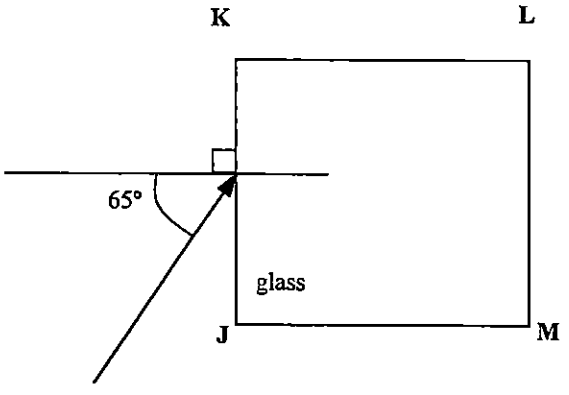


The current *I* in the top part of the voice coil is directed out of the page. The current *I* in the bottom part of the voice coil is directed into the page.

(i) State the direction of the electromagnetic force acting on the voice coil when the current is in the direction shown. [1]

(ii) State *one* quantity that may be changed to increase the electromagnetic force acting on the voice coil. [1]

6. The figure below shows a square block of glass **JKLM** with a ray of light incident on side **JK** at an angle of incidence of 65°. The refractive index of the glass is 1.50.

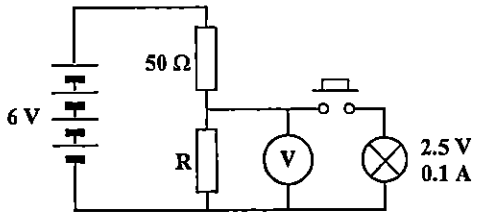


(a) Calculate the angle of refraction of the ray. [2]

(b) Calculate the critical angle for a ray of light in this glass. [2]

(c) Explain why the ray shown in the figure cannot emerge from side KL but will emerge from side LM. [3]

7. A pupil studying potential dividers sets up the circuit as shown in the diagram below. The bulb has the rating of 2.5 V, 0.1 A



When the switch is not pressed the voltmeter shows a reading of 2.5 V.

(a) (i) What is the potential difference across the 50 Ω resistor? [1]

(ii) Calculate the current in the 50 Ω resistor. [1]

(iii) Calculate the value of R. [1]

(b) The pupil now closes the switch.

(i) Explain why the reading shown on the voltmeter reduces. [1]

(ii) Calculate the reading shown on the voltmeter when the switch is closed. [3]

8. Figure 8.1a shows a positively charged conducting rod put near an uncharged light ball suspended at the end of an insulating thread. The surface of the ball has been coated with conducting paint. Figure 8.1b shows what happens after the ball has been allowed to touch the rod.

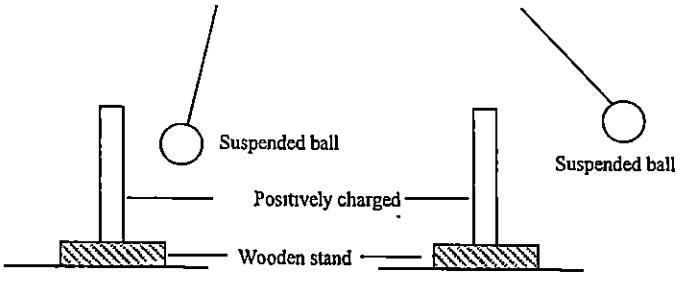
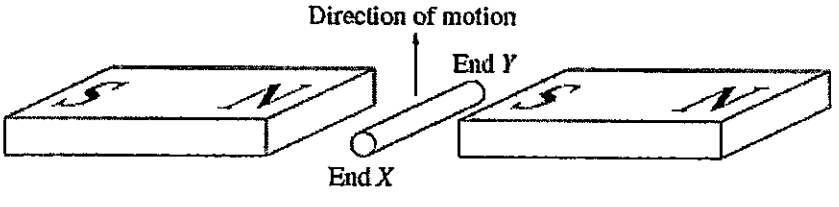


Figure 8.1a Figure 8.1b

(a) (i) Explain why in Figure 8.1a, the ball is displaced from the vertical. [2]

(ii) Explain what happens after the ball has been allowed to touch the rod [2]

(b) When the metal rod, which is connected to a circuit, is moved upwards through the magnetic field as shown in the diagram, an emf is induced between the two ends.



(i) State the direction of current flow in the rod. [1]

(ii) Explain how the emf is produced in the rod. [2]

SECTION B [30 marks]

Answer 3 questions in this section. Questions 9 and 10 are compulsory. Choose EITHER Question 11 OR Question 12 to answer.

9 (a) State what is meant by specific latent heat of fusion of ice. [2]

_____

_____

_____

(b) A student performed an experiment using the apparatus as illustrated in Fig. 9.1.

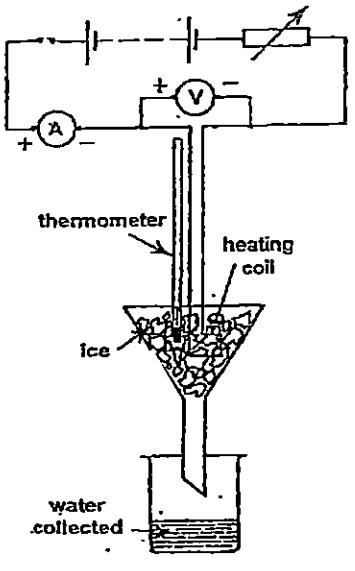


Fig 9.1

A heating coil was placed in a filter funnel and surrounded by lumps of ice. The potential difference V across the heater and mass m of water collected in time t of 500 s were measured for various values of the heater current I.

The values were recorded and a spreadsheet was used to make calculations as shown in table below.

	A	B	C	D	E
No.	Potential difference, V / V	Current, I / A	Mass of water collected, m / g	Time taken, t / s	Thermal energy supplied / J
1	4.0	2.0	14.9	500	4000
2	6.0	3.0	29.8	500	9000
3	7.0	3.5	39.5	500	12250
4	8.0	4.0	50.6	500	

(i) Explain how the values for the thermal energy supplied by the heating coil in column E were calculated from the relevant columns in the table [1]

(ii) Calculate the thermal energy supplied when the mass of the water collected was 50.6 g. [2]

(iii) The student wishes to find out the value of the specific latent heat of fusion of ice. He chose the values from row 4 to do the calculation. Write down the energy equation that will help him get started. (You should define symbols that are used in the equation.) [1]

(iv) Hence, determine the value of the specific latent heat of fusion of ice. [2]

(v) Later, the student discovered that all four values of the specific latent heat of fusion of ice calculated from each row of data were less than actual value of 336J/g. Suggest a reason to explain the discrepancy. [2]

10 (a) An appliance is connected to the *live*, *neutral* and *earth* conductors of the mains supply. The current in the circuit is 4.0 A and the rating of the fuse is 5 A Explain what is meant by [2]

(i) *live*

(ii) *neutral*

_____

(b) When a fault occurs in the appliance, no damage or injury is caused provided that the correct fuse is used and the metal case is connected to earth. Explain why there is a risk of damage or injury if [2]

(i) the 5 A fuse was replaced by a 30 A fuse.

_____

_____

(ii) the earth was *not* connected to the metal case. [2]

_____

_____

(c) State *one* advantage of using a circuit breaker rather than a fuse to protect the appliance. [1]

_____

_____

(d) Describe, with the aid of a diagram, an experiment to check that a fuse blows at 5 A. [3]

EITHER

11 A small wind-powered generator is placed on a hill above a campsite It is connected to a caravan on the site by a pair of cables, each 160 m long. Fig. 11.1 shows how a pair of transformers has been included to raise the efficiency of this transmission system.

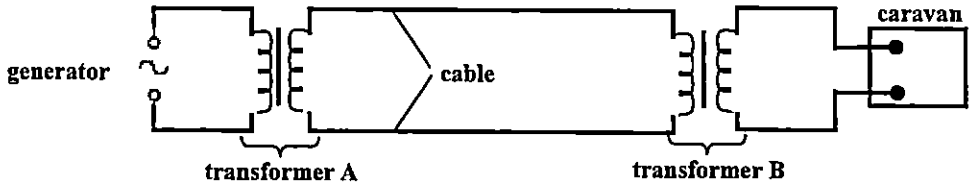


Fig. 11.1

[1]

(a) From Fig. 11.1, state the name of the transformer which you think would be a step-down one.

(b) The step-down transformer has 1 000 turns of wire on its primary coil and 50 turns on its secondary coil and it can be assumed as ideal. The caravan requires an a.c. power supply with a potential difference of 24 V and a current of 16 A.

For the primary coil of the step-down transformer, calculate

(i) the potential difference across it, [2]

(ii) its current, [2]

(iii) the rate at which electrical energy is being delivered. [1]

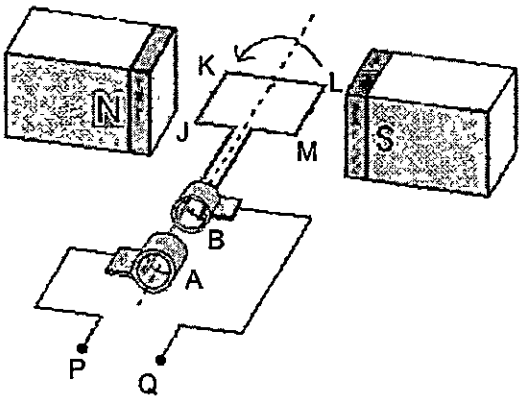
(c) Each cable has a resistance per unit length of 0.120 Ωm^{-1}. Calculate the total rate at which electrical energy is transferred to heat energy in the two cables. (Correct your answer to 3 significant figures.) [2]

(d) Calculate the output power of the secondary coil in transformer **A**. (Correct your answer to 3 significant figures.) [1]

(e) State the advantage of doubling the number of turns of wire on the secondary coil in transformer **A**. [1]

OR

12 The diagram below shows a simple a.c. generator.



(a) Explain: [1]

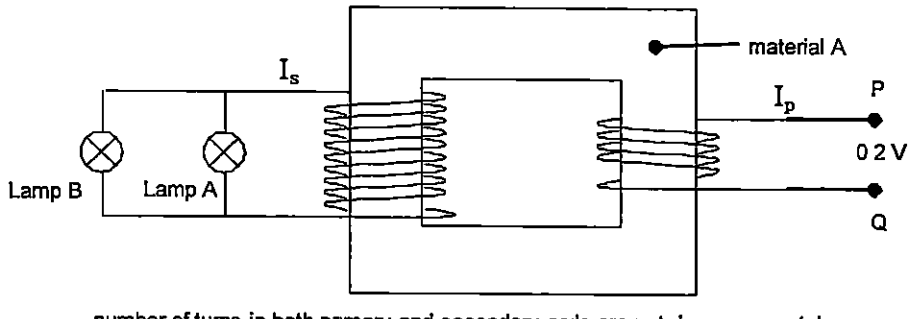
(i) the function of the slip-rings A and B,

(ii) why an emf is induced in the coil as it rotates [1]

(b) State and explain the direction of induced current created in coil J-K-L-M as it rotates anti-clockwise. [2]

(c) The coil of the generator rotates 100 times per second. At this speed, the maximum induced emf is 0.2 V. Sketch a graph of emf against time for a time interval of 20 ms from the instant shown above. Label your axes clearly. [2]

(d) The ends P and Q are connected to a step-up transformer that is 100% efficient. The diagram below shows the setup for the transformer connected to identical lamps rated at 2V, 10W each.



number of turns in both primary and secondary coils are not drawn accurately

(i) Explain why material A cannot be made from steel. [1]

(ii) If both lamps are operating at optimum brightness, calculate the currents in both primary and secondary circuits, I_p and I_s [3]

END OF PAPER

CCHY Pure Physics Prelim P1 MS

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

Physics Prelim 2 Paper 2 Marking Scheme

Section A

1(a)(i)

$$a = \frac{v-u}{t}$$

$$10 = \frac{v-0}{4} \qquad [1]$$

$$v = 40m/s \qquad [1]$$

1(a)(ii)

$$d = \frac{1}{2} \times 4 \times 40 \quad [1]$$

$$= 80m \qquad [1]$$

1(a)(iii)

$$d = \frac{1}{2} \times 2 \times 20 \quad [1]$$

$$= 20m$$

$$depth = 80 - 20 = 60m \quad [1]$$

1(b)(i)

$$a = \frac{F_{net}}{m}$$

$$a = \frac{5.0\text{N}}{0.50\text{kg}}$$

$$a = 10.\ \text{m/s}^2 \text{ or } 10.\ \text{N/kg} \quad [1]$$

1(b)(ii)

1. 5.0N [1]
2. 6.0N [1]

2(a)

$mgh = ½\ mv^2 + mgh$

$(10)(850) = ½\ v^2 + 750$ [1]

$V^2 = 2000 \rightarrow$ [1] so, $v = 44.7ms^{-2} \rightarrow$ [1]

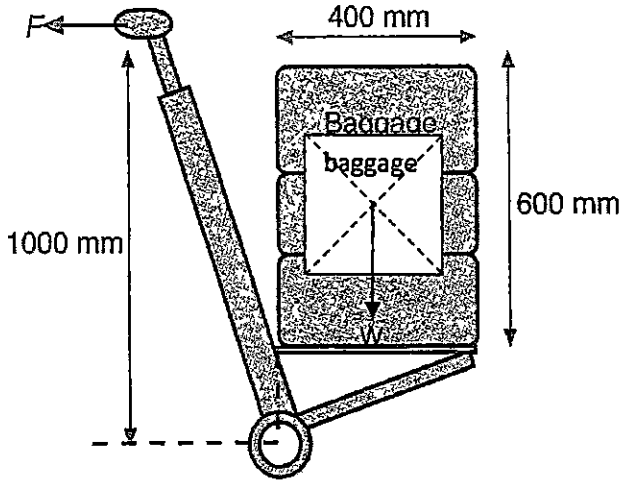
2(b)

$mgh_1 = mgh_2$ + energy lost due to friction (E_{lost})

$E_{lost} = 80(10(850) - 80(10)(750)$ [1]

$E_{lost} = 80kJ$ [1]

3(a)



[1]

3(b)

W = mg

= 60 x 10 = 600 N [1]

M= Fd

= 600 x 0.2

= 120 Nm [1]

3(c)

F x 1 = 120 [1]

F = 120 N [1]

4(a)

P = F/A = 400/20 [1] =20 N/cm^2 [1]

4(b)

20 N/cm^2

4(c)

F= PA = 20 x 400 [1]

= 8000 N [1]

5(a)(i)

Longitudinal wave [1]

5(a)(ii)

The waveform captured by the CRO will have a larger amplitude [1] as the sound will be louder. [1]

5(b)(i)

Towards the right [1]

5(b)(ii)

The magnitude of current can be increased. [1]

6(a)

$1.50 = \sin i / \sin r$

$= \sin 65° / \sin r$ [1]

$r = \sin^{-1}(\sin 65° / 1.5)$

$= 37.2°$ [1]

6(b)

$n = 1/ \sin c$

$1.5 = 1/ \sin c$ [1]

$c = \sin^{-1}(1/1.5)$

$= 41.81... = 41.8°$ [1]

6(c)

At the boundary KL, the angle of incidence is greater than the critical angle [1], therefore the light ray cannot emerge from KL but will undergo total internal reflection [1].

At boundary LM, the angle of incidence is less than critical angle, therefore the ray will be refracted [1] and emerged from LM.

7(a)

(i) $V = 6 - 2.5 = 3.5V$ [1]

(ii) $I = \frac{3.5}{50} = 0.07A$ [1]

(iii) $R = \frac{2.5}{0.07} = 35.7\Omega$ [1]

7(b)(i)

When the switch is closed, the total resistance connected in parallel will be lesser than the original R value, thus the voltage reading will drop [1].

7(b)(ii)

$R_{bulb} = \frac{2.5}{0.1} = 25\Omega$ [1]

$\frac{1}{R_T} = \frac{1}{140} + \frac{1}{25} = \frac{5}{140}$ [1]

$R_T = 21.2\Omega$

$V_R = \frac{21.2}{100 + 21.2} \times 6 = 1.05V$ [1]

8(a)

The positively charged rod induced charges on the suspended ball [1]. Since unlike charges attracts, the ball will be attracted to the positively charged rod [1].

8(b)

The electrons from the ball will flow to the rod to neutralise some of the positive charges on the rod [1]. The ball would then be positively charged and since like charges repel, it will move away from the rod [1].

(i) End Y to End X

(ii) An emf is induced in the rod due to a change in the rate at which magnetic field lines are being cut / change in magnetic flux linkage / rate of change of magnetic field experienced by the rod[1] according to Faraday's law [1].

Section B

9. (a) Amount of energy needed to change 1kg of ice to water or water to ice [1] without a change in temperature. [1]

(b)

(i) Thermal energy = V I t , values from column A, B D are multiplied [1]
(ii) E = 8 x 4 x 500 [1] = 16, 000 J [1]
(iii) Energy needed = mass x specific latent heat of fusion
Or
$Q = m\ l_f$ (m and l_f should be defined) [1]
(iv) 16000 = 50.6 x l_f [1]
l_f = 316.2 J/g [1]
(v) Heat was absorbed from the surrounding by the ice. [1] As such, more mass of ice was melted causing calculated value of l_f to be lesser than 336 J/g [1]

10.(a) (i) Live cable is connected to the high voltage of the mains supply. [1]

(ii) Neutral cable is maintained at zero volts. [1]

(b)(i) With a 30 A fuse, when the current exceeds 5 A the fuse will not blow. [1] The cable connected to the appliance may overheat and catch fire.

(b)(ii) If the live cable touches the metal case due to an electrical fault, the metal case is raised to a high voltage when the switch is closed. [1]

Anyone who touches the metal case will receive an electric shock as there is no alternative path for the high current. [1]

(c) If a fuse blows, the fuse wire has to be replaced. If a circuit breaker trips, it can easily be reset. [1]

(d)

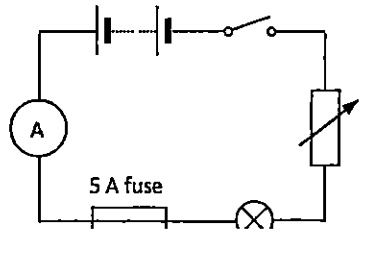
Circuit diagram: [1]

Description: [2]

1. Set up the circuit shown and adjust the rheostat to the maximum resistance.

2. Adjust the rheostat to increase the current gradually.

Note the ammeter reading when the lamp goes off.



11(a) Transformer B [1]

(b) (i) $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ [1]

Vp = (1000/ 50) x 24

=480 V [1]

(b) (ii) $\frac{N_s}{N_p} = \frac{Ip}{Is}$

50/1000 = I_p/ 16

I_p = 0.8 A

(iii) P= $V_p I_p$

= 480 x 0.8

= 384 W [1]

(c) P = I^2R [1]

= $(0.8)^2$ x (0.120 x 160 x2)

= 24.6 W [1]

(d) Output power = 384 + 24.6

= 409 W [1]

(e) less power lost as heat. [1]

12(a)

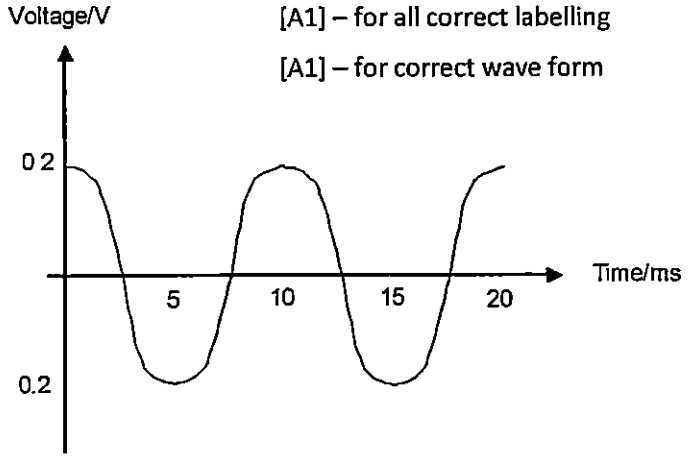
(a) **(i)** Transfers induced emf to external circuit [1]

(ii) When a conductor experiences changing magnetic field, emf is induced inside it. Similarly when the coil rotates, it experiences changing magnetic field, hence emf is induced inside the coil. [1]

(b) Current flows in the (anti-clockwise) direction from M-L-K-J [1]

By Fleming's Right Hand Rule, and taking arm J-K as [1] reference, when J-K moves downwards, thumb points downwards while the pointer finger points from North to South direction. Thus the middle finger would indicate the direction of induced current which is from K to J.

(c)



[A1] – for all correct labelling

[A1] – for correct wave form

(d) **(i)** Steel is not easily magnetized and retains its [1] magnetism permanently.

(ii) At optimum brightness, this means that pd across both lamps is 2 V.

Current across each lamp = P/V = 10/2 = 5A

So $I_s = 2 \times 5 = \underline{10A}$ [1]

and from $V_s = 2V$

Turns ratio is $V_s/V_p = 2 / 0.2 = \underline{10}$ [1]

$I_p/I_s = Vs/Vp$

$I_p = 10 \times 10 = \underline{100A}$ [1]