Name.............Marking.....scheme........... Index No. ....

School.. Candidate's signature.........................

Date...

LANJET JOINT EVALUATION
NOV/DEC 2021
FORM FOUR
PHYSICS
Paper - 232/2
Time: 2 hours

INSTRUCTIONS TO CANDIDATES

- *Write your name and index number in the spaces provided.*
- *This paper consists of two sections, A and B.*
- *Answer **ALL** the questions in the spaces provided.*
- *All working must be shown clearly in the spaces provided in this booklet.*
- *Mathematical tables and electronic calculators **may** be used.*

FOR EXAMINER'S USE ONLY

Question	Maximum marks	Candidate's score
A	1-12	25
B	13	11
	14	11
	15	13
	16	8
	17	10
	Total score	80

ANSWER ALL QUESTIONS

1. a) State the number of images formed when three objects are placed between two plane mirrors parallel to each other. (1mark)

The number of images will be infinity ✓1

b) Give a reason why the images formed becomes fainter in successive reflection. (1mark)

Plane mirrors absorb light after every reflection hence the final image becoming fainter and fainter. ✓1

2. State two reasons why the earth pin is normally longer than the other pins in a three pin plug. (2marks)

so as to open valve or shutters ✓1 of the life and neutral pin. It also provides the path for excess current ✓1

3. a) Explain the effects of pressure on the sound in air. (1mark)

Air pressure has no effect at all in an ideal gas ✓1 approximation. This is because pressure and density both contribute to sound velocity equally, and in an ideal gas the two effects cancels out.

b) Abby stands 190m from high wall and claps his hand, if he hears an each 1.3 seconds later. Calculate the speed of sound in air. (2 marks)

$$S = \frac{2d}{t} = \frac{2 \times 190}{1.3} ✓1 = 292.31 ✓1$$

4. The figure (3) below illustrates an eye defect;


✓1
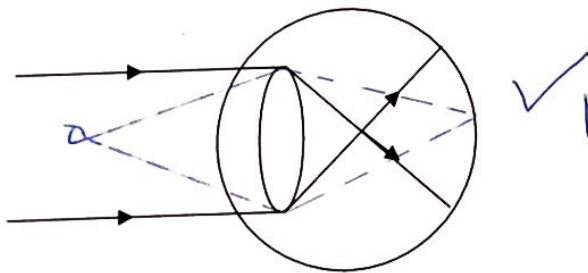
i) Identify the defect. ✓ (1mark)

ii) State one cause of this defect. ✓1 ✓1 (1mark)
Short focal length, Long eyeball any one

iii) In the same diagram, sketch the appropriate ions lens to show the effect of the lens. (2marks)
✓ ②

5. Figure below shows a graph of the variation of strength of a magnet and the magnetizing force for two materials X and Y. Study it and answer the questions below

Strength
Of
Magnet

Magnetizing force
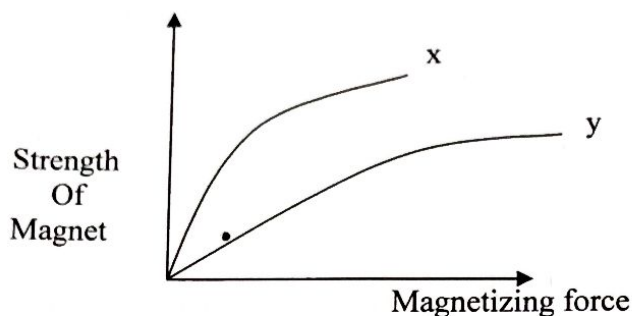
a) Identify the material that is a soft magnetic material.   (1mark)

X ✓ 1

b) Repulsion and not attraction is consisted to be the surest test for the polarity of a magnet. Give a reason for this.   (1mark)

Repulsion only occurs between a pole of a magnet and another pole. While attraction occurs between unlike poles of a magnet and a magnet and a magnetic material.

6. i) Two liquids have A and B have refractive indices of 1.5 and 1.3 respectively. Compare the velocity of light in the two liquids.   (1mark)

The velocity of Light in medium B will be higher than in medium A. ✓ 1

ii) State the property of sound that causes the formation of echo.   (1mark)

Reflection of Sound ✓ 1

7. Figure show a sharp pin fixed on a cap of leaf electroscope. The electroscope is highly charged and then left for some time. Explain why the leaf collapses.   (2marks)

Sharp pin
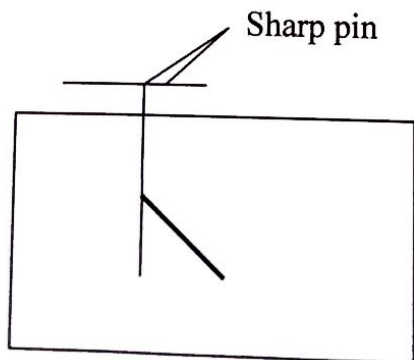
8. Use the figure below to answer the questions below.
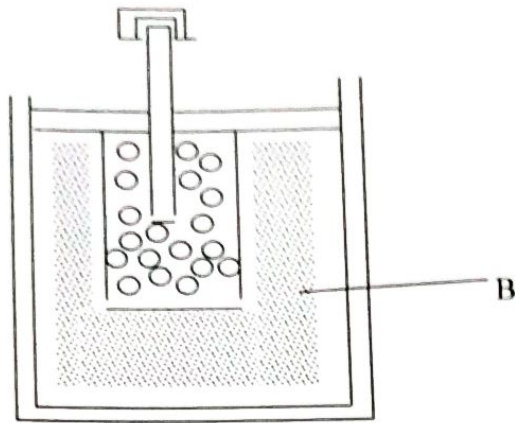
i) Name the part labeled B. (1mark)

   A mmonium chloride paste· ✓ 1

ii) Accumulation of bubbles of hydrogen gas around the copper electrode is one of the defects of a simple primary cell. Name the defect. (1mark)

   Polarization ✓ 1

9. The chart shows an arrangement of different parts of the electromagnetic spectrum.

Radio waves	Q	Infrared rays	K	Ultra – violet rays	X - Rays

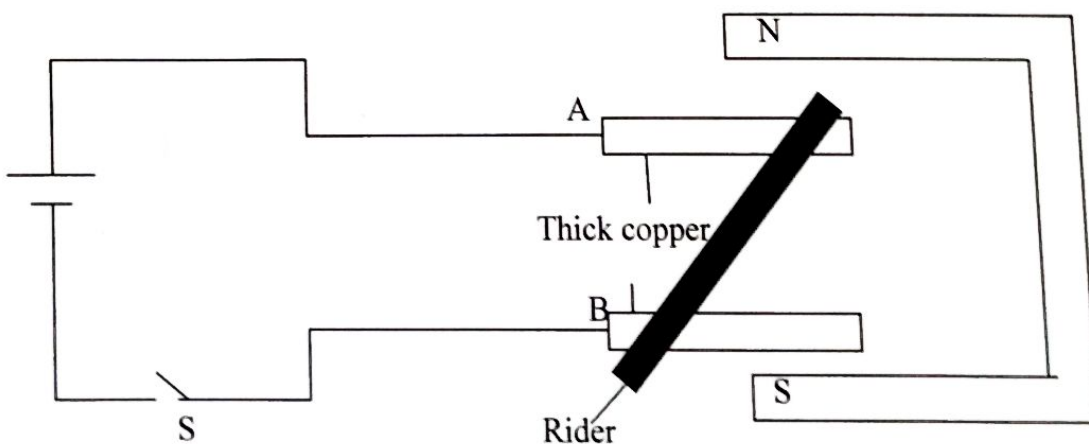i) Name the radiation represented by.
Q (1mark)

   microwaves ✓ 1

ii) State one use of radiation represented by K. (1mark)

   In Photosynthesis by plants ✓ 1   any
   Photographi
   The eye vision

10. Figure below shows two parallel thick copper conductors connected to a d.c power supply. A rider made from thin copper wire is placed on the conductor.

When the switch s is closed, it is observed that the rider experiences motion a long the thick copper wire towards ends A and B. Explain (2 marks)

When the switch is closed, current flows in the wire together with the rider. The rider being in a magnetic field experiences a motion called motor effect
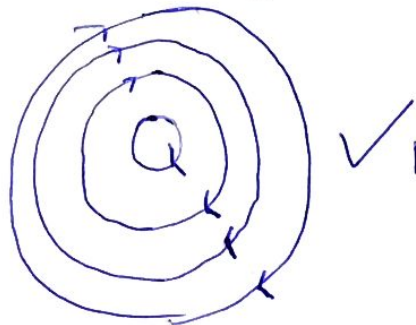
11. With the aid of a diagram, explain what is meant by two transverse waves being in phase. (2marks)
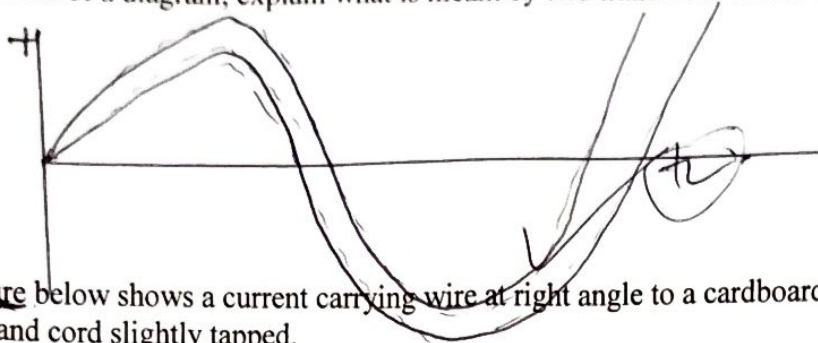
12. The figure below shows a current carrying wire at right angle to a cardboard. Iron fillings are sprinkled on the card and cord slightly tapped.
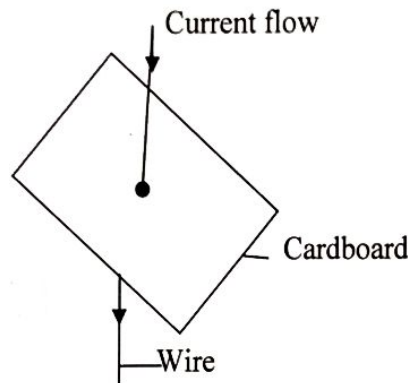
Draw and indicate the direction of the magnetic field displayed on the card. (1mark)

SECTION B

13. a) i) Define the term electrical resistance. (1mark)

This refers to the opposition that is offered to the flow of current by a given material.

ii) The filament of a heating coil is made using a long and thin write. Explain these observations.(2marks)

It is Long and thin to enhance resistance, by generating more heat energy from the coil.

b) Figure below shows three resistors. The reading of voltmeter v is 9v. Study the diagram and answer the questions that follow.
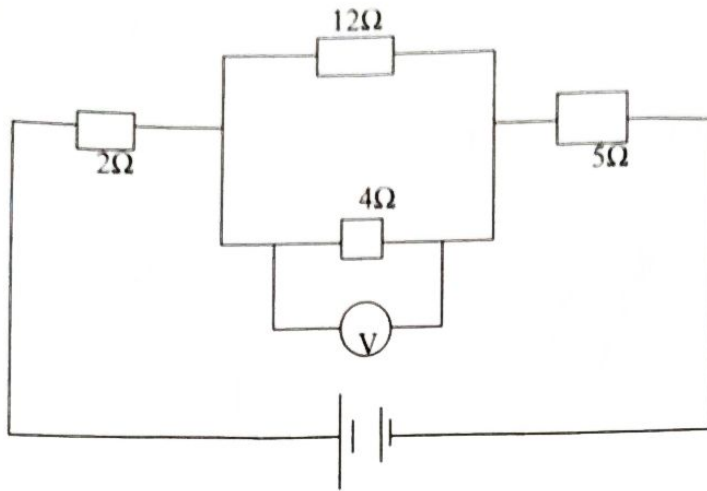

Figure (ii)

Determine;

i) The effective resistance. (2marks)

$$\text{Effective resistance} = \frac{4 \times 12}{16} + 2 \times 5$$

$$= 10\,\Omega \checkmark$$

ii) The current through the 5Ω resistance. (2marks)

Current through $4\Omega = \frac{9V}{4\Omega} = 2.75A$ $V = IR$

Current through $12\Omega = \frac{9v}{12} = 0.25A$ $\checkmark$

Current through 5Ω resistor is the sum of the current through 4Ω and $12\Omega = 2.75A + 0.25A = 3.0A$ $\checkmark$

iii) The potential difference across the 2Ω resistor. (1mark)

Current through the 2Ω resistor is the same as that of 5Ω since both are in series $\checkmark$

$V = IR = 2 \times 3.0 = 6V$

c. i) What is meant by the term 'terminal voltage' as used in current electricity? (1mark)

The Potential difference across the cell when the circuit is closed is referred to as terminal voltage of the cell.

ii) A cell supplies a current of 2.0A when connected to a 6.0Ω resister and 1.5A when the same cell is connected to 0.9Ω resister. Find the e.m.f and the internal resistance of the cell. (3 marks)

$E = IR + Ir$

$= 2.0 \times 0.6 + 2.0 \times r$

$E = 1.2 + 2.0r \ - - - (1)$

$E = 1.35 + 1.5r \ - - - (11)$

$+\dfrac{0.15}{0.5} = \dfrac{0.5r}{0.5}$ $\checkmark$
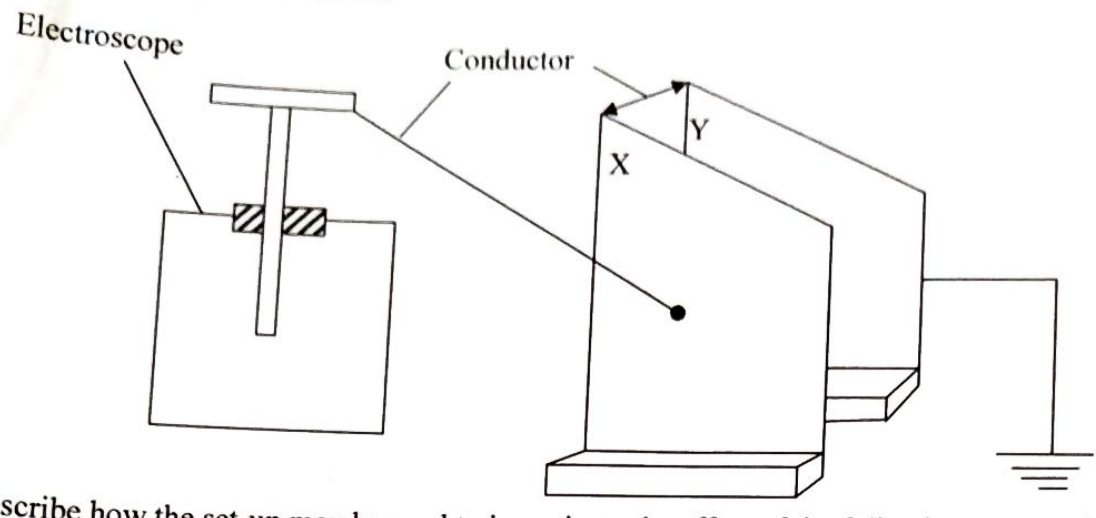
$r = 0.3\,\Omega$

$E = 1.5 \times 0.9 + 1.5r$

$E = 1.35 + 1.5r \ - - - (11)$

$E = 1.2 + 2.0 \times 0.3$

$E = 1.2 + 0.6$ $\checkmark$

$= 1.8V$

14. The figure shows a set-up used to study the factors that affect this capacitance of a capacitor. A and B are metal plates each fixed to an insulated stand. X is given a charge and Y is earthed. Study the set-up and answer the question that follows.

Electroscope   Conductor

a) Describe how the set-up may be used to investigate the effect of the following on capacitance C. State the observation made on the leaf in each case.

i) Separation distance d, between the plates.   (2markks)

Move the Plate y away (but while still parallel to x) so as to increase the separation distance, divergence of the Leaf of the elecroscope decreases (loss in potential) hence capacitance $= \frac{Q}{V}$ decreases.

ii) Effective area between the plates.   (2marks)

Slide plate y sideways so as to reduce the effect area between plates. divergence of the Leaf of the elecroscope increases (rise in potential hence capacitance $\frac{Q}{V}$ decreases).

iii) Explain how the capacitor gets charged.   (2marks)

The negative charge flow from the negative terminal of a battery Plate connected to it. At the same rate, the negative charge flow from the other plate of the capacitor towards the positive terminal of the battery. A potential difference is therefore set on plate.

b) The figure show capacitor A and B connected in series with a battery of e.m.f 4v

A   B

3µf   6µf

4v
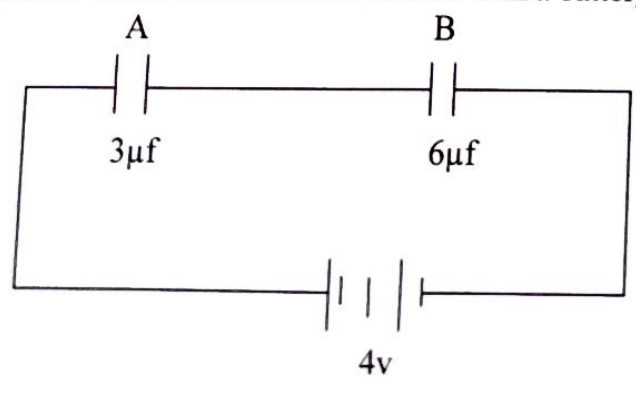
Determine;
i) The effective capacitance of the circuit. ✓ | ✓ | (2marks)

$$C_T = \frac{1}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6} = 2\mu F \checkmark$$

ii) The quantities of charge in capacitor A. (2marks)

$$Q = CV = 2 \times 10^{-6} \times 4 \checkmark$$
$$= 8 \times 10^{-6} C \checkmark$$

iii) The quantity of charge in capacitor. (1mark)

$$\underline{8 \times 10^{-6} C} \checkmark$$

15. When current flows through the coil of a transformer heating occurs in the wires leading to energy losses.
i) Explain why the heating occurs. ✓ (1mark)

This happens when the e.m.f forces a flow of electrons round the circuit against the resistance offered by various component
ii) How can the heating be minimizes? (1mark)

This can be minimised by use of thick copper wire to reduce heating effect. ✓

b) The graph below show the relationship between position of rotating coil of a simple a.c generator in angles and the e.m.f generated.

E.M.F generated

90   180   270
Angle of rotation
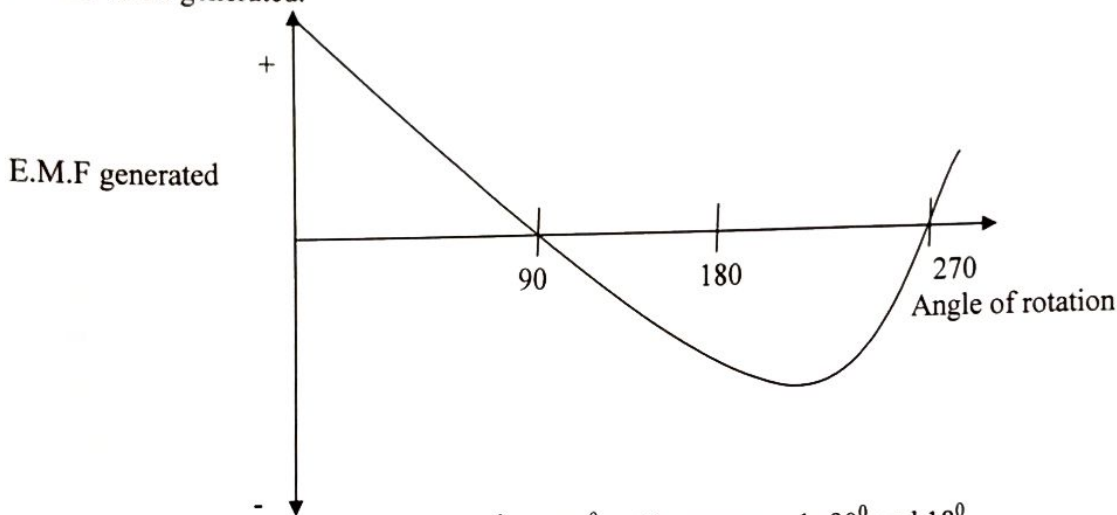
Explain what happens between angles 0^0 and 90^0 and between angle 90^0 and 18^0. (2marks)

Between 0' and 90' the coil moves a horizontal position to a vertical position. The angle at which it cuts, the magnetic field flux decreases consequently the generated e.m.f also decreases from maximum to zero.

c) The input voltage of a transformer is 240v and its output is 12v. When an 80w bulb is connected across the secondary coil the current in the primary coil is 0.36A. Determine;
i) The ratio N_p/N_s of the transformer (where N_p is the number of turns in the primary coil and N_s is the number of turns in secondary coil) (3marks)

$$\frac{N_p}{N_s} = \frac{V_p}{V_s} = \frac{240}{12V} = 20$$

ii) The power input of the transformer.

$$\text{power input} = I_p \times V_p \checkmark$$
$$= 0.36 \times 240 \checkmark$$
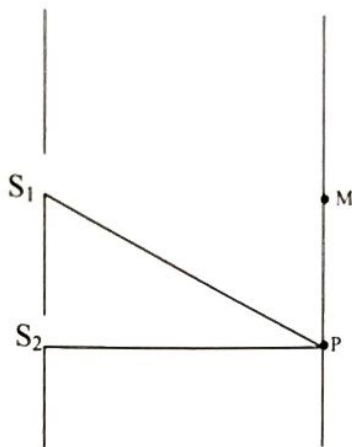$$= 86.4W \checkmark$$

iii) The power output of the transformer. (1mark)

$$\text{Power output} = 80W$$

iv) The efficiency of the transformer. (2marks)

$$\text{Efficiency} = \frac{\text{Power output}}{\text{Power input}} \times 100\% = \frac{80}{86.4} \times 100\%$$
$$= 92.59\%$$

16. a) Figure 14 below shows the waves stating from two coherent sources S_1 and S_2.

i) State the functions of S_1 and S_2. (1mark)

When The double slit allows for diffraction of light to occur Creating an interference pattern on the screen.

ii) State and explain what will be observed when the slit separation S_1 and S_2 is reduced. (2marks)

When the slit separation is reduced the distance between peaks on the interference pattern increases. This is because of increase in resolution power.

iii) What would be observed at point P if the waves are light waves? (2marks)

A central white ring will be formed followed by the other fringes taking the seven colours of the rainbow will be differed differently because of varying wavelength.

b) The figure below shows a ray of travelling from glass to air.

Air

42^0
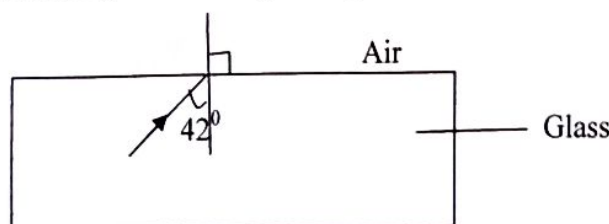
Glass

Determine the;

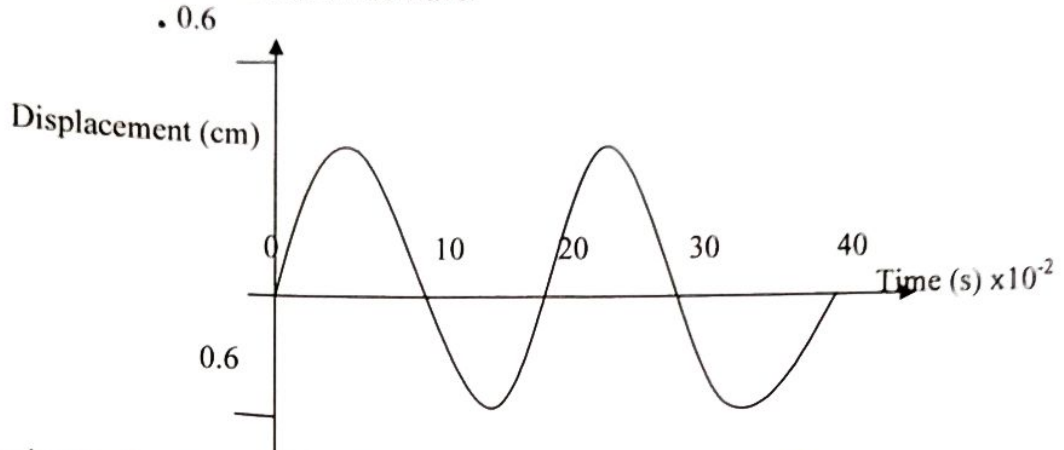- i) Critical angle of the glass – air interface. (1mark)

$$42^0 \checkmark$$

ii) Refractive index of glass. (2 marks)

$$n = \frac{1}{\sin c} = \frac{1}{\sin 45} = \frac{1}{0.6411} = 4.495 \checkmark$$

iii) Figure below shows a transverse wave.

Determine the frequency of the wave. (2marks)

$$T = 20 \times 10^{-2}s \quad f = \frac{1}{T} = \frac{1}{0.2} = 5Hz \checkmark$$

17. a) State two factors that affect photoelectric emission. (2marks)

Intensity of the radiation ✓
Energy of the radiation ✓   any two
Type of metal ✓

b) Electrons emitted from a metal surdface when light of a certain frequency is shone on the metal are found to have a maximum energy of 9.725×10^{-20}J. If the work function of the metal is 4.0×10^{-19}J, determine the wavelength of the incident light (planck's constant $= 6.63 \times 10^{-34}$Js and velocity of light $= 3 \times 10^8$ m/s) (3mks)

$$\lambda = \frac{hc}{k_{Emax} + kl_0} = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{9.725 \times 10^{-20} + 4\times 0 \times 10^{-19}} \quad \lambda = 4 \times 10^{-7}m$$

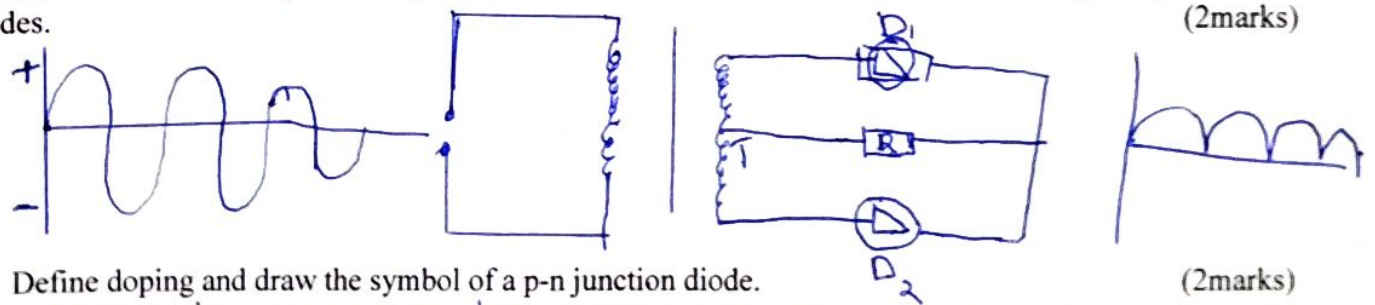c) i) What is rectification? (1mark)

is the process of converting a.c current to d.c current

ii) Use a well labeled diagram to explain how a full wave rectification may be achieved by using and two diodes. (2marks)

iii) Define doping and draw the symbol of a p-n junction diode. (2marks)

Doping is a process of adding a very small quantity of impurities to pure semi-conductor to obtain a desired property