MARKING GUIDE
PHYSICS
FORM IV

1

i	ii	iii	iv	v	vi	vii	viii	ix	x
B	D	D	E	D	D	A	A	D	A

(10)

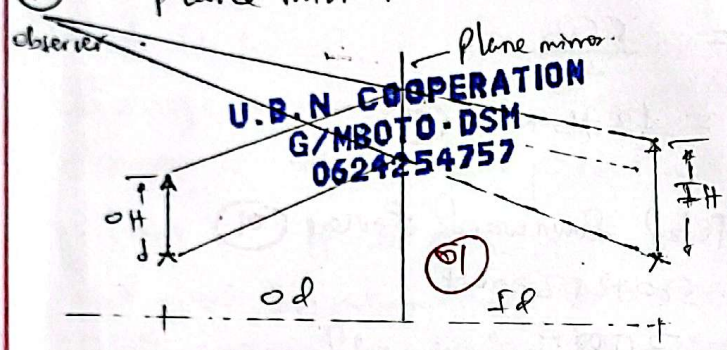
2.

LIST A	i	ii	iii	iv	v	vi
LIST B	G	F	D	C	B	H

(06)

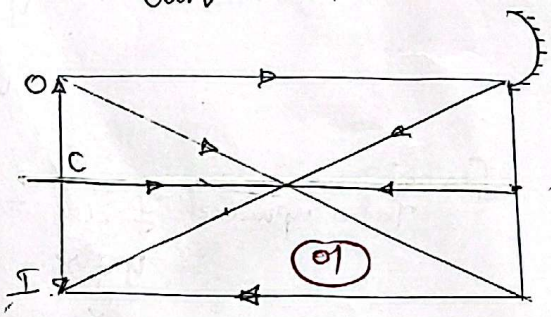
SECTION B: (40 Marks)

3 (a) Plane mirror.



(01)

Curved mirror



(01)

Similarity
→ Both images formed have the same size as the object (01)
→ Both images have the same distances as their objects (01)

Differences

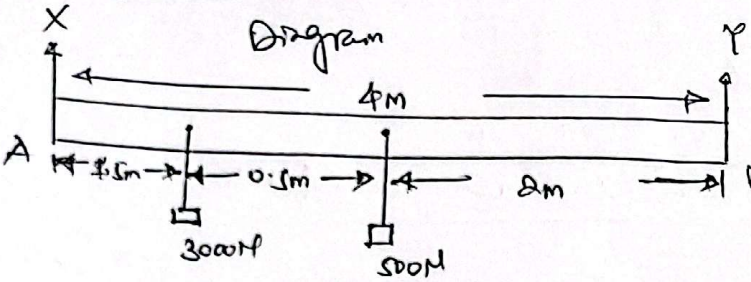
Image formed in plane mirror	Image formed in curved mirror.
(i) It is virtual image (01)	It is real image
(ii) It is laterally inverted (01)	It is upside down inverted

(b) (i) Used to view specimen in the keabor
(ii) Used by watchmakers to read small parts - Components
(iii) It is used to read small prints.
(iv) It is used to concentrate light waves

(03) any three (@ (01))

4. (a) Data given,
Density of mercury $\rho = 13.6 \times 10^3 \text{ kg/m}^3$
Height of reading barometer = 732mm = 0.732m
From atmospheric pressure $P = \rho g h$ (01)
$P = 13.6 \times 10^3 \text{ kg/m}^3 \times 9.8 \times 0.732$ (01)
$\therefore$ atmospheric pressure $(P) = 9.96 \times 10^4 \text{ Pa}$ (01)

4 (b) Solution



(02)

Assume pivot is at point A

Since

Total anticlockwise moment = Total clockwise moment (01)

$4 \times y = 3000 \times 1.5 + 500 \times 2.$

$4y = 5500$

$y = \frac{5500}{4}$

$y = 1375\ N$ (01)

Since:

Total upward forces = Total downward forces (01)

$y + x = 500N + 3000N$

$x + y = 3500N$

$x = 3500 - y$

$x = (3500 - 1375)N$

$x = 2125\ N$ (01)

5 (a) Data Given

Mass of meteor, $M_1 = 5 \times 10^{10}$ kg

speed of meteor $u_1 = 7200$ m/s

Mass of earth, $M_2 = 6 \times 10^{24}$ kg

Assume the earth is initially at rest, $u_2 = 0$ m/s (0½)

And after collision they move together with same speed (V) (0½)

From principle of Conservation of linear momentum

$M_1u_1 + M_2u_2 = M_1v_1 + M_2v_2$ (01)

But $u_2 = 0$, $v_1 = v_2 = v$ (01)

$M_1u_1 = (M_1 + M_2)V$ (01)

$V = \frac{M_1u_1}{M_1 + M_2} = \frac{5 \times 10^{10}\ kg \times 7200\ m/s}{(5 \times 10^{10} + 6 \times 10^{24})kg}$ (01)

$V = 6 \times 10^{-11}$ m/s

∴ Speed of earth is 6×10^{-11} m/s (01)

(i) Inclined plane is used at homes to climb high places example upstairs, help people to climb from ground to the room and climbing from the ground to the roof by using ladder (01½)

(ii) Screw jack is used in garage to raise up heavy objects example when opening the car tyres, screw jack is used to raise up a car so as to simplify opening of the tyre. (01½)

6 (a) Let θ be final temperature.
change in aluminium temperature = (100 − θ) °C (½)
change in water temperature = (θ − 20) °C. (½)
from $H = mc\Delta T$ (01)
Heat lost by aluminium = 0.5kg × 900 J/kg°C (100 − θ)°C (½)
Heat gained by water = 1.0kg × 4200 J/kg°C (θ − 20)°C (½)
Heat gained by water = Heat lost by aluminium (01)

$1 \times 4200 \times (\theta - 20) = 0.5 \times 900 \times (100 - \theta)$ (01)

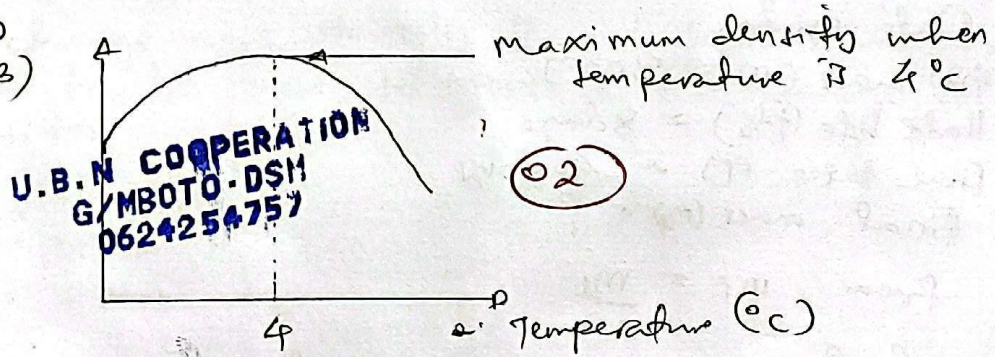
$4200\theta - 84000 = 4500 - 450\theta$

$\frac{4650\theta}{4650} = \frac{129000}{4650}$

$\theta = 27.7°C$

∴ The final temperature is 27.7 °C. (01)

(b) The phenomenon is anomalous expansion of water. (01)
The graph of density against temperature for this phenomenon is shown below.



(02)

7 (a) (i) Conditions for an echo to be formed

- Sound source: There must be a source of sound such as a voice, or musical instrument (01)
- Reflective surface: such as wall, mountain or building (01)
- Distance: The distance between the source of sound and reflective surface should be at least 17m (01)
- Time delay: There must a noticeable delay between an original sound and the reflected sound. any three

(ii) Case I

From 1st resonance $L = \lambda/4$, but $L = 20cm$ (01)

$20 = \lambda/4$, $\lambda = 80cm$

Case II 2nd resonance

$L = 3\lambda/4$, but $\lambda = 80cm$

$L = \frac{3 \times 80}{4} = 60cm$ (01)

Case III for 3rd resonance

$L = \frac{5\lambda}{4}$, but $\lambda = 80cm$

$L = \frac{5 \times 80cm}{4}$

$L = 100cm$

∴ The lengths of 2nd and third resonance are 60cm and 100cm (01)

(b) Data given.

Initial mass (m_i) = 8000g

Half life ($t_{1/2}$) = 8 days

Time take (T) = 40 days

final mass (m_f) = ?

from $m_f = \frac{m_i}{2^n}$

But $n = T/t_{1/2} = \frac{40 days}{8 days} = 5$ (01)

7 (b) $m_f = \frac{m_i}{2^n}$ (01)

$m_f = \frac{8009}{2^5}$

$m_f = 800/32$

$m_f = 25g$

∴ 25g will remain undecayed after 40 days (01)

8 (a) - Land scape formation
- Tourism attraction
- Environmental pollution (01½) any three @ ½
- Geothermal energy
- Destruction of properties

(b) (i) - Carbon dioxide
- Carbon monoxide
- Chlorofluorocarbons (01½) @ ½
- Halons

(ii) Importances of tides
- High tides help in navigation, they raise the water level close to the shores, this help ships to move to the harbours more easily (02)
- High tides help in fishing. More fish come closer to the shore during high tides. This enable fishermen to get plentiful catch (02)
- Tides are used for generation of tidal electricity. (02)

SECTION: C (30 Marks)

9. (a) (i) The reason is that the increased charge repels any incoming charge more strongly than before. Thus more work has to be done to increase the charge on a capacitor (02)

(ii) Data Given
(A) $C_1 = 10\mu F$
B (C_2) = 20μF
C (C_3) = 30μF

9 (a) (i) Let C be total capacitance.

$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$ (01)

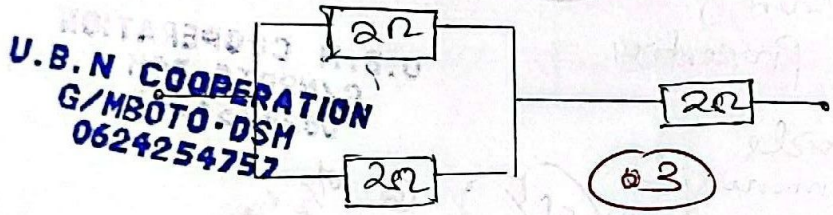
$= \frac{1}{10\,\mu F} + \frac{1}{20\mu F} + \frac{1}{30\mu F}$ (01)

$\frac{1}{C} = \frac{(20\times30) + (10\times30) + (10\times20)}{10\times20\times30}$ (01)

$C = \frac{6000}{1100} = 5.45\,\mu F$ (01)

The value of an equivalent single capacitor is $5.45\,\mu F$ (01)

(b) (i) By Connecting two 2Ω resistors in parallel, then in series with another 2Ω resistors



(03)

(ii) Data.

Current (I) = 1A

charge of an electron (e) = $1.6\times10^{-19}C$

Time (t) = 1s

From $I = ne/t$ (01)

$n = It/e$

$n = \frac{1A\times1s}{1.6\times10^{-19}C}$ (02)

$n = 6.25\times10^{18}$ (01)

∴ The number of electrons is 6.25×10^{18} (01)

10 (a) (i) X-rays are produced when fast moving electrons strike a target and lose their energy (01)

(ii) Uses of x-rays.

- In medical field
- In astronomy for studies
- In Microscopic analysis for research
- In Crystallography for studying structure of molecules
- In x-ray fluorescence.

(03)

10 (a) (ii) • In industries for analysis of the finished goods and machines.

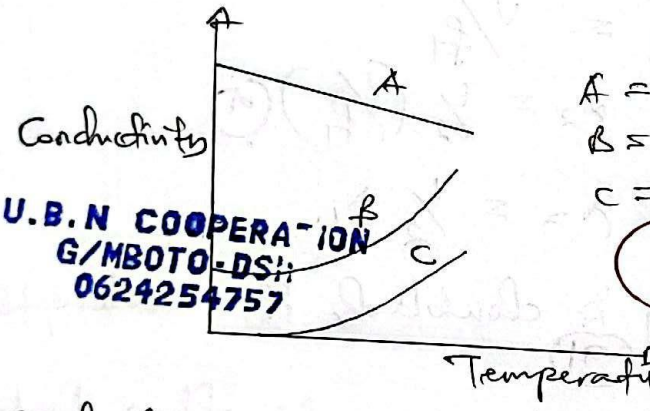
(b) (i) Mode of action of P-N junction

P-type	N-type

01

- As a P-N junction is made. electrons Cross over the boundary from n-type material to holes in the p-type material. At the same time, holes cross over the p-side to n-side and capture electrons. This movement of holes and electrons causes the n-side to become positively charged and the p-side negatively charged. This creates a potential difference across the boundary. The P-N creates a barrier and stops further flow of electrons and holes. 04

(ii)



A = Conductors
B = Semiconductors
C = Insulators

0 1/2

Conductors.

→ With increase of temperature, electrical conductivity decrease.

Semiconductors 0 1/2

→ Increase of temperature increases conductivity of semiconductors 0 1/2

Insulator.

→ Increase in temp increases conductivity from absolute zero temperature. However very high temperature may be needed to enable some valence electrons to break away from valence to conduction band and hence conduct electricity. 0 1/2

11. (a) (i) Speed of sound in air greater than the speed of the car, that is why we hear sound of an incoming car before the car reaches us. (02)

(ii) from $v = \lambda f$

$\lambda_1 = v/f_1$ ... (i) (01)

$\lambda_2 = v/f_2$ ... (ii)

from the condition.

$f_2 = 2f_1$ (01)

doubled frequency

$\lambda_2 = v/2f_1$ (01)

$\lambda_2 = \frac{1}{2}(v/f_1)$ (01)

$\lambda_1 = v/f_1$

then $\lambda_2 = \frac{1}{2}(v/f_1)$ (01)

$\lambda_2 = \frac{1}{2}\lambda_1$

∴ If the frequency is doubled, the wavelength is halved. (01)

(b) (i) There must be change in magnetic flux linking the circuit or conductor. (02)

(ii) Data.

No of turns in primary coil (N_p) = 400 turns

No of turns in secondary coil (N_s) = 4000 turns

Voltage in primary coil (V_p) = 12V

Current in primary coil (I_p) = 5A

Transformer efficiency = 90%

Voltage in secondary (V_s) = ?

from $\frac{N_p}{N_s} = \frac{V_p}{V_s}$ (01)

$V_s = \frac{N_p \times N_s}{N_p}$

(b) (ii) $V_s = \frac{12 \times 1000}{100}$

$V_s = 1200V$ (01)

from $e = \frac{I_s \times V_s}{I_p \times V_p} \times 100\%$ (01)

$I_s = \frac{e \times I_p \times V_p}{V_s \times 100\%}$

$= \frac{90\% \times 5 \times 12}{1200 \times 100\%}$ (01)

$I_s = 0.045A$

∴ The Current in secondary coil is 0.045A (01)