STD: IX   Marks: 80
Date: /02/2017   Dur: 2hrs

Question 1

a.   Give any two point of difference between primary cell and secondary cell.   [2]

b.   State Ohm's law. And state its mathematical expression.   [2]

c.   Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m/s in a
        given medium.   [2]

d.   State whether the resistance of filament of bulb will decrease, remain unchanged or increase   when
        it glows and why?   [2]

e.   Draw a ray diagram to show the formation of image by a concave mirror for an object between pole
        and focus.   [2]

Question 2

a.   A stone is kept in front of a plane mirror at a distance 1 meter from it.
         i) Where is the image of the stone formed?
         ii) What is the distance between stone & its image?   [2]

b.   Suppose you and your friend are on the Moon. Will you be able to hear any sound produced by
        your friend?   (Give reason for your answer)   [2]

c.   How does a stretched string on being set into vibration, produce the audible sound?   [2]

d.   A longitudinal wave of wavelength 1 cm travels in air with a speed of 330 m s^{-1}. Calculate the
        frequency of the wave. Can this wave be heard by a normal human being?   [2]

e.   Define lateral inversion and state one use of periscope.   [2]

Question 3

a.   0.6 c charge passes through a cross section of a conductor in 6 sec find the current.   [2]

b.   A sound wave travels at a speed of 339 ms^{-1}. If its wavelength is 1.5 cm, what is the frequency
        of the wave?   [2]

c.   State any two characteristics of a wave motion.   [2]

d. A conductor AB is joined to a cell with its end A at lower potential and the end B at a high potential

    a) state the direction of flow of electrons in it. b) What will be the direction of flow of conventional current in the conductor   [2]

e. Define Potential difference. State its SI unit.   [2]

Question 4

a.   i.   When the ray of light incident on a plan mirror, for what angle of incidence the ray will reflect back on same path

    ii   Define reflection of light.   [2]

b. If you place your ear close to an iron railing which is tapped at some distance away, you hear the sound twice. Explain why?   [2]

c. Why transverse wave does not travel through air or gases?   [2]

e. State laws of reflection.   [2]

d. A submarine emits a sonar pulse, which returns from an underwater cliff in 1.02 s. If the speed of sound in salt water is 1531 m/s, how far away is the cliff?   [2]

Question 5

a. State the characteristics of the image of an extended source, formed by a convex mirror.   [3]

b. Two conductors A and B are joined by a copper wire. State the direction of flow of electron in   each of the following cases with proper reason.

    i.   If A is positively charged and B is uncharged.

    ii.   If A is negatively charged and B is uncharged.

    iii.   If A is positively charged and B is negatively charged   [3]

c. The wavelength of waves produced on the surface of water is 20 cm. If the wave velocity is 24 m s^{-1}, calculate:

    I.   The number of waves produced in one second and

   II.   The time required to produce one wave.

Question 6

a. i) Name the types of waves which we use for a sound ranging.

    ii) Why are this waves mentioned above not audible to us.

iii) Give one use of sound ranging? [3]

b.   What are the factors on which speed of sound wave depends upon? [3]

c.   i.   A cell of PD 1.5 V is connected to a resistor of 5 ohms, with an ammeter in series (see Fig.). What is the reading of the ammeter?
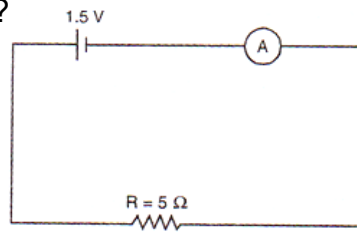
ii.   In transferring 1.5 C charge through a wire, 9 J of work is needed. Find the PD across the wire. [4]

Question 7

a.   Write 3 differences between real and virtual images? [3]

b.   State and explain three factors on which the resistance of a wire depends. [3]

c.   Define wavelength, frequency, time period and amplitude of a sound wave? [4]

Question 8

a.   Write any three points of differences between Transverse waves and longitudinal waves. [3]

b.   Draw a displacement - time graph of a wave and mark amplitude and time period on it and also draw displacement - distance graph and mark wavelength of wave on it on it [3]

c.   i.   Draw a ray diagram to show the formation of an image in a plane mirror of an extended source [2]

ii.   Draw a ray diagram to show the formation of image of an object kept in front of a convex mirror. State characteristics of the image so formed. [2]

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Answer key

Question 1

a.   Give any two point of difference between primary cell and secondary cell.   [2]
        Primary cell : It is not rechargeable .It is cheap and light. It has
                    high resistance
        Secondary cell : It is rechargeable .It is costly and heavier. It has
                    low resistance

b.   State Ohm's law. And state its mathematical expression.   [2]
Ans.   current in conductor is directly proportional to the PD across the end of the conductor, provided
        the physical state (dimensions and temperature) of conductor remains same.

$$\frac{V}{I} = R$$

c.   Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m/s in a
        given medium.   [2]
Ans.   Given v = 220Hz, speed (v) = 440 m/s and λ =?
        Since v = λ × v ⇒ λ = v/v = 440/220 = 2m

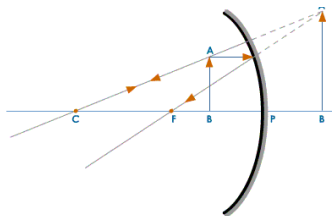d.   State whether the resistance of filament of bulb will decrease, remain unchanged or increase   when
it glows and why?   [2]
Ans.   Resistance increases
        Temperature of glowing bulb more and temperature increases with the increase in temperature

e.   Draw a ray diagram to show the formation of image by a concave mirror for an object between pole
and focus.   [2]
Ans.

Question 2

a.   A stone is kept in front of a plane mirror at a distance 1 meter from it.
         i) Where is the image of the stone formed
         ii) What is the distance between stone & its image.   [2]
Ans.   i)   1 m behind the mirror
        ii)   2 m

b.   Suppose you and your friend are on the Moon. Will you be able to hear any sound produced by
        your friend?   [2]

Ans   No we will not hear any sound on the Moon. The Moon does not have any atmosphere, since sound is a mechanical wave and requires a medium to travel.

c.   How does a stretched string on being set into vibration, produce the audible sound?   [2]

Ans.   A stretched string on being set into vibrations sends sound wave through the medium in the form of compressions and rarefactions which are received by the ear in the form of sound.

d.   A longitudinal wave of wavelength 1 cm travels in air with a speed of 330 m s^{-1}. Calculate the frequency of the wave. Can this wave be heard by a normal human being?   [2]

Ans.   Given : v = 330 m s^{-1}, λ = 1 cm = 0.01 m, v = ?

$$v = \frac{v}{\lambda} = \frac{330 \text{ m s}^{-1}}{0.01 \text{ m}} = 33000 \text{ Hz}$$

No, the wave cannot be heard as it is beyond the audible range of a normal human being.

e.   Define lateral inversion. State one use of periscope.   [2]
Ans.   The interchange of right and left sides in the image of an object in the plane mirror is called a lateral inversion.
For looking over the heads of a crowd by raising it above the obstacles.

Question 3

a.   0.6 c charge passes through a cross section of a conductor in 6 sec ,find the current.   [2]
Ans.   I= Q/ t
       = 0.6/6
       =0.1 A
b.   A sound wave travels at a speed of 339 ms^{-1}. If its wavelength is 1.5 cm, what is the frequency of the wave?   [2]
Ans.   Given speed (v) = 339 ms–1. λ = 0.0015 m, v =?
       Since v = λ × v $\Rightarrow$ v = v/λ = 339/0.0015 = 22600Hz
c.   State any two characteristics of a wave motion.   [2]

Ans.   (i)   Wave motion is periodic disturbance.
       (ii)   In wave motion, there is no transfer of the particles of the medium from one part to another part of the medium. The particles simply execute vibratory motion about their mean position.

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d. A conductor AB is joined to a cell with its end A at lower potential and the end B at a high potential a) state the direction of flow of electrons in it. b) What will be the direction of flow of conventional current in the conductor   [2]

ans. electrons B to A

Current A to B.

e. Define Potential difference. State its SI unit.   [2]

Ans. Work done in carrying unit positive charge from one point to another .

Volt.

Question 4

a. i.   When the ray of light incident on a plan mirror, for what angle of incidence the ray will reflect back on same path

ii   Define reflection of light.   [2]

Ans   i. angle of incidence = $0°$

ii. Bending of ray of light when it passes from one medium to another.

b. If you place your ear close to an iron railing which is tapped at some distance away, you hear the sound twice. Explain why?   [2]

Ans. The sound travels in iron faster than in air , so first the sound through iron nail is heard and then the sound through air is heard.

c. Why transverse wave does not travel through air or gases?   [2]

Ans   In transverse waves, the particles of the medium vibrate perpendicular to the direction of of propagation of the wave. The gas particles are loosely packed and compressible. The gas particles do not vibrate in perpendicular direction to the direction of propagation of sound.

d.   A submarine emits a sonar pulse, which returns from an underwater cliff in 1.02 s. If the speed of sound in salt water is 1531 m/s, how far away is the cliff?   [2]

Ans   Time taken by the sonar pulse to return, t = 1.02 s

Speed of sound in salt water, v = 1531 m s - 1

Distance of the cliff from the submarine = Speed of sound x Time taken

Distance of the cliff from the submarine = 1.02 x 1531 = 1561.62 m

Distance travelled by the sonar pulse during its transmission and reception in water = 2 x Actual distance = 2d

Actual Distance, d= Distance of the cliff from the submarine/2

= 1561/2

= 780.31 m

e. State laws of reflection.   [2]

Ans   i) Incident ray, reflected ray and normal at the point of incidence lie in the same plane
       ii) Angle of incidence = angle of reflection

Question 5

a.   State the characteristics of the image of an extended source, formed by a convex mirror.   [3]
Ans.   The image of an extended source, as formed by a concave lens, has the   following
       characteristics:
       (i) It is smaller in size as compared to the source itself,
       (ii) A virtual image and
       (iii) An erect image
b.   Two conductors A and B are joined by a copper wire . State the direction of flow of electron in   each
of the following cases with proper reason.
       i.   If A is positively charged and B is uncharged.
       ii.   If A is negatively charged and B is uncharged.
       iii.   If A is positively charged and If B is negatively charged   [3]

Ans.   i.   B to A as electrons always gets attracted to positive.
       ii.   A to B as elections are attracted by positive charge partials in B
       iii.   B to A as electrons gets attracted by positive charge.

c.   The wavelength of waves produced on the surface of water is 20 cm. If the wave
       velocity is 24 m s^{-1}, calculate:
                (1)   the number of waves produced in one second and
                (2)   the time required to produce one wave.
(ii)   Given : λ = 20 cm = 0.2 m   v = 24 m s^{-1}
                         v = ?   T = ?

                (1)   Number of waves produced in one second,

                        i.e., $v = \dfrac{v}{\lambda} = \dfrac{24 \text{ m/s}}{0.2 \text{ m}} = 120 \text{ s}^{-1}$

       (2)   Time required to produce one wave

                        $T = \dfrac{1}{v} = \dfrac{1}{120 \text{ s}^{-1}} = 0.0083 \text{ s}$
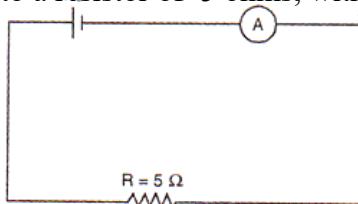
Question 6

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a. i) Name the types of waves which are use for a sound ranging.
    ii) Why are this waves mentioned above not audible to us.
    iii) Give one use of sound ranging?   [3]
Ans. I   ultra sonic waves
      ii.   because of higher frequency
      iii.   To detect the presence of obstacle for ship while travelling.

b.   What are the factors on which speed of sound wave depends upon?   [3]
Ans. Speed of the sound depends on the following factors:
      inertial property of the medium (to store kinetic energy)
      elastic property of the medium (to store potential energy)
      temperature of the medium
      density of the medium
      humidity present in the medium (in air/gases)

c.   i.   A cell of PD 1.5 V is connected to a resistor of 5 ohms, with an ammeter in series (see Fig.). What
           is the reading of the ammeter?

R = 5 Ω

     ii.   In transferring 1.5 C charge through a wire , 9 J of work is needed . find the pd across the wire. [4]
Ans. i.   Given: $v = 1.5$ V. $R = 5Ω$, $I = ?$

           We know that $i = \dfrac{v}{R} = \dfrac{1.5\ V}{5Ω} = \dfrac{15\ V}{5\ Ω} = 0.\ 3A$

     ii.   PD $=$ work /charge $= \dfrac{9}{1.5} = 6v$

Question 7

a.   Write 3 differences between real and virtual images?   [3]
Ans

Real-	Virtual
i) It can be taken on the screen	i) It cannot be taken on screen
ii) Light rays actually meet after reflection.	ii) Light rays do not meet after reflection.
iii) it is always inverted	iii) a virtual image is always erect unless they are again reflected or refracted.

b.   State and explain three factors on which the resistance of a wire depends.   [3]

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Ans   Length of conductor: more the length larger will be resistance
Area of cross section: more the area of cross section less is the resistance
Temperature of conductor: greater the temperature larger is the resistance

c.   Define wavelength, frequency, time period and amplitude of a sound wave?   [4]
Ans.   Wavelength(λ): The distance between two consecutive compressions or two consecutive
rarefactions is known as the wavelength. Its SI unit is metre (m).
Time period(T): Time taken by a particle of the medium to complete one vibration is called Time
period. Its unit is second.
Frequency (v): The number of vibrations completed by a particle in one second is called
frequency . Its unit is hertz. i.e. v = 1/T.
Amplitude(a): The maximum displacement of a particle from the mean position is called amplitude.
Its unit is metre.

Question 8

a.   Write any three points of differences between Transverse waves and longitudinal waves.   [3]
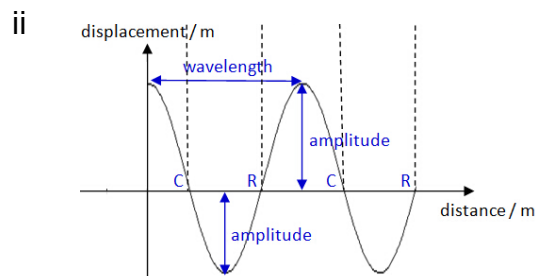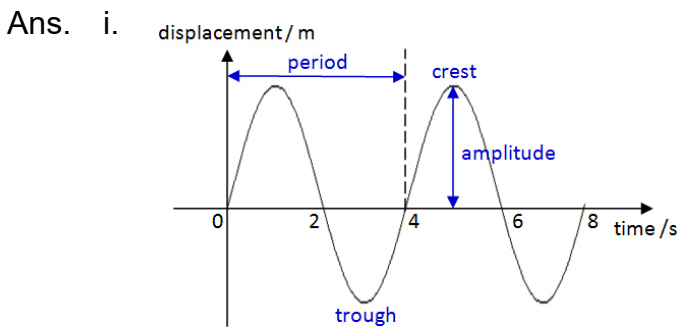Ans   Transverse Waves Longitudinal Waves
1 Particles of medium vibrate perpendicular to the direction of propagation of wave. Particles of
medium vibrate along the direction of propagation.
2 Waves are propagated in the form of crests and troughs. Waves are transmitted in the medium
in the form of rarefactions and compressions.
3 No pressure variation in the medium. Pressure and density of the medium are maximum at
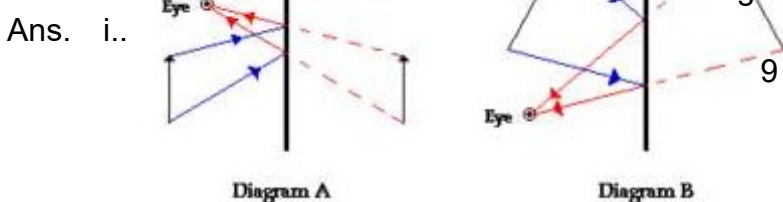compressions and minimum at rarefactions.
4 e.g. waves in solids, liquid surfaces e.g. Travel in solids, liquids and gases.

b.   Draw a displacement - time graph of a wave and mark amplitude and time period and also draw
displacement - distance graph and mark wavelength of wave on it on it   [3]

Ans. i.

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c.   i.   Draw a ray diagram to show the formation of an image in a plane mirror of an extended
source   [2]
        ii.   Draw a ray diagram to show the formation of image of an object kept in front of a convex
mirror. State characteristics of the image so formed.   [2]

Ans. i..

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ii.