Kerala Board Class 10 Physics 2018

Instructions

- First 15 minutes is cool off time.
- Answer the questions only after reading instructions and questions thoroughly. Questions are given in A, B, C, D sections. Write only 4 questions from each section.
- Score alloted for sections A, B, C, D are 1, 2, 3 and 4 respectively.

Section-A

Q1. Write any two factors that influence the speed of sound through air.

Solution:

Two factors that affect the speed of sound are:

1. Density of the medium: The speed of sound depends on the density of the medium. In gases, the speed of sound generally decreases with increased density. However, in solids, the speed of sound is higher because the particles are closely packed, facilitating quicker vibrations.
2. Temperature of the medium: The speed of sound is directly proportional to the temperature of the medium. As the temperature increases, the molecules in the air move faster, facilitating quicker transmission of sound waves. Therefore, the speed of sound increases with higher temperatures.

Q2. Solar energy is treated as the energy source of the future. Write any two solar devices working on solar energy that can be utilised in daily life.

Solution:

Two solar devices that work on solar energy and can be utilized in daily life are:

1. Solar cell: Converts sunlight directly into electricity and is used in calculators, solar lights, and other electronic devices.
2. Solar cooker: Utilizes sunlight to cook food, providing a sustainable alternative to conventional cooking methods.

Q3. Distinguish the relationship between the terms given below and fill in the blanks:

(i) Generator → armature → induced emf.

(ii) Microphone →⟶ → induced emf.

Solution:

(ii) Voice coil

In a microphone, sound waves vibrate the diaphragm, which moves the voice coil within a magnetic field, producing an induced emf that converts sound into an electrical signal.

Q4. Find the odd one from the brackets below and give a reason for your selection.

[Blue, Yellow, Red, Green]

Solution:

Yellow is the odd one out. In the additive colour model, blue, red, and green are primary colours, while yellow is a secondary colour.

Q5. Write any two problems faced when electrical power is transmitted to distant places.

Solution:

Two problems faced when electrical power is transmitted to distant places are power loss due to heat in transmission lines and voltage drop over long distances.

Section-B

Q6. Correct the underlined parts of the following statements appropriately if it is wrong.

(i) Conductors having higher melting points than the circuit elements are used as fuse wire.

(ii) The amperage of the fuse wire must be reduced as the power of the equipment included in the circuit is increased.

Solution:

(i) Conductors having a low melting point than the circuit elements are used as fuse wire.

(ii) The amperage of the fuse wire must be increased as the power of the equipment included in the circuit is increased.

Q7. A student standing in front of a huge building claps his hands. He heard its echo after 2 seconds. [Speed of sound in air is 340 m/sec]

(i) Calculate the distance between the student and the building

(ii) Write the characteristics of the ear behind the phenomenon called echo

Solution:

(i) Given, speed of sound in air, $v = 340$ m/sec and time, $t = 2$sec

We know, distance between the student and the building, $d = vt/2$

Replacing the values, $d = (340 \times 2)/2 = 340$ m

So, the distance between the student and the building is 340 m.

(ii) The characteristic of the ear behind the phenomenon called echo is the persistence of audibility. This means that the ear retains the sound signal for a short duration, allowing the reflection of sound to be perceived as a distinct echo if the reflected sound reaches the ear after a delay of at least 0.1 seconds.

Q8. Identify the electronic components from the following symbols. Write any one difference between them.

Solution:

The symbol (a) is for LED, while the symbol in figure (b) is for the photodiode. An LED emits light when current flows through it, while a photodiode absorbs light and generates current in response.

Q9. The statements given below are related to a step-down transformer. Tabulate them as those related to primary and secondary.

(i) Winding with thick wire

(ii) Current flowing at a higher voltage

(iii) Winding with a thin wire

(iv) Current flowing at low voltage

Solution:

The statements given are tabulated as those related to primary and secondary. They are as follows:

Primary:

Winding with a thin wire

Current flowing at a higher voltage

Secondary:

Winding with a thick wire

Current flowing at a low voltage

Q10. Explain how the following arrangements are useful in power transmission.

(i) Reduction in the resistance of the conductor

(ii) Increase in the transmission voltage

Solution:

(i) The heat generated in the conductor is I^2Rt, where I is the current and R is the resistance of the conductor. By using materials with lower resistance (such as copper or aluminum), the power loss due to heat is reduced, making the transmission more efficient.

(ii) When the voltage is increased, the current required for the same power transmission decreases. Since the power loss due to heat is proportional to I^2R, reducing the current minimizes the heat produced and power loss in the transmission lines, enabling efficient long-distance transmission of electrical energy.

Section- C

Q11. Explain the reason for the following in a power generator.

(i) The armature is used as the stator

(ii) Strong electromagnets are used as the field magnets

(iii) Three armature coils are arranged at 12**0**° angular separation

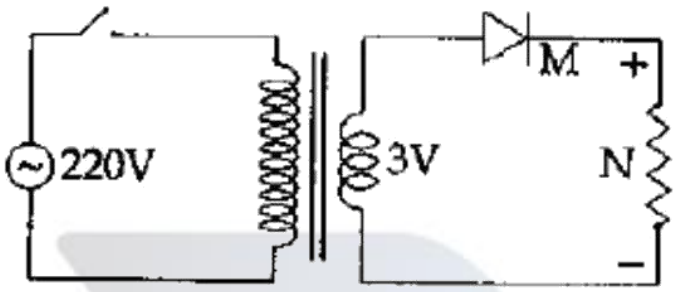
Solution:

(i) In power generators, the armature is fixed as the stator to prevent sparking. This arrangement allows the generator to operate at high potential without facing insulation problems or risk of spark formation.

(ii) Electromagnets are preferred over permanent magnets because their magnetic field strength can be easily adjusted by controlling the current passing through them. This flexibility enhances the efficiency of the generator by allowing for better regulation of the magnetic field.

(iii) The coils are spaced at 120° to produce three-phase alternating current (AC), ensuring a continuous power supply with minimal fluctuations.

Q12. Analyse the given circuit diagram of a half-wave rectifier and answer the following questions.



(i) Identify the components labelled as **M** and **N**

(ii) What the changes to be made in the following components for converting this to a fullwave rectifier.

a. Transformer

b. No. of Diodes

(iii) Draw the output waveform of a full-wave rectifier.

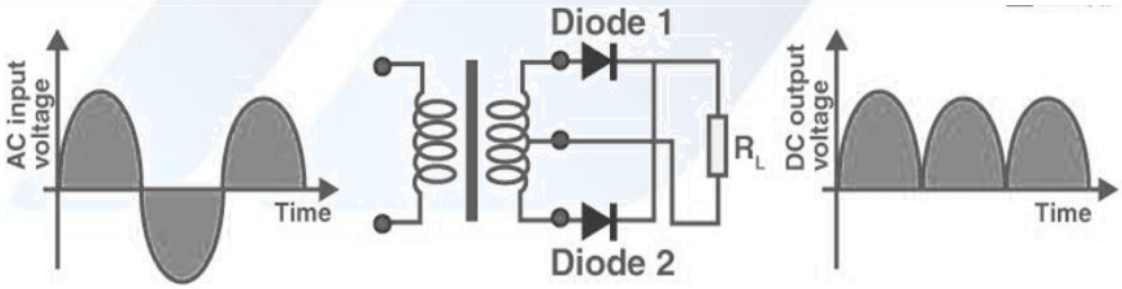
Solution:

(i) The component labelled M is the diode, which allows current to flow in only one direction. The component labelled N is the resistor, which is used to limit the current in the circuit.

(ii) a. To convert to a full-wave rectifier, a center-tapped transformer is required.

b. For a full-wave rectifier, two diodes are used.

(iii)



Q13. Explain the following everyday life experiences scientifically.

(i) Spirit kept in an open watch glass is converted into the gaseous state even at room temperature.

(ii) The variation in atmospheric temperature does not affect our body temperature instantaneously.

(iii) Complete melting of ice-cream will not happen suddenly.

Solution:

(i) Spirit in an open watch glass turns into gas at room temperature:

This is due to evaporation, where surface molecules gain enough energy to escape into the air without boiling.

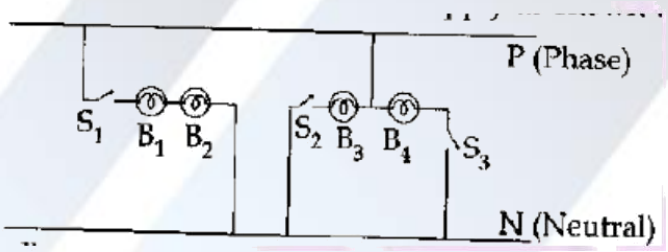
(ii) Atmospheric temperature change doesn't affect body temperature immediately:

This is because of the high specific heat capacity of water in our body, which resists quick temperature changes.

(iii) Ice cream doesn't melt suddenly:

This happens because of the high latent heat of fusion of ice, meaning a lot of energy is needed to convert it from solid to liquid.

Q14. Four [40 W, **230** V] bulbs are connected to a **230**V supply, as shown below:



(i) Which are the bulbs connected in series?

(ii) Which are the bulbs that can work at 40 W power?

(iii) Write two advantages of connecting household equipment in parallel.

Solution :

(i) The bulbs that are connected in series in the figure given are B_1 and B_2.

(ii) The bulbs that can work at 40 W power are B_3 and B_4.

(iii) Two advantages of connecting household equipment in parallel are

- Each appliance can operate independently.
- The voltage across each appliance remains the same.

Q15. Roshan observed a beautiful rainbow in the western sky from his school ground.

(i) When did Roshan observe the rainbow?

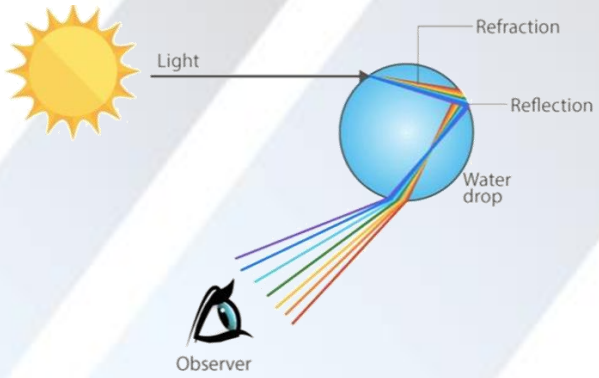
[Morning, Noon, Evening, Prediction of time is impossible]

(ii) Draw the diagram of dispersion taking place in a water droplet during the formation of a rainbow.

Solution:

(i) The rainbow is typically observed when sunlight passes through rain or water droplets in the atmosphere. A rainbow appears when the sun is in the opposite direction to where we are looking. If Roshan saw the rainbow in the western sky, the sun must have been in the eastern sky, which means it was most likely morning.

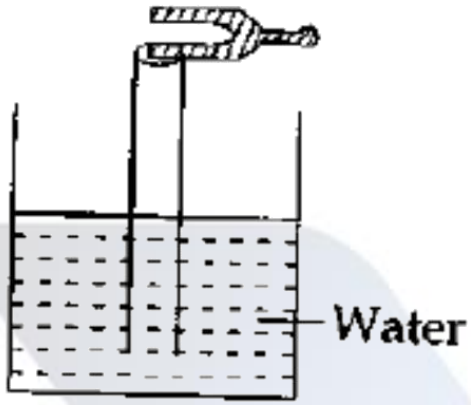
(ii)



Rainbow Formation

Section-D

Q16. The following diagram shows an experiment using a beaker of considerable height and a pipe [Excited tuning fork is used].



(i) What happens to the loudness of the sound produced by the tuning fork while adjusting the height of the air column inside the pipe?

(ii) What will be the natural frequency of the air column at the same time of hearing the loud sound if the frequency of a given tuning fork is 512 Hz ? Explain the phenomenon behind this loudness.

Solution:

(i) The loudness of the sound produced by the tuning fork varies as the height of the air column inside the pipe is adjusted. When the air column resonates with the tuning fork's frequency, the sound is amplified, increasing the loudness.

(ii) The natural frequency of the air column at the time of hearing the loud sound is the same as the frequency of the tuning fork, 512 Hz. This phenomenon is called resonance and it occurs when the natural frequency of the air column matches the frequency of the tuning fork, causing the air column to vibrate with maximum amplitude, which results in a louder sound.

Q17. Answer the following question by analysing the table:

Number	Substance	Mass	Temperature Difference	Heat Given

1	Coconut Oil	10 kg	10 K	210000 J
2	Copper	10 kg	10 K	38500 J
3	Water	10 kg	10 K	420000 J
4	Lead	10 kg	10 K	1200 J

(i) Why does the temperature difference remain the same when various amounts of heat energy are given to the above substances of equal masses?

(ii) Which substance has a higher specific heat capacity?

(iii) Name the substance in the above table, which exhibits the largest temperature change when the same amount of heat is given.

Solution:

(i) The temperature difference remains the same because of the difference in specific heat capacities of the substances. The heat given to each substance results in the same temperature change because the mass and temperature difference are constant in each case.

(ii) Water has the highest specific heat capacity, as it requires the most heat (420000 J) to produce the same temperature change (10 K) compared to the other substances.

(iii) Lead exhibits the largest temperature change when the same amount of heat is given, because it has the lowest specific heat capacity (1200 J).

Q18. An electric heater of resistance 115Ω is made to work on 230 V supply.

(i) What will be the current through this heater while it is working?

(ii) Calculate the power of this heater.

(iii) Calculate the heat generated by this heater if it works for **10** minutes.

Solution:

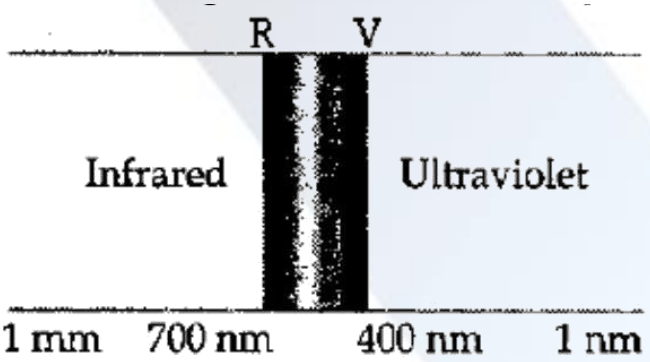
(i) we know, I = V/R

On substituting the values, I = 230/115 = 2 A

(ii) Now, Power (P) = VI = 230 × 2 = 460 W

(iii) Then, H = Pt = 460 × 10 × 60 = 276000 J

Q19. Analyse the diagram of the solar spectrum and write the answers:



(i) Which radiation has a wavelength greater than visible light in this spectrum?

(ii) Which colour has the highest frequency in the visible part of the solar spectrum?

(iii) Write one merit and demerit of infrared and ultraviolet radiations.

Solution:

(i) Infrared radiation has wavelength greater than visible light in the electromagnetic spectrum.

(ii) Violet has the highest frequency in the visible part of the solar spectrum.

(iii) One merit and demerit of infrared and ultraviolet radiations is -

Radiation	Merit	Demerit
Infrared	Used in night vision and thermal imaging	Can cause skin burns with prolonged exposure

Ultraviolet	Helps in vitamin D production	Overexposure can cause skin cancer and eye damage

Q20. (i) Write one example each for fossil fuels in a solid and liquid state.

(ii) Which fossil fuel produces ammonia when distilled in the absence of air?

(iii) Write down the process of evolution of fossil fuels on earth.

Solution:

(i) Examples of fossil fuels in solid and liquid states –

Solid: Coal, Liquid: Petrol.

(ii) Coal produces ammonia when distilled in the absence of air.

(iii) Fossil fuels formed from the remains of dead plants and animals that were buried under layers of silt and sediment. Over millions of years, with extreme heat and pressure, these organic materials transformed into coal, oil, and natural gas.