Kerala Board Class 10 Physics 2017

Instructions:

- First 15 minute duration is cool off time. Cool off time is given to read and understand the questions.
- Read the instructions of each questions carefully before answering.
- The score of each question is given along with it. Answers should be written in accordance with the score.

Q1. Study the relation between the first pair and then complete the second pair. (1)

(i) Resistor: 

(ii) LED: .....

Solution:

(ii) LED: 

Q2. Which of the following is not a part of an AC generator? (1)

(i) Field magnet

(ii) Armature

(iii) Transformer

(iv) Slip rings

Solution:

(iii) Transformer—A transformer is a separate device used to step up or step down voltage and is not part of an AC generator.

Q3. Find the correct statement from the following. (1)

(i) The main constituent of LPG is carbon dioxide.

(ii) The bio-gas is formed by the action of bacteria in the presence of oxygen.

(iii) The uncontrolled fission is used in atom bomb.

Solution:

Correct statement: Uncontrolled nuclear fission releases a huge amount of energy instantly, which is the working principle of an atom bomb. In contrast, controlled fission is used in nuclear power plants.

Q4. Three statements related to a three-phase generator are given below of which one is incorrect. (1)

(i) All the three armature coils have equal number of turns.

(ii) AC generated in all the three armature coils will be in same phase.

(iii) AC of same frequency is generated in all the three armature coils.

Solution:

(ii) The three-phase generator produces three alternating currents that are 120° out of phase with each other, not in the same phase. This phase difference ensures continuous power supply.

Q5. A current of 0.2 A flows through a resistor of resistance 200Ω. Calculate the heat generated. (2)

Solution:

Current, $I = 0.2\ A$

Resistance, $R = 200\ \Omega$

Time, $t = 5 \times 60 = 300\ s$

Using Joule's law of heating:

$$H = I^2Rt$$

Substituting the values:

$$H = (0.2)^2 \times 200 \times 300$$

$$H = 0.04 \times 200 \times 300 = 2400\ J$$

Q6. Spirit taken in a watch glass disappears into air even without heating. (2)

(a) Write the name of above phenomenon.

(b) Explain a daily life situation where the above phenomenon is used.

Solution:

(a) The name of the phenomenon is evaporation.

(b) Example from daily life:

Drying of wet clothes: When clothes are hung outside, water in them evaporates into the air, even without heating, due to sunlight and wind.

Cooling effect of sweating: Sweat evaporates from our skin, absorbing heat from our body, which helps in cooling us down.

Q7. Match the following three columns suitably. (3)

	A	B	C
(a)	CFL	heating coils are used	works at low dc voltage
(b)	LED	carbon rods are used	harmful for environment
(c)	ARC Lamp	least power loss	filaments of very high resistivity are used
		contains mercury vapour	works at high dc voltage

Solution:

	A	B	C
(a)	CFL	contains mercury vapour	harmful for environment
(b)	LED	least power loss	works at low dc voltage
(c)	ARC Lamp	carbon rods are used	works at high dc voltage
		heating coils are used	filaments of very high resistivity are used

Q8. Observe carefully the following diagrams which show the splitting up of a composite light into its constituent colours. (3)

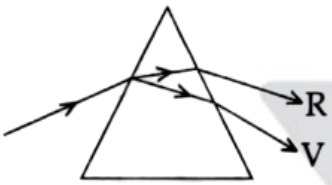


Fig. (i)

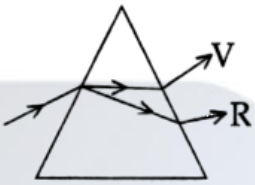


Fig. (ii)

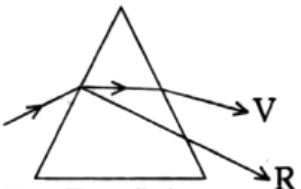


Fig. (iii)

(a) Which among the above figures is correct? Give reason.

(b) Write the name of the phenomenon.

Solution:

(a) The correct figure is the one where:

Violet appears at the bottom because it has the least wavelength and undergoes the most deviation. Red appears at the top because it has the longest wavelength and undergoes the least deviation.

Fig. (i)

(b) The phenomenon is Dispersion of light. It occurs when white light passes through a prism and splits into its component colors due to different refraction angles for each wavelength.

Q9. Thickness of insulated copper wire used in the primary turns and secondary turns of a transformer are not equal.

(a) In a step-up transformer, which set of turns (primary/secondary) is made of thicker copper wire? Justify your answer. (2)

(b) Write down the working principle of a transformer. (1)

Solution:

(a) In a step-up transformer, the primary coil is made of thicker copper wire.

A step-up transformer increases the voltage, meaning the secondary coil has more turns and carries lower current than the primary coil.

Since current is inversely proportional to voltage ($V \propto 1/I$ for constant power), the primary coil carries higher current than the secondary coil.

To handle the higher current, the primary coil requires thicker copper wire to reduce resistance and prevent excessive heating.

(b) A transformer works on the principle of **mutual induction.**

Mutual induction in a transformer occurs when a changing magnetic flux in the primary coil induces an EMF in the secondary coil due to electromagnetic induction, as described by Faraday's law.

Q10. When the stem of an excited tuning fork is pressed on a table, the surface of the table vibrates at the frequency of the tuning fork.

(a) The vibration of the table surface under the influence of a vibrating tuning fork is an example for _____ vibration. (1)

(b) When does the table is said to be in resonance with the tuning fork ? (1)

(c) Write the name of an instrument that is used in laboratory to demonstrate the phenomenon of resonance on a stretched string or wire. (1)

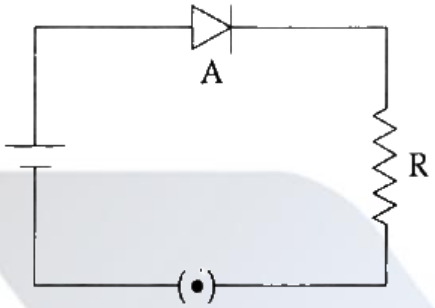
Solution:

(a) The vibration of the table surface under the influence of a vibrating tuning fork is an example of **forced** vibration.

(b) The table is said to be in resonance with the tuning fork when it vibrates with maximum amplitude due to the frequency of the tuning fork matching the natural frequency of the table.

(c) The instrument used in the laboratory to demonstrate resonance on a stretched string or wire is called a sonometer.

Q11. Observe the circuit diagram given below:



(a) Identify the electronic component marked A. (1)

(b) In the above circuit diagram the component A is in _____ biasing. (1)

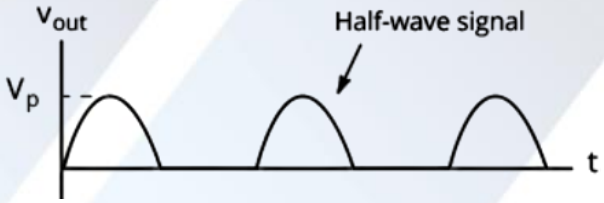
(c) Draw the voltage-time graph of output (across the resistor *R*) if the DC voltage source in the above diagram is replaced by an AC voltage source. (1)

Solution:

(a) Component A is a diode, depending on the circuit. It is used for rectification (conversion of AC to DC).

(b) The component A is in forward biasing. Since the diode is in forward bias, it allows current to flow through the circuit.

(c)



Q12. Windmill, Hydroelectric power, Nuclear reactor and Solar cell are four energy sources.

(a) Classify the above four energy sources as green energy and brown energy.(2)

(b) What is meant by green energy? (1)

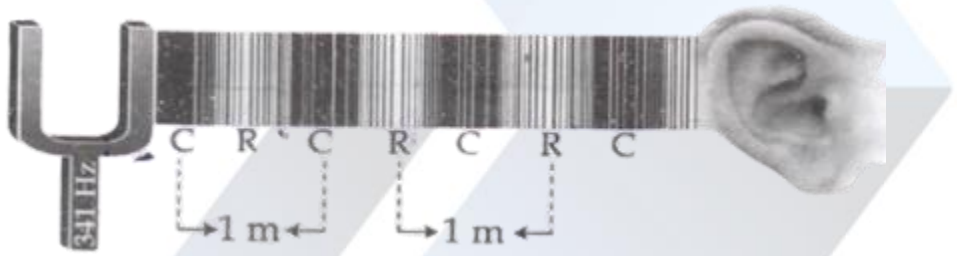
Solution:

(a) Classification of energy sources:

Green energy:	Brown energy:
Windmill, Hydroelectric power, and Solar cell	Nuclear reactor

(b) Green energy refers to energy generated from natural, renewable sources that are environmentally friendly and produce little to no pollution or greenhouse gas emissions. Examples include energy from the sun (solar), wind, and water (hydro).

Q13. The following figure illustrates the propagation of sound waves from a tuning fork 341 Hz to our ears.



(a) Which type of mechanical wave is shown in the figure? (1)

(b) Analyse the figure carefully and identify the frequency and wavelength of the wave. (2)

Solution:

(a) The type of mechanical wave shown in the figure is a longitudinal wave.

In a longitudinal wave, the particles of the medium vibrate parallel to the direction of wave propagation, forming compressions and rarefactions.

(b) Frequency (f): $f = 341$ Hz (given).

Wavelength (λ): $\lambda = 1$ m(given).

The velocity (v) of the sound wave is calculated using the formula:

$$v = f \times \lambda$$

Substitute the values:

$$v = 341\ \text{Hz} \times 1\ \text{m} = 341\ \text{m/s}$$

Thus, the velocity of the sound wave is 341 m/s.

Q14. Power transmission is the process of sending electricity to distant places through wires from the power station.

(a) Write any two difficulties faced when electrical power is to be transmitted to distant places. (2)

(b) Which type of transformer is used at the power stations as power transformer? (1)

(c) What is the voltage of electricity supplied for domestic consumption? (1)

Solution:

(a) Difficulties faced in power transmission:

- Power Loss: Electrical energy is lost as heat due to the resistance of the transmission wires, especially over long distances.
- Voltage Drop: The voltage decreases over the length of the transmission line, affecting the efficiency of power delivery.

(b) Type of transformer used:

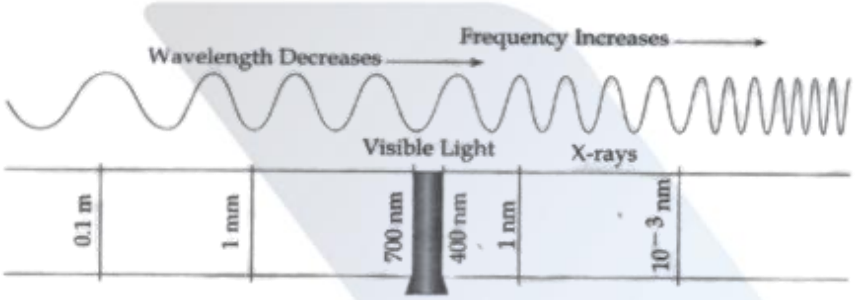
A step-up transformer is used at power stations to increase the voltage for efficient long-distance transmission. Higher voltage reduces power loss during transmission.

(c) Voltage for domestic consumption:

The voltage supplied for domestic consumption is typically 220–240 volts (AC) in many countries, while in some regions like the United States, it is 110–120 volts.

Answer either 15 (A) OR 15 (B) completely.

Q15. (A) The figure given below shows electromagnetic spectrum.



(a) Write the name of the wave between visible light and X-rays in the electromagnetic spectrum. (1)

(b) Give one use each for Infra-Red rays and X-rays. (2)

Solution:

(a) The wave that lies between visible light and X-rays in the electromagnetic spectrum is ultraviolet rays (UV rays).

(b) Uses of Infrared rays and X-rays:

Infrared rays:

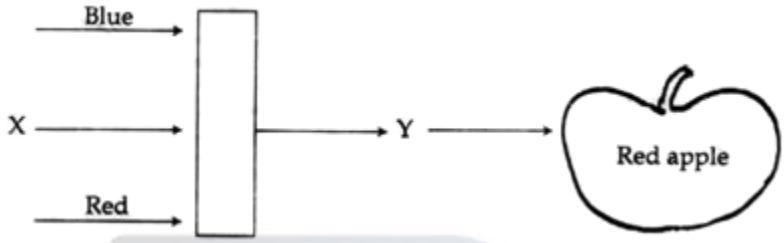
Used for thermal imaging to detect distant objects and in remote controls.

X-rays:

Used for medical imaging to view bones and organs, as well as in industrial applications to inspect materials for defects.

OR

(B) Three primary colors are incident on a transparent blue glass slab, as shown below. One of the incident colors is marked *X* and the color that passes out of the glass slab is marked Y.



(a) Identify the colours marked X and Y in the given figure. (2)

(b) In what colour does a red apple appear if it is observed in the colour *Y* which is coming out of the blue glass plate shown above? (1)

Solution:

(a) Colour X: X must be Green, because the three primary colours are Red, Green, and Blue, and the figure shows Red separately.

Colour Y: The transparent blue glass slab will absorb all colours except blue. The incident primary colours are Red, Blue, and Green. Since blue light passes through the glass slab, the colour Y is Blue.

(b) A red apple appears red because it reflects red light and absorbs all other colours. Since only blue light (Y) is available after passing through the blue glass, the apple cannot reflect red light. The apple will absorb blue light and appear black (because there is no red light to reflect).

Answer either 16(A) OR 16(B) completely.

Q16. (A) The table given below shows the data obtained in an experiment for determining the specific heat capacity of coconut oil.

Substance used	Mass of the substance taken	Quantity of heat supplied	Increase in Temperature
Coconut Oil	10 kg	420000 J	20 K

(a) What is meant by specific heat capacity of a substance? (1)

(b) Write the answer in SI unit of specific heat capacity. (1)

(c) Calculate the specific heat capacity of coconut oil using data given in the table.(2)

Solution:

(a) The specific heat capacity of a substance is the amount of heat energy required to raise the temperature of 1 kg of the substance by 1 K (or 1°C).

(b) The SI unit of specific heat capacity is joule per kilogram per kelvin (J/kg·K).

(c) The formula for specific heat capacity (c) is:

$$c = \frac{Q}{m \times \Delta T}$$

where:

$Q = 420000$ J (heat supplied)

$m = 10$ kg (mass of the substance)

$\Delta T = 20$ K (temperature increase)

Substituting the values:

$$c = \frac{420000}{10 \times 20}$$

$$c = \frac{420000}{200}$$

$$= 2100 \text{ J/kg. K}$$

The specific heat capacity of coconut oil is 2100 J/kg·K.

OR

(B) In SI unit Latent heat of fusion of ice is 335×10^3 units.

(a) What is meant by Latent heat of fusion? (1)

(b) Write the SI unit of Latent heat of fusion. (1)

(c) Calculate the quantity of heat required to completely convert 5 kg of ice at 0°C into water at the same temperature. (2)

Solution:

(a) The latent heat of fusion is the amount of heat energy required to change 1 kg of a solid into a liquid without changing its temperature.

(b) The SI unit of latent heat of fusion is joule per kilogram (J/kg).

(c) Calculation of heat required to melt 5 kg of Ice:

The formula to calculate the heat required (Q) is:

$$Q = m \times L$$

Where:

$m = 5$ kg (mass of ice)

$L = 335 \times 10^3$ J/kg (latent heat of fusion of ice)

Substituting the values:

$$Q = 5 \times (335 \times 10^3)$$
$$= 1675 \times 10^3\ J$$