SECTION A (40 Marks)

Compulsory: Attempt all questions.

Question 1

(a) Directions: Each question in this part is followed by four possible choices of answers. Choose the correct answer with key and write it in the space provided. **[15]**

(i) The S.I. unit of force is

A watt.
B joule.
C pascal.
D newton.

Answer:……

(ii) Translational kinetic energy is the energy possessed by a body

A due to its vibration.
B due to its state of rest.
C moving in a straight line.
D due to its rotation about an axis.

Answer:……

(iii) Study the mechanical advantages (MA) given below.

I MA is greater than one.
II MA is equal to one.
III MA is less than one.

For a class I lever, which of the statements given above are ***TRUE***?

A I and II
B I and III
C II and III
D I, II and III

Answer:…….

(iv) The pressure at any point in a liquid at rest depends on all the following factors ***EXCEPT***

A volume of the liquid.
B density of the liquid.
C acceleration due to gravity at that place.
D depth from the free surface of the liquid.

Answer:……

(v) Which one of the following sentences best describes Archimedes' Principle?

A The weight of a floating body is double the upthrust.
B The weight of a floating body is equal to the upthrust.
C The weight of a floating body is less than the upthrust.
D The weight of a floating body is greater than the upthrust.

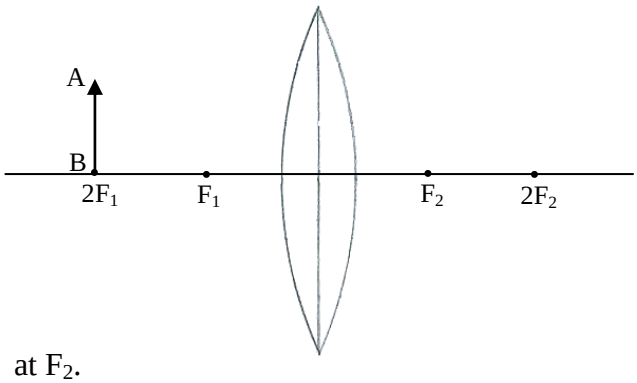
Answer:……

(vi) The speed of light in air is

A 2×10^8m/s.
B 2.25×10^8 m/s.
C 2.5×10^8m/s.
D 3×10^8m/s.

Answer:……

(vii) The location of the image formed in the diagram given below will be



A at F_2.
B at $2F_2$.
C beyond $2F_2$.
D between F_2 and $2F_2$.

Answer:……

(viii) The purpose of blackening the inside of a photographic camera is to

A avoid internal reflection of light.
B avoid internal refraction of light.
C prevent the light entering into the camera.
D control the amount of light entering the camera.

Answer:……

(ix) Dawa is a photographer, who wanted to take pictures of Thimphu in the night. You would advise him to use

A X- rays.
B gamma rays.
C infrared rays.
D ultraviolet rays.

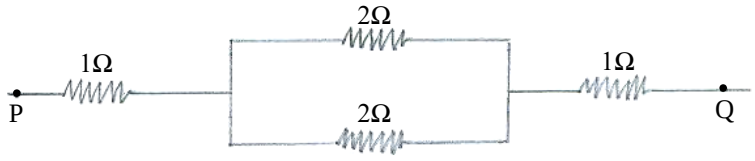
Answer:……

(x) Divya was surprised that she could not hear an echo of a sound in a room of 5m×5m×5m dimension. What could have been the reason?

A Echo cannot be produced in a closed room.
B Speed of sound in air is too slow to produce echo.
C Reflected sound does not reach the source of sound.
D Minimum distance between source of sound and reflector should be 17m.

Answer:……

(xi) The equivalent resistance between points P and Q in the diagram given below is



A 3Ω.
B 4Ω.
C 5Ω.
D 6Ω.

Answer:……

(xii) The function of a socket is

A for earthing.
B to draw the supply of voltage from the mains.
C to break the circuit when current is not needed.
D to regulate the supply of voltage to electrical appliances.

Answer:……

(xiii) A d.c. motor present in air conditioners converts

A electrical energy to sound energy.
B chemical energy to mechanical energy.
C mechanical energy to electrical energy.
D electrical energy to mechanical energy.

Answer:……

(xiv) The heat required to raise the temperature of 42g of water from 50^oC to 60^oC will be (Specific heat capacity of water=$4200Jkg^{-1}{}^\circ C^{-1}$)

A 1764J.
B 1774J.
C 1784J.
D 1794J.

Answer:……

(xv) The particle X in the following decay ${}^{214}_{83}Bi \rightarrow {}^{214}_{84}Po + X$ is

A an alpha particle.
B a beta particle.
C a gamma ray.
D an X-ray.

Answer:…….

(b) Fill in the blanks by writing suitable words. **[5]**

(i) If the displacement is in the opposite direction of the force, the work done is …….

(ii) The efficiency of an ideal machine is always …….

(iii) The brakes of vehicles work on the principle of …….

(iv) ……. is the minimum amount of energy required to emit electrons from a metal surface.

(v) The frequency of vibration of an air column is ……. proportional to the length of the air column.

(c) Match each item under Column A with the most appropriate item in Column B. Rewrite the correct matching pairs in the space provided. **[5]**

Column A	**Column B**
(a) Hydrometer	(i) ohm
(b) Power of a lens	(ii) frequency
(c) Pitch	(iii) J kg^{-1}
(d) Latent heat	(iv) specific gravity
(e) Resistance	(v) amplitude
	(vi) J $kg^{-}1$ $°C^{-1}$
	(vii) dioptre

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(d) Correct and rewrite the following statements: **[5]**

(i) The relative density of a substance is the ratio of the density of the substance to the density of water at 0°C.

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(ii) When a ray of light travels from air to water, it will bend away from the normal.

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(iii) A diverging lens always forms a real image.

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(iv) At the Paro sub-station, the power is stepped down from 33KV to 11KV for domestic consumption.

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(v) The strength of an electromagnet can be increased by decreasing the number of turns in the coil.

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(e) Answer the following questions:

(i) What is the unit of loudness? **[1]**

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(ii) Write ***two*** factors on which the heat absorbed by a body depends. **[2]**

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(iii) Write the functions of the following in a cathode ray tube. **[2]**

1. X-plates

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2. Y-plates

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(iv) How does your eye focus while reading a story book and how does it differ from a photographic camera? **[1]**

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(v) 'A parallel combination of resistors is better than series combination of resistors'. Justify the statement with an example. **[2]**

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(vi) Why are X-rays used to locate fractures in our body? **[1]**

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(vii) Maya wanted to replace a fuse wire with a copper wire. Give reasons why this could be dangerous. **[1]**

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SECTION B (40 Marks)

Attempt any four questions.

Question 2

(a) An electric heater of 1000W raises the temperature of 5kg of a liquid from $25^{o}C$ to $31^{o}C$ in 2 minutes. Calculate the:

1. heat capacity of the liquid and
2. specific heat capacity of the liquid . **[3]**

(b) A battery of emf 3volts is connected in series with an ammeter, a 10Ω coil of wire and a parallel combination of resistances 3Ω and 6Ω.

1. Draw a circuit diagram for the above arrangement. **[1]**

2. What will be the reading on the ammeter? **[2]**

(c) (i) Will the weight of Ap Bokto on the moon be less, equal or greater than that on the earth? Give a reason for your answer. **[2]**

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(ii) State any ***two*** laws of liquid pressure. **[2]**

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Question 3

(a) (i) State Newton's second law of motion. **[1]**

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(ii) What is the loudness of a sound? **[1]**

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(iii) List ***two*** factors that affect the loudness of a sound. **[2]**

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(b) Find the values of X, Y and Z in the following decay reactions: **[3]**

(i) $^{238}_{92}\mathrm{U} \rightarrow {}^{234}_{X}\mathrm{Th} + {}_{2}\mathrm{He}^{4}$

(ii) $^{228}_{88}\mathrm{Ra} \rightarrow {}^{Y}_{89}\mathrm{Ac} + {}_{-1}\beta^{0}$

(iii) $^{214}_{83}\mathrm{Bi}^{*} \rightarrow {}^{214}_{83}\mathrm{Bi} + Z$

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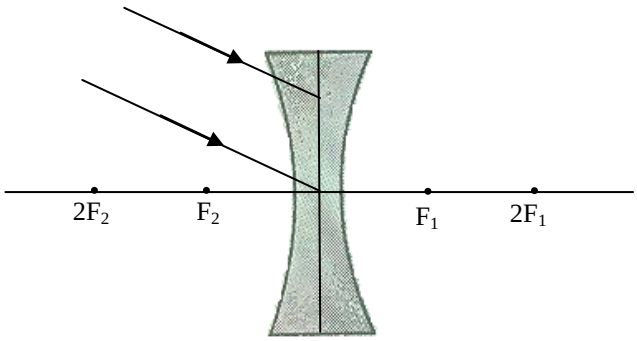
(c) (i) Complete the ray diagram below showing the formation of an image. **[1½]**



(ii) Write ***three*** characteristics of the image formed in the above diagram. **[1½]**

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Question 4

(a) (i) From the frequencies A and B given below, which one has a higher pitch? **[1]**

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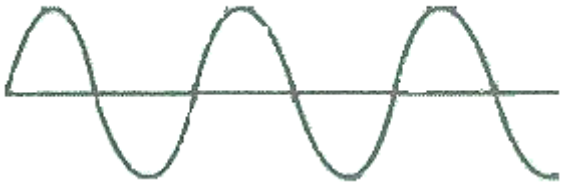
B



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(ii) Compare any ***two*** properties of α-particles and β- particles in the table given below: **[2]**

α -particles	β -particles

(b) Match the machines in Column I against their mechanical advantages in Column II. **[3]**

Column I	**Column II**
1. Class II lever 2. Block and table system with 5 pulleys 3. Inclined plane	(a) MA=1 (b) $\frac{1}{\sin e\theta}$ (c) MA=5 (d) MA>1

(c) (i) What is meant by the term 'up thrust'? **[1]**

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(ii) Calculate the mass of a body whose volume is $5m^3$ and relative density 0.65. **[2]**

(iii) What is the ratio between the height of an object to the height of its image called? **[1]**

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Question 5

(a) (i) Define what is critical angle. **[1]**

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(ii) Give reasons for the following:

1. We get an eye strain when we work on the computer for long hours. **[1]**

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2. Phurba usually follows the normal exposure times of only 1/500s, 1/250s, 1/30s, etc. while taking photographs. Why do you think so? **[1]**

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(b) (i) An electric bulb is marked 250W, 230V.

1. How many joules of energy does it consume in an hour? **[1½]**
2. How long would the lamp take to use 1kWh energy when connected to 230V mains? **[1½]**

(ii) Define the following terms: **[2]**

1. Dispersion of light

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2. Complementary colours

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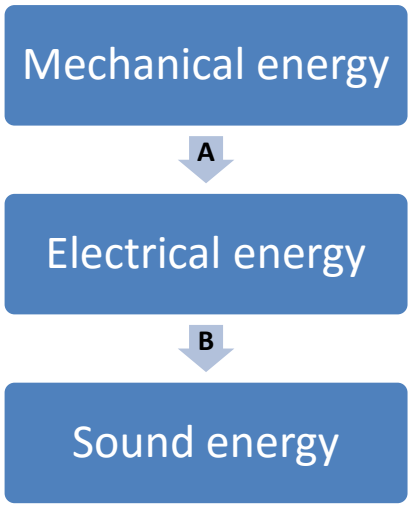
(c) (i) Study the energy transformations in the diagram given below and give an example of a device that carries out each transformation labelled A and B. **[1]**



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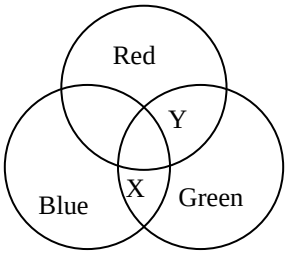
(ii) What will be the colour of light in the portions marked X and Y in the diagram given below? **[1]**



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Question 6

(a) (i) Name the instrument used to measure the density of the acid in a battery. **[1]**

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(ii) What is a galvanometer? List ***one*** advantage of a moving coil galvanometer. **[2]**

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(b) (i) State the principle of reversibility of light. **[1]**

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(ii) Write ***two*** differences between the total internal reflection by a prism and reflection by a plane mirror in the table below. **[2]**

Total internal reflection	Reflection from a plane mirror

(c) (i) Give reasons. **[2]**

1. A musical sound is pleasant to our ears.

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2. We usually cup our hands to make a loud sound.

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(ii) 'Electricity is a boon to human kind rather than evil'.

Justify the statement. **[2]**

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Question 7

(a) (i) Why is the core of a transformer laminated? **[2]**

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(ii) Define the following terms. **[2]**

1. One calorie

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2. Principle of calorimetry

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(b) (i) The work done while carrying a load and moving in a circular path is always zero. Justify the statement. **[2]**

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(ii) Give ***one*** use of cathode rays. **[1]**

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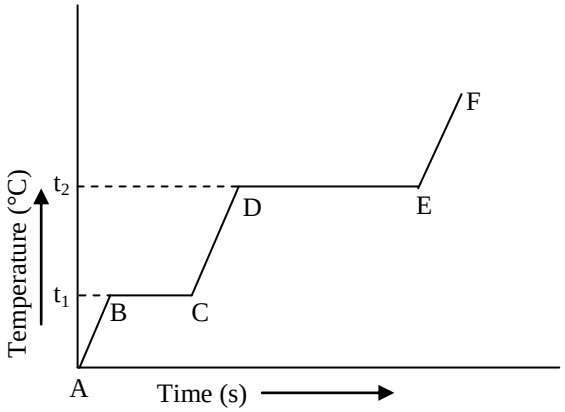
(c) (i) The figure given below shows the change of the phase of a substance in a temperature-time graph.



What is the boiling point of the substance? **[1]**

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(ii) List down ***two*** limitations of Ohm's law. **[2]**

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for Rough Work

for Rough Work