PHYSICS

(SCIENCE PAPER 1)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

***Section A** is compulsory. Attempt **any four** questions from **Section B**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options.   [15]

(Do not copy the questions, write the correct answers only.)

(i)   Clockwise moment produced by a force about a fulcrum is considered to be:

    (a)   Positive

    (b)   Negative

    (c)   Zero

    (d)   None of these

(ii)   When the speed of a moving object is *doubled*, then its *kinetic energy*:

    (a)   remains the same

    (b)   decreases

    (c)   is doubled

    (d)   becomes four times

(iii)   The energy conversion in a washing machine is from _____.

       (a)   magnetic to electrical

       (b)   electrical to mechanical

       (c)   electrical to magnetic

       (d)   magnetic to electrical

(iv)   Which of the following radiations suffer maximum deflection in a magnetic field?

       (a)   Alpha radiations

       (b)   Beta radiations

       (c)   Gamma radiations

       (d)   X-radiations

(v)   Speed of blue light in water is:

       (a)   more than green light

       (b)   more than orange light

       (c)   more than violet light

       (d)   more than red light

(vi)   A concave lens produces only _____ image.

       (a)   real, enlarged

       (b)   virtual, enlarged

       (c)   virtual, diminished

       (d)   real, diminished

(vii)   When a body vibrates under a periodic force, the vibrations of the body are always:

       (a)   natural vibrations

       (b)   damped vibrations

   (c)   forced vibrations

       (d)   resonant vibrations

(viii) Two notes are produced from two different musical instruments, such that they have same loudness and same pitch. The produced notes differ in their:

(a) Waveform

(b) Frequency

(c) Wavelength

(d) Speed

(ix) When a current I flows through a wire of resistance R for time t then the electrical energy produced is given by:

(a) I^2Rt

(b) IR^2t

(c) IRt

(d) IRt^2

(x) Choose the correct relation for e.m.f. (ε) and terminal voltage V:

(a) $\varepsilon = V$ (always)

(b) $V > \varepsilon$ [always]

(c) $V < \varepsilon$ [when the cell is in use]

(d) None of these

(xi) If the strength of the current flowing through a wire is increased, the strength of the magnetic field produced by it:

(a) decreases

(b) increases

(c) remains the same

(d) first increases then decreases

(xii) **Specific** latent heat of a substance:

(a) is directly proportional to the mass

(b) is directly proportional to the change in the temperature

(c) depends on the material

(d) is inversely proportional to the mass

(xiii)   Specific heat capacity of a substance X is 1900 Jkg^{-1} $^{\circ}$C^{-1} means:

(a)   Substance X absorbs 1900 J for 1°C rise in temperature

(b)   1 kg of substance X absorbs 1900 J heat for 1°C rise in temperature

(c)   1 kg of substance X absorbs 1900 J heat to increase the temperature

(d)   1 kg of substance X absorbs 1900 J heat to cool down by 1°C

(xiv)   When a ray of light travels normal to the given surface, then the angle of refraction is:

(a)   180°

(b)   90°

(c)   0°

(d)   45°

(xv)   Small air bubbles rising up a fish tank appear silvery when viewed from some particular angle is due to the:

(a)   reflection

(b)   refraction

(c)   dispersion

(d)   total internal reflection

Question 2

(i)   (a)   When does the nucleus of an atom tend to become radioactive?   [3]

(b)   Name a single pulley in which displacement of load and effort is not the same.

(c)   State one advantage of this pulley.

(ii)   (a)   What is the position of centre of gravity of a triangular lamina?   [2]

(b)   When this triangular lamina is suspended freely from any one vertex, what is the moment of force produced by its own weight in its rest position?

(iii) The diagram shows wheel **O** pivoted at point **A**. Three equal forces **F₁, F₂** and **F₃**   [2]
act at point **B** on the wheel.
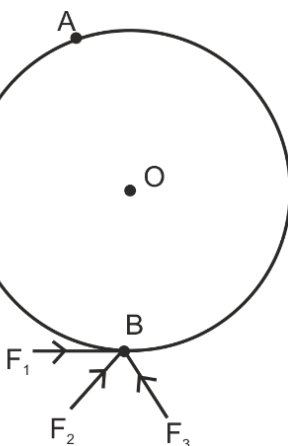
(a) Which force will produce maximum moment about **A**?

(b) Give a reason for your answer in (a).

(iv) (a) What should be the *angle* between the direction of force and the direction of   [2]
displacement, for work to be negative?

(b) Name the physical quantity obtained using the formula $\frac{U}{h}$, where U is the
potential energy and h is the height.

(v) Calculate the power spent by a crane while lifting a load of mass 2000 kg, at velocity   [2]
of 1.5 ms⁻¹. (g = 10 ms⁻²)

(vi) A metal foot ruler is held at the edge of a table. It is pressed at its free end and then   [2]
released. It vibrates.

(a) Name the vibrations produced.

(b) State *one* way to increase the frequency of these vibrations.

(vii) 'A geyser is rated 240 W – 220 V'. Explain the meaning of this statement.   [2]

Question 3

(i) (a) Is it possible for a concave lens to form an image of size two times that of the   [2]
object? Write *Yes* or *No*.

(b) What will happen to the focal length of the lens if a part of the lens is covered
with an opaque paper?

(ii)   (a) Which electrical component protects the electric circuit in case of excess current and which can also be used as a switch? [2]

(b) Name the wire to which this electrical component is connected in an electric circuit.

(iii) A copper conductor is placed over two stretched copper wires whose ends are connected to a D.C. supply as shown in the diagram. [2]

(a) What should be the magnetic poles at the points **A** and **B** lying on either side of the conductor to experience the force in the upward direction?

(b) Name the law used to find these polarities.
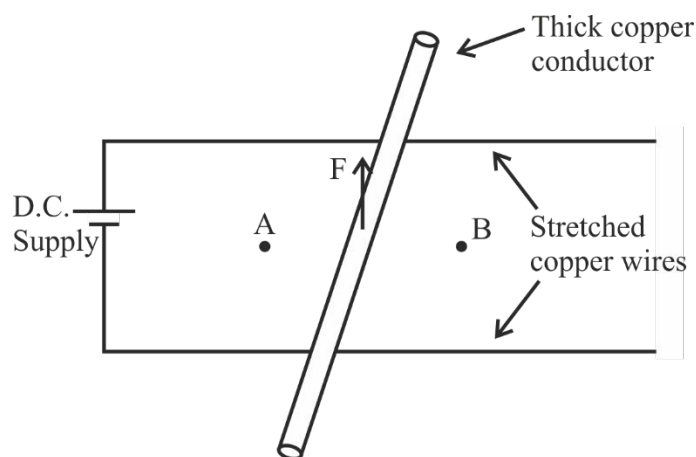
(iv) Thermal capacities of substances **A** and **B** are same. If mass of **A** is more than mass of **B** then: [2]

(a) Which substance will have more specific heat capacity?

(b) Which substance will show greater rise in temperature if the same amount of heat is supplied to both?

(v) How is the *radioactivity* of a radio isotope affected if it undergoes a *chemical change*? Give a reason for your answer. [2]
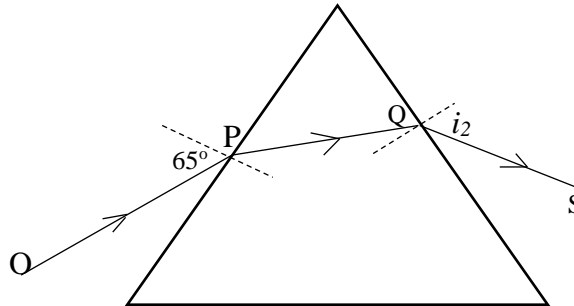
*(Attempt **any four** questions from this **Section**.)*

Question 4

(i)   The diagram below shows the ray **OP** travelling through an *equilateral* prism of a   [3]
certain material.

(a)   Calculate the value of i_2, if the angle of deviation is 43°.

(b)   What is the ray **QS** called?

(ii)   Copy the diagram given below and complete the path of the light ray **PQ**, as it emerges   [3]
out of the prism by marking necessary angles. The critical angle of glass is 42°.
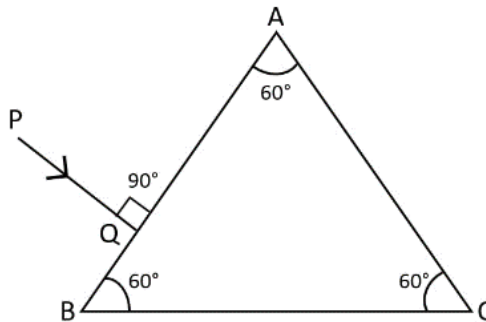
(iii)   The diagram below shows two parallel rays **A** (Orange) & **B** (Blue) incident from   [4]
air, on air-glass boundary.

(a)   Copy and complete the
path of the rays **A** and **B**.

(b)   How do the speeds of
these rays differ in glass?

(c)   Are the two refracted rays
in glass parallel? Give a
reason.
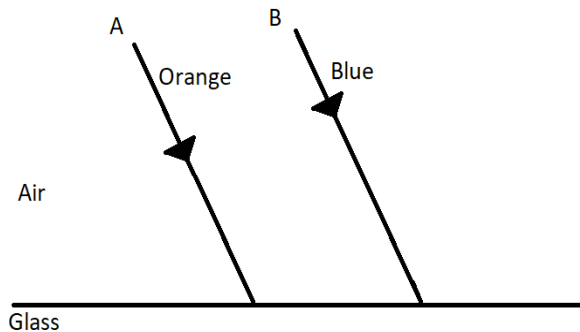
Question 5

(i)   A convex lens of focal length 10 cm is placed at a distance of 60 cm from a screen.   [3]
        How far from the lens should an object be placed so as to obtain a real image on the
        screen?

(ii)   (a)   A coin kept inside water [$\mu=4/3$] when viewed from air in a vertical direction   [3]
              appears to be raised by 3.0 mm. Find the depth of the coin in water.

        (b)   How is the critical angle related to the refractive index of a medium?

(iii)   (a)   Infrared radiations are used in warfare. Explain with reason, why.   [4]

        (b)   A ray of light is incident at 45° on an equilateral prism in the diagram below.
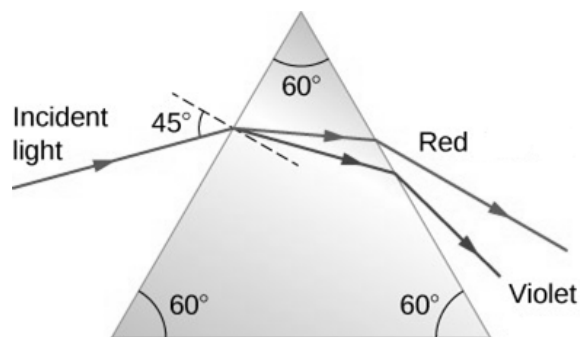

        1.   Name the phenomenon exhibited by the ray of light when it enters and
              emerges out of the prism.

        2.   State the cause of the above phenomenon mentioned by you.

Question 6

(i)   A block and tackle system of pulleys has *velocity ratio* 4.   [3]

        (a)   Draw a labelled diagram of the system indicating clearly, the direction of the
              load and the effort.

        (b)   What is the value of the mechanical advantage of the given pulley system if it
              is an ideal pulley system?

(ii)   A **metre** scale of weight 50 gf can be balanced at 40 cm mark without any weight   [3]
suspended on it.

(a)   If this ruler is cut at its centre then state which part [0 to 50 cm or 50 to
100 cm] of the ruler will weigh more than 25 gf.
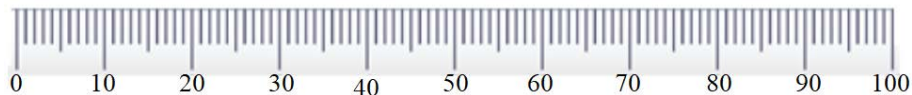
(b)   What minimum weight placed on this metre ruler can balance this ruler when
it is pivoted at its centre?

(iii)   A car of mass 120 kg is moving at a speed 18 **km/h** and it accelerates to attain a   [4]
speed of 54 **km/h** in 5 seconds. Calculate:

(a)   the work done by the engine.

(b)   the power of the engine.

Question 7

(i)   (a)   Which characteristic of sound is affected due to the larger surface of a school   [3]
bell?

(b)   Calculate the distance covered by the Ultrasonic wave having a velocity of
1.5 **kms^{-1}** in 14 s, when it is received after reflection by the receiver of the
SONAR.

(ii)   (a)   Complete the following nuclear changes: [3]

$$^{238}_{92}P \rightarrow \underline{}Q + {}^{4}_{2}He \rightarrow \underline{}R + {}^{0}_{-1}e$$
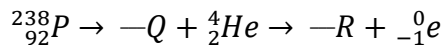
(b)   Name the nuclear radiation which has the highest ionizing power.

(iii)   We are able to see the T.V. channels clearly when we set T.V. on *auto-tuning*.   [4]

(a)   Which *phenomenon* led to the clear visibility of the channels, due to auto-
tuning?

(b)   Define the above phenomenon mentioned by you.

(c)   Give *any one* more example of this phenomenon.

Question 8

(i)   (a)   Define specific resistance.   [3]

        (b)   What happens to the specific resistance of a conductor if its length is doubled?

        (c)   Name a substance whose specific resistance remains almost unchanged with the increase in its temperature.

(ii)   (a)   Which nuclear radiation will travel undeviated in an electric field?   [3]

        (b)   How can one stop the radiations escaping from a nuclear reactor in a nuclear power plant?

        (c)   Name *one* internal source of background radiations.

(iii)   Find the value of current **I** drawn from the cell.   [4]
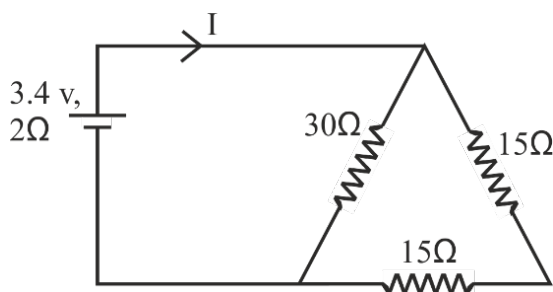
        (a)   Calculate the current **I**.

        (b)   Calculate the terminal voltage.

Question 9

(i)   Calculate the total amount of heat energy required to **melt** 200 g of ice at 0°C to water at 100°C.   [3]

    (Specific latent heat of ice = 336 J g^{-1}, specific heat capacity of water = 4.2 J g^{-1} °C^{-1})

(ii)   (a)   State the principle of calorimetry.   [3]

        (b)   Name the material used for making a calorimeter.

        (c)   Write *one* characteristic property of the material chosen for making a calorimeter.

(iii)   The diagram below shows a cardboard on which iron filings are kept. A wire bent   [4]
in the form of a loop is seen passing through the cardboard. When current flows
through it the iron filings arrange themselves as shown below.

Iron filings
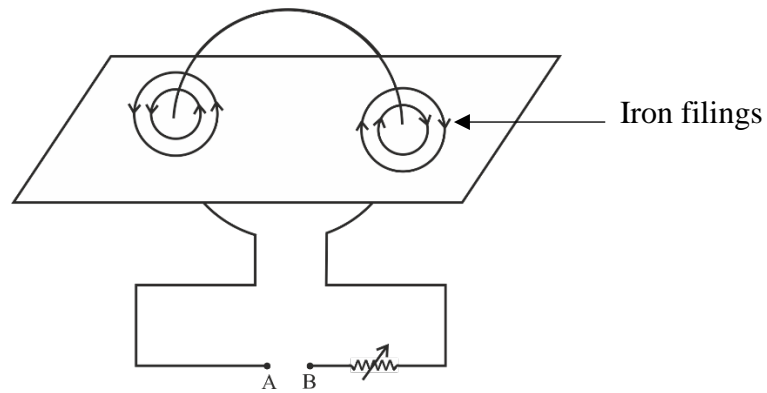
(a)   State the polarities of the *battery* at **A** and **B**.

(b)   State the effect on the magnetic field if an iron rod is held along the axis of the
coil.

(c)   State one way to:

1.   Change the polarity of the *coil*.

2.   *Decrease* the strength of the magnetic field around the coil.