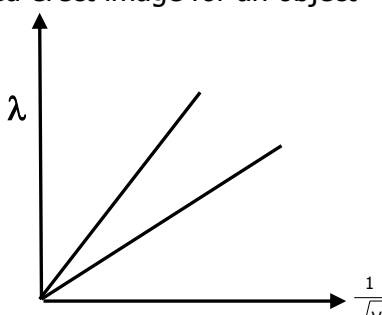


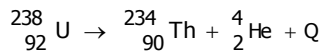


1. Name the part of electromagnetic spectrum whose wavelength lies in the range of  $10^{-10}$  m. Give its one use. (1)
2. Give the graph for stopping potential versus frequency incident radiation in photoelectric effect. What does the slope of the graph indicate? (1)
3. The radioactivity isotope D decays according to the sequence with D goes  $\beta$  decay to form  $D_1$  and  $D_1$  undergoing  $\alpha$  decay to form  $D_2$ . Complete the series.
 

$D \longrightarrow D_1 \longrightarrow D_2$

 Given that mass number and atomic number of  $D_2$  are 176 and 71 respectively. (1)
4. a) In an hydrogen atom an electron undergoes transition from 2<sup>nd</sup> excited state to the 1<sup>st</sup> excited state and then goes to the ground state. Identify the spectral series to which this transition belongs. (2)  
 b) Find out the ratio of the wavelengths of the emitted radiations in the two cases. (2)
5. Show that a convex mirror always forms a virtual, diminished erect image for an object placed in front of it. (2)
6. a) Show that the de Broglie's wavelength of electron accelerated to a potential of  $V$  can be expressed as  $\lambda = \frac{h}{\sqrt{2meV}}$  (2)  
 b) In the figure given, which of the two particles A or B has smaller mass.
  (2)
7. a) An electromagnetic wave is travelling in a medium with velocity  $\mathbf{v} = v\mathbf{i}$ . Draw a sketch showing the propagation of the electromagnetic wave, indicating the directions of oscillating electric and magnetic fields. (3)  
 b) How are the magnitude of electric and magnetic fields in electromagnetic waves related with the velocity of the electromagnetic waves?  
 c) Considering the case of a parallel plate capacitor being charged, show how one is required to generalize the Ampere's circuital law to include the term due to displacement current. (3)
8. Write Einstein's photoelectric equation. State clearly the three salient features observed in photoelectric effect which can be explained on the basis of above equation. (3)
9. a) State the law of nuclear disintegration. Derive the expression number of nuclei left over after a time 't'. (3)  
 b) A radioactive sample initially has  $16 \times 10^{12}$  nuclei. How many nuclei will disintegrate in 64 years if the half life period of the sample is 16 years? (3)
10. A point object placed in front of a convex spherical refracting surface forms a real image when the ray travels from a rarer medium (refractive index  $n_1$ ) to the denser medium (refractive index  $n_2$ ). Derive the relation between the object distance, image distance and radius of curvature of the convex spherical surface. (3)

11. a) Draw a graph showing the variation of binding energy per nucleon with mass number of different nuclei. State two important inferences from the graph.  
 b) Calculate the energy released in MeV in the following nuclear reaction.



Given;  $m_{{}_{92}^{238}\text{U}} = 238.05079\text{u}$ ,  $m_{{}_{90}^{234}\text{Th}} = 234.043630\text{u}$ ,  $m_{{}_2^4\text{He}} = 4.00260\text{u}$  (3)

12. a) Does the appearance of bright and dark fringes in the pattern violate, in any way, conservation of energy? Explain.  
 b) Yellow light ( $\lambda = 6000\text{\AA}$ ) illuminates a single slit of width 0.1mm. Calculate the distance between two dark lines on the either side of the central maxima when the diffraction pattern is viewed on a screen kept 1.5m away from the slit and the angular spread of the first diffraction minima. (3)

13. What is a plane polarized light? Two polaroids are placed in crossed position with each other. What would be the transmitted intensity? What happens when one more polaroid is placed between these two, bisecting the angle between them? Show graphically, how will the intensity of transmitted light vary on further rotating the third Polaroid through an angle of  $2\pi$ ? (3)

14. a) Draw labelled ray diagram to show the image formation at least distance of distinct vision in a compound microscope. Derive the expression for its magnifying power.  
 b) Using the data given below, state as to which of the given lenses will you prefer to use as (i) eye piece, and (ii) an objective to design a compound microscope. Give reason for your answer. (3+2)

Lens	Power	Aperture
A	20 D	0.02m
B	10 D	0.02m
C	10 D	0.05m
D	1.0 D	0.1m

-x-x-x-x-x-x-