

6. The finite resolution of our eye or of optical instruments such as telescopes or microscopes is limited due to the phenomenon of
- interference
 - diffraction
 - dispersion
 - total internal reflection
7. In Young's double slit experiment, the intensity at the centre of screen is I . When one of the slits is covered, the intensity at centre will now be
- $I/2$
 - I
 - $I/4$
 - $I/3$

Study the following paragraph and answer questions no. 8 and 9 based on it.

It is observed that the mass of a stable nucleus is always less than the sum of the masses of its constituent protons and neutrons. The difference in the mass of a nucleus and its constituents is called mass defect. Using Einstein's mass energy equivalence, we express the mass difference in terms of energy known as the binding energy of the nucleus. The value of B. E. Per nucleon gives a measure of the stability of that nucleus. Greater the B. E. Per nucleon of the nucleus, more stable is the nucleus.

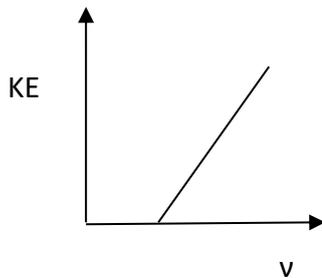
8. If number of nucleons increase, then B. E. Per nucleon of the nucleus
- first increases then decreases with mass number
 - continuously increases
 - continuously decreases
 - remains constant
9. Average B. E. Per nucleon is maximum for the nucleus
- ${}^2_2\text{He}^4$
 - ${}^8_8\text{O}^{16}$
 - ${}^{56}_{26}\text{Fe}^{56}$
 - ${}^{238}_{92}\text{U}^{238}$
10. A transistor can be used as
- oscillator and switch
 - oscillator and amplifier
 - switch and amplifier
 - All of the above
11. For a light of wavelength λ in nano meter, the photon energy $h\nu$ in eV is
- $\frac{1240}{\lambda}$
 - $\frac{1200}{\lambda}$
 - $\frac{1360}{\lambda}$
 - $\frac{\lambda}{1240}$

12. Match the following for the relevant relations

1. n-type semiconductor	a) $n_e = n_h$
2. p-type semiconductor	b) $n_e \gg n_h$
3. intrinsic semiconductor	c) $n_e \ll n_h$
4. extrinsic semiconductor	d) $n_e \neq n_h$

- A) 1- c, 2- a, 3 - b, 4 - d
 B) 1- b, 2- c, 3 - d, 4 - a
 C) 1- b, 2- c, 3 - a, 4 - d
 D) 1- b, 2- d, 3 - a, 4 - c

13. The graph of kinetic energy of emitted electron with frequency of incident radiation is as shown



The slope of the curve is

- A) h/ν B) h C) hc D) h/e

14. First experiment to verify wave nature of electron experimentally was

- A) Young's double slit experiment
 B) Davisson and Germer experiment
 C) Diffraction at single slit
 D) Rutherford's alpha scattering experiment

15. A TV transmission tower has a height of 140 m and the height of the receiving antenna is 40 m. What is the maximum distance upto which signal can be broadcasted from this tower using LoS mode?

- A) 65 km
 B) 80 km
 C) 40 km
 D) 48 km

16. Frequency band used for F M broadcast is of

- A) 88 - 108 k Hz B) 88 - 108 M Hz C) 88 - 108 G Hz D) 88 - 108 Hz

17. When a forward bias is applied to a p-n junction, it
- A) raises the potential barrier
 - B) reduces the majority carrier current to zero
 - C) lowers the potential barrier
 - D) none of the above

18. Match the following

- | | |
|------------------|---------------------|
| 1. Myopia | a) convergent lens |
| 2. Hypermetropia | b) cylindrical lens |
| 3. Astigmatism | c) divergent lens |

- A) 1- c, 2- a, 3 – b
- B) 1- b, 2- c, 3 – a
- C) 1- b, 2- a, 3 – c
- D) 1- a, 2- c, 3 – b

In question number 19 and 20, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct option out of the options given below

- A) If both assertion and reason are correct and R is true explanation of A.
- B) If both assertion and reason are correct and R is not the correct explanation of A.
- C) If assertion is true but reason is false.
- D) If both assertion and reason are false.

19. Assertion: Zener diode works on the principle of breakdown voltage.

Reason: Current suddenly increases after breakdown voltage

20. Assertion: When the reflected wave is perpendicular to the refracted wave, the reflected wave is totally polarised wave.

Reason: Refractive index of a medium is numerically equal to tangent of the polarising angle.

Section B

21. Does the apparent depth of a tank of water change if viewed obliquely? If so, does the apparent depth increase or decrease?

OR

When a tiny circular obstacle is placed in the path of light from a distant source, a bright spot is seen at the centre of the shadow of the obstacle. Explain why?

22. What focal length should the reading spectacle have for a person for whom the least distance of distinct vision is 50 cm? It is given that the distance of normal vision is 50 cm?

23. Calculate momentum of the electrons accelerated through a potential difference of 56 V.

OR

The work function for a certain metal is 4.2 eV. Will this metal give photoelectric emission for incident radiation of wavelength 330 nm?

24. Draw a labelled energy level diagram of hydrogen atom and its various spectral series.

25. How will you obtain an OR gate using NAND gates only.

26. Discuss the inconsistency in Ampere's circuital law. What modification was given by Maxwell in this law. (1.5 + 1.5 = 3)

OR

Show that the average energy density of the electric field equals the average energy density of the magnetic field.

27. Draw the diagrams for

- i) refraction of a plane wave by a thin prism
- ii) refraction of a plane wave by a convex lens
- iii) reflection of a plane wave by a concave mirror

28. Obtain the law of radioactive decay. Hence define disintegration constant.

OR

With the help of a labelled diagram describe in brief moderator, control rods and coolant in a nuclear reactor.

29. a) Define sky wave propagation

b) Why space wave propagation is called LoS propagation? (1+2 = 3)

30. What is dispersion of light? Derive an expression for the angle of deviation for a ray of light passing through an equilateral prism of refracting angle A.

OR

b) Define interference of light. Derive conditions for constructive and destructive interference using the superposition principle.

31. a) Draw a circuit diagram for an npn transistor in common emitter configuration to study its

- i) input characteristics
- ii) output characteristics
- iii) transfer characteristics

Use the relevant plots where applicable and give their important features.

OR

What is an oscillator? Give its working principle with the help of a labelled circuit diagram, explain how a transistor can be used to produce self sustained oscillations?