ETERNAL CAREER CLASSES

SUBJECT : PHYSICS		CLASS	: XII	FULL MARKS : 40	
NAME :		BOARD TEST	: 25	DATE : 06.01.2024	
<u>SECTION - A</u>					
Single	answer type question. Attemp	pt any Fourteen q	uestion :-	Marks : $1 \times 14 = 14$	
1. The ratio of the nuclear densities of two nuclei having mass numbers 64 and 125 is					
	(a) $\frac{64}{125}$ (b) $\frac{4}{5}$				
	(c) $\frac{5}{2}$ (d) 1				
2.	 2. The curve of binding energy per nucleon as a function of atomic mass number has harp peak for helium nucleus. This implies that helium nucleus is 				
	(a) radioactive (b) un	stable	then its neighb.		
(c) easily its stonable (d) more stable nucleus than its neighbours The radius of ${}^{27}X$ nucleus is P . The radius of V nucleus will be:					
5. The factors of $_{13}$ A functions is K. The factors of T functions with De :					
	(a) $\frac{5}{3}$ R (b) $\left(\frac{13}{53}\right)^3$ R				
	(c) $\left(\frac{5}{R}\right)^{\frac{1}{3}}$ (d) $\left(\frac{13}{R}\right)^{\frac{1}{3}}$				
4	When two nuclei (A ≤ 10) fus	e together to form	a heavier nucle	eus the	
	(a) binding energy per nucleon increases				
	(b) binding energy per nucleon	n decreases			
	(c) binding energy per nucleon	does not change.			
_	(d) total binding energy decrea	ises			
5. In β^{-1} decay, a					
	(a) neutron converts into a prof	ton emitting antine	eutrino		
	(c) proton converts into a pro	ron emitting antine	autrino		
	(d) proton converts into a neut	ron emitting neutri	ino		
6.	Heavy stable nucleus have mo	ore neutrons than p	rotons. This is b	because of the fact that	
	(a) neutrons are heavier than p	protons			
	(b) electrostatic force between	protons is repulsiv	/e		
	(c)neutrons decay into proton t	through beta decay			
7	(a) nuclear force between neutrons is weaker than that between protons.				
1.	(a) proton (b) neutron	(c) electron	(d) neu	trino	
8.	X amount of energy is requir	red to remove an e	lectron from its	orbit and Y amount of energy is	
	required to remove a nucleon f	from the nucleus.			
	(a) $X = Y$ (b) $X > Y$	(c) $Y > X$	(d) $X \ge Y$		
9.	Nuclear force is a and _	force	_		
	(a) strong, long – range	(b) stroi	ng, short – range	3	
10	(c) Weak, long – range	(d) wea	k, short – range		
10	(a) Shanti Swarup Bhatnagar	(b) Hor	ni I Bhabha		
	(c) Meghnad Saha (d) Daulat Singh Kothari				
11. During the formation of a $p - n$ junction :					
(a) diffusion current keeps increasing					
(b) drift current remains constant					
(c) both the diffusion current and drift current remain constant					

(d) diffusion current remains almost constant but drift current increases till both currents become equal

12. The energy required by an electron to jump the forbidden band in Silicon at room temperature is about

(a) 0.01 eV	(b) 0.05 eV		
(c) 0.7 eV	(d) 1.1 eV		

- 13. In an extrinsic semiconductor, the number density of holes is $4 \times 10^{23} m^{-3}$. if the number density of intrinsic carriers is $1.2 \times 10^{15} m^{-3}$, the number density of electrons in it is (a) $1.8 \times 10^9 m^{-3}$ (b) $2.4 \times 10^{10} m^{-3}$ (c) $3.6 \times 10^9 m^{-3}$ (d) $3.2 \times 10^{10} m^{-3}$
- 14. The formation of depletion region in a p n junction diode is due to (a)movement of dopant atoms(b) diffusion of both electrons and holes
 - (c)drift of electrons only
 - (d) drift of holes only
- 15. Hole is
 - (a) an anti particle of electron.
 - (b) a vacancy created when an electron leaves a covalent bond
 - (c) absence of free electrons
 - (d) an artificially created particle
- 16. 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
- 17. In the circuit shown in figure , if the diode forward voltage drop is 0.3 V, the voltage diffrece between A and B is



(a) 1.3 V (b) 2.3 V (c) 0 V (d) 0.5 V18. In figure, assuming the diodes to be ideal,



(a) D_1 is forward biased and D_2 is reverse biased and hence current flows from A to B

(b) D_2 is forward biased and D_1 is reverse biased and hence no current flows from B to A and vice versa

(c) D_1 and D_2 are both forward biased and hence current flows from A and B

(d) D_1 and D_2 are both reverse biased and hence no current flows from A and B vice versa

- 19. A semiconductor device is connected in series with a battery, an ammeter and a resistor . A current flows in the circuit. If the polarity of the battery is reversed, the current in the circuit almost becomes zero. The device is
 - (a) intrinsic semiconductor
 - (b) p type semiconductor
 - (c) n type semiconductor
 - (d) p n junction diode
- 20. In an unbiased p n junction at equilibrium, which of the following statements is true about diffusion current and drift current ?
 - (a)Diffusion current is equal to drift current
 - (b) Drift current exists while diffusion current is zero
 - (c) Diffusion current exists while drift current is zero
 - (d) Neither drift current nor diffusion current exists

SECTION - B

Short answer type question. Attempt any two question :-

21. A given coin has a mass of 3.0g. Calculate the nuclear energy that would be required to separate all the neutrons and proton from each other. For simplicity assume that the coin is entirely made of ${}^{63}_{29}Cu$ atoms (of mass 62.92960 u)

Given $m_a = 1.007825$ u and $m_n = 1.008665$ u.

- 22. Draw the graph showing the variation of binding energy per nucleon with mass number . Write two inferences which can be drawn from this graph.
- 23. Write two distinguishing features between conductors, insulators and semiconductors on the basis of energy band diagram
- 24. (a) What do you mean by conduction band and valence band ?
 - (b) What is the conductivity of a semiconductor at 0K?
 - (c) Why resistance of a semiconductor decreases with temperature ?

Long answer type question. Attempt any four question :-

- 25. The fission properties of ${}^{239}_{94}Pu$ are very similar to those of $235 \ 92^{2}{}^{35}_{92}U$. The average energy released per fission is 180 MeV. How much energy, in MeV, is released if all the atoms in 1 kg of pure ${}^{239}_{94}Pu$ undergo fission?
- 26. How long can an electric lamp of 100W be kept glowing by fusion of 2.0 kg of deuterium? Take the fusion reaction as ${}_{1}^{2}H + {}_{1}^{2}H \rightarrow {}_{2}^{3}He + n + 3.27 \text{ MeV}$
- 27. Calculate the height of the potential barrier for a head on collision of two deuterons. (Hint: The height of the potential barrier is given by the Coulomb repulsion between the two deuterons when they just touch each other. Assume that they can be taken as hard spheres of radius 2.0 fm.)
- 28. Draw V I characteristics of a p –n junction diode. Answer the following questions giving reasons.
 - (i) Why is the current under reverse bias almost independent of the applied potential upto a critical voltage ?
 - Why does the reverse current show a sudden increase at the critical voltage ?
 Name any semiconductor device which operates under the reverse bias in the breakdown region
- 29. Draw the circuit arrangement for studying V I characteristics of a p n junction diode in (i) forward biasing and (ii) reverse biasing. Draw the typical V I characteristics of a silicon diode.

Marks : $4 \times 5 = 20$

Marks: $2 \times 3 = 6$

Describe briefly the following terms : (i) minority carrier injection in forward biasing and (ii) breakdown voltage in reverse biasing .

30. Name two important processes involved in the formation of a p - n junction diode. With the help of diode as a full wave rectifier. Draw its input and output waveforms. State the characteristic property of a junction diode that makes it suitable for rectification.