PHYSICS PRACTICE EXAM

Class 12th Physics (2021)

Time allowed: 3 hours | Maximum marks: 70

General Instructions:

(1) All questions are compulsory. There are 33 questions in all.

(2) This question paper has five sections:

Section A contains ten VSA questions and four assertion reasoning MCQs of 1 mark each,

Section B has two case based questions of 4 marks each,

Section C contains nine short answer questions of 2 marks each,

Section D contains five short answer questions of 3 marks each

Section E contains three long answer questions of 5 marks each.

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SECTION - A

Q.1> Name one material used for making visible LED

Q.2> Mention one method to reduce eddy currents.

Q.3> If the frequency of the ac supply is increased then the current in an RC circuit will?

Q.4> Vm is the unit of __

Q.5> If a dielectric slab is inserted in a capacitor while keeping battery connected then the energy stored in the capacitor will?

Q.6> When current flows, the drift velocity of electrons is in the _____ direction as the electric field in it

Q.7> How will focal length of a concave lens change when it is immersed in water

Q.8> State whether the statement is true or false: Ideal junction diode acts as a closed switch when forward biased and open switch when reverse biased.

Q.9> The mass of a nucleus is ____ sum of the masses of nucleons in it.

Q.10> How does the kinetic energy of a charged particle vary in magnetic field?For question numbers 11, 12, 13 and 14, two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is NOT the correct explanation of A
c) A is true but R is false
d) A is false and R is also false

Q.11> Assertion (A) : When light travels from a rarer to a denser medium, its energy reduces
Reason (R) : The energy of a wave depends on its speed

Q.12> Assertion (A) : The eye piece of a refracting telescope should have high focal length
Reason (R) : The magnification is directly proportional to the focal length of the eye piece

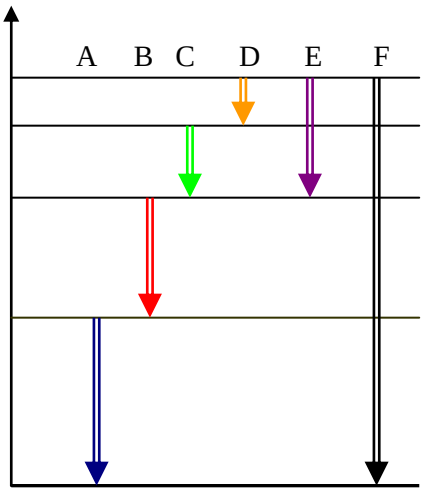
Q.13> Assertion (A) : Hydrogen atom can never emit a wavelength of 27nm
Reason (R) : The shortest wavelength in Lyman series is 91nm

Q.14> Assertion (A) : The net magnetic flux of a closed loop is always zero
Reason (R) : Magnetic monopole does not exist

SECTION - B

Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.

Q.15> In a hydrogen atom, when an electron makes a transition from a higher level to a lower level, it emits a photon corresponding to the energy difference of the two levels. The wavelength of this emitted photon can be determined by the Rydberg formula. Refer to the following transitions in the Hydrogen atom and answer any four sub parts.

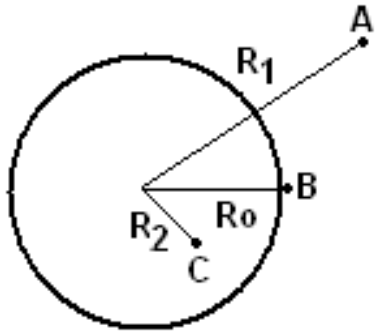


Which transition will correspond to

(a) Emission of highest wavelength
(b) Emission of lowest wavelength
(c) Emission of highest frequency
(d) Emission of heat waves
(e) Emission of visible light

Q.16> Consider a hollow conductor of radius R_O and having a charge Q on its surface. It produces a radially outward electric field from its surface while the electric field inside it is zero. Consider points A outside the conductor, B on the surface and C inside. Answer the four subparts

(a) Which point has lowest magnitude of electric field?
(b) Which point has lowest magnitude of electric potential
(c) Does the total flux of this conductor depend on its radius
(d) What is the expression for work done in moving a unit positive charge from point A to B



SECTION - C

Q.17> Draw a plot to show the variation of potential energy as a pair of nucleons as a function of their separation. Show the regions of attractive and repulsive forces in this graph.

Q.18> Draw the IV characteristics of a solar cell. Explain why PbS which has a band gap around 0.4eV is not suitable for making solar cells.

Q.19> What is the principle of a potentiometer? Why is it preferred over a voltmeter?

Q.20> State Gauss theorem. A charge Q is placed at the centre and another charge –Q at the vertex of a cube. Find the total flux of this cube.

Q.21> Twenty seven drops of same size are charged at 220 V each. They coalesce to form a bigger drop. Calculate the potential of the bigger drop.

OR

Draw variation of electrostatic potential V with 1/R for point charge:
(a) Q_1
(b) $-Q_2$ where $|Q_1| > |-Q_2|$

Q.22> An electron has been excited to the 4^{th} shell. When it makes a transition, it emits visible light. Find its wavelength.

Q.23> Define specific resistance. The external diameter of a 5 meter long hollow tube is 10 cm and the thickness of its wall is 5 mm. If the specific resistance of copper be 1.7×10^{-5} ohm-meter, then determine its resistance.

Q.24> In an ammeter, 10% of main current is passing through the galvanometer of resistance G. Calculate the shunt resistance used.

Q.25> Draw refracted rays after passing through a concave lens placed in a medium having refractive index higher than its material when parallel rays fall on it.

SECTION - D

Q.26> Explain the three elements of earth's magnetism using suitable figures.

Q.27> A real image is formed by the lens at a distance of 20 cm from the lens. The image shifts towards the combination by 10 cm when a second lens is brought in contact with the first lens. Determine the power of the second lens.

Q.28> Using Biot Savart law, derive an expression for the magnetic field on the axis of a current carrying coil. Hence derive the magnetic field at the centre.

Q.29> Angular width of a central maximum in the diffraction pattern of a slit is measured. The slit is illuminated by light of wavelength 600nm. When the slit is illuminated by light of another wavelength, the angular width decreases by 30%. Calculate the wavelength of this light. The same decrease in the angular-width of central maximum is obtained when the original apparatus is immersed in a liquid. Find refractive index of the liquid.

OR

Light is falling on two slits separated by a small distance. A pattern is being observed on the screen. Now one of the slits is closed. Mention two changes that would occur in the observed pattern

(b) Define coherent sources of light. Mention one method of obtaining coherent sources.

Q.30> Draw a schematic of the EM wave clearly showing the orientation of electric and magnetic fields.

(b) Name the EM waves that are used to study crystal structure. Write their wavelength

SECTION – E

Q.31> Define (i) Depletion region (ii) Potential barrier.

(b) How are they affected in case of (i) Forward biasing (ii) Reverse biasing

(c) Explain the statement "A diode offers a unidirectional flow of current"

OR

Explain the energy band theory of solids.

(b) Using this theory, explain the difference between a conductor, a semiconductor and an insulator

(c) Even though both carbon and silicon have 4 valence electrons, yet they have very different electrical properties. Explain this statement.

Q.32> What is "Q value". Briefly explain the reason for production of energy in a nuclear reaction.

We are given the following atomic masses:

(a) $^{238}U_{92}$ = 238.05079 u (b) $^{4}He_{2}$ = 4.00260 u (c) $^{1}H_{1}$ = 1.00783 u

(d) $^{234}Th_{90}$ = 234.04363 u (e) $^{237}Pa_{91}$ = 237.05121 u

Calculate the Q Value of the alpha decay of Uranium

Show that Uranium cannot spontaneously emit a proton

Q.33> Derive an expression for the impedance of the LCR circuit and the expression for the current and phase difference.

(b) Under what condition is the current in the circuit in phase with the voltage? Derive the expression for the source frequency in this case.
(c) Draw the variation of impedance of the circuit versus the source frequency clearly labeling the frequency derived in the part (b) above.

OR

Derive an expression for the current flowing in the circuit when an ideal inductor is connected across an alternating emf. Hence write the expression for the phase difference b/w current and voltage
(b) Draw the phasor diagram
(c) Explain how the maximum current flowing in the circuit will vary on increasing the frequency of the ac source

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