CBSE · CLASS 12 · PHYSICS

CBSE Class 12 Physics Guess Paper 2027

Time: 3 hours · Maximum marks: 70 · 33 questions

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Section A

16 questions of 1 mark each — 12 MCQ + 4 Assertion-Reason

Q1. A galvanometer of resistance G Ohm is converted into an ammeter of range 0 to I A. If the current through the galvanometer is 0.1% of I, the resistance of the ammeter is: (A) G/999 Ohm (B) G/1000 Ohm (C) G/1001 Ohm (D) G/100.1 Ohm — 1 mark

Q2. The potential difference across a cell in an open circuit is 8 V. It falls to 4 V when a current of 4 A is drawn from it. The internal resistance of the cell is: (a) 4 ohm (b) 3 ohm (c) 2 ohm (d) 1 ohm — 1 mark

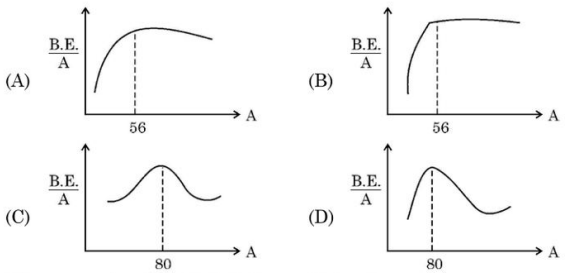
Q3. The ratio of the nuclear densities of two nuclei having the mass numbers 8 and 27 is (A) 8:27 (B) 3:2 (C) 2:3 (D) 1:1 — 1 mark

Q4. The 'distance of closest approach' of an alpha-particle is 'd' when it moves with a velocity v head-on towards the target nucleus. If the velocity of alpha particle is halved, the new 'distance of closest approach' will be (A) d/2 (B) 2d (C) d/4 (D) 4d — 1 mark

Q5. Which of the following figures correctly represent the shape of curve of binding energy per nucleon as a function of mass number? (Options A, B, C, D show different curves of B.E./A versus mass number A.) — 1 mark

(A) $\lambda_d > \lambda_p > \lambda_e$ (B) $\lambda_e > \lambda_p > \lambda_d$
(C) $\lambda_p > \lambda_e > \lambda_d$ (D) $\lambda_e = \lambda_p = \lambda_d$

11. Which of the following figures correctly represent the shape of curve of binding energy per nucleon as a function of mass number ? 1



12. When a p-n junction diode is forward biased 1

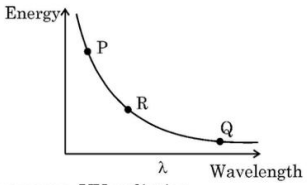
Q6. In an unbiased p-n junction, at equilibrium, which of the following statements is true? (A) Diffusion current is zero but drift current exists. (B) Diffusion current exists but drift current is zero. (C) Diffusion and drift currents are equal and opposite. (D) Both the diffusion and drift currents exist but are unequal. — 1 mark

Q7. The diffraction effect can be observed in (A) sound waves only (B) light waves only (C) ultrasonic waves only (D) sound waves as well as light waves — 1 mark

Q8. Four independent waves are expressed as (i) $y_1 = A_1 \sin \omega t$ (ii) $y_2 = A_2 \sin 2\omega t$ (iii) $y_3 = A_3 \cos \omega t$ (iv) $y_4 = A_4 \sin(\omega t + \pi/3)$. The interference between two of these waves is possible in (A) (i) and (iii) only (B) (iii) and (iv) only (C) (i), (iii) and (iv) only (D) All of them 1 mark

Q9. The given diagram exhibits the relationship between the wavelength of the electromagnetic waves and the energy of photon associated with them. The three points P, Q and R marked on the diagram may correspond respectively to: (A) X-rays, microwaves, UV radiation (B) X-rays, UV radiation, microwaves (C) UV radiation, microwaves, X-rays (D) Microwaves, UV radiation, X-rays 1 mark

respectively to : 1



(A) X-rays, microwaves, UV radiation
(B) X-rays, UV radiation, microwaves
(C) UV radiation, microwaves, X-rays
(D) Microwaves, UV radiation, X-rays

4

Q10. A conducting wire connects two charged metallic spheres A and B of radii r_1 and r_2 respectively. The distance between the spheres is very large compared to their radii. The ratio of electric fields, (E_A/E_B) at the surfaces of spheres A and B will be (A) r_1/r_2 (B) r_2/r_1 (C) r_1^2/r_2^2 (D) r_2^2/r_1^2 1 mark

Q11. A long straight wire of circular cross-section (radius a) carries a steady current I. The current is uniformly distributed across this cross-section. The magnitude of the magnetic field produced at a point at a distance (a/2) from the axis of the wire will be (A) Zero (B) $\mu_0 I/(2\pi a)$ (C) $\mu_0 I/(4\pi a)$ (D) $\mu_0 I/(6\pi a)$ 1 mark

Q12. In a series LCR circuit, the voltage across the resistor, capacitor and inductor is 10 V each. If the capacitor is short circuited, the voltage across the inductor will be (A) 10 V (B) $5\sqrt{2}$ V (C) $5/\sqrt{2}$ V (D) $10\sqrt{2}$ V 1 mark

Q13. Assertion (A): In Bohr model of hydrogen atom, the energy levels are discrete and quantised. Reason (R): In a hydrogen atom, the electrostatic force on the electron provides the necessary centripetal force to it to revolve around the nucleus. [Standard assertion-reason options: (A) both true, R correct explanation; (B) both true, R not correct explanation; (C) A true, R false; (D) both false] 1 mark

Q14. Assertion (A): If accelerated electrons are passed through a narrow slit, a diffraction pattern is observed. Reason (R): Electrons behave as both particles and waves. [Standard assertion-reason options: (A) both true, R correct explanation; (B) both true, R not correct explanation; (C) A true, R false; (D) both false] 1 mark

Q15. Assertion (A): When a bar of copper is placed in an external magnetic field, the field lines get concentrated inside the bar. Reason (R): Copper is a paramagnetic substance. Codes: (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. — 1 mark

Q16. Assertion (A): The critical angle of light passing from glass to air is minimum for violet colour. Reason (R): The wavelength of blue light is greater than the light of other colours. — 1 mark

Section B
5 Very Short Answer questions of 2 marks each

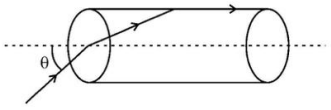
Q17. In a photoelectric experiment, the emitter plate is irradiated with radiation of 200 nm. The photocurrent becomes zero when the collector plate potential is −0.80 V. Calculate the work function (in eV) of the emitter. — 2 marks

Q18. In a Young's double-slit experimental set-up with slit separation 0.6 mm a beam of light consisting of two wavelengths 440 nm and 660 nm is used to obtain interference pattern on a screen kept 1.5 m in front of the slits. Find the least distance of the point from the central maximum where the bright fringes due to both the wavelengths coincide. — 2 marks

Q19. In a Young's double-slit experiment, two light waves, each of intensity I_0, interfere at a point, having a path difference lambda/8 on the screen. Find the intensity at this point. — 2 marks

Q20. A transparent solid cylindrical rod (refractive index 2/sqrt(3)) is kept in air. A ray of light incident on its face travels along the surface of the rod, as shown in figure. Calculate the angle theta. — 2 marks

ray of light incident on its face travels along the surface of the rod, as shown in figure. Calculate the angle θ. 2

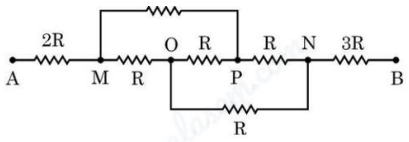


Q21. Write an expression for the magnetic force per unit length between two parallel thin current carrying wires. Hence define one ampere. — 2 marks

Section C
7 Short Answer questions of 3 marks each

Q22. A compound microscope consists of an objective lens of focal length 0.82 cm and an eyepiece lens of focal length 2.9 cm. An object is placed 0.91 cm from the objective lens. The image is formed at the near point (25 cm) from the eye. (I) Calculate the angular magnification of the microscope. (II) Draw the ray diagram of compound microscope in normal adjustment. — 3 marks

Q23. (a) Obtain the condition of balance of a Wheatstone bridge. (b) Find net resistance of the network of resistors connected between A and B, as shown in figure. 3 marks



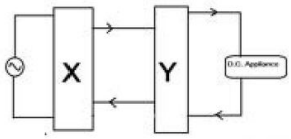
23. A parallel plate capacitor of capacitance C has a dielectric slab between its plates. It is charged to a potential difference V by connecting it across a battery. The battery is then disconnected. If the dielectric slab is now

Q24. (a) Draw the ray diagram to show the image formation by a refracting telescope and write the expression for angular magnification for the telescope in normal adjustment. (b) Give two reasons to explain why a reflecting telescope is preferred over a refracting telescope. 3 marks

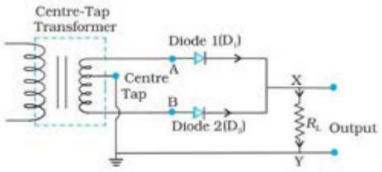
Q25. (I) Identify the circuit elements X and Y as shown in the given block diagram and draw the output waveforms of X and Y. (II) If the centre tapping is shifted towards Diode D_1 as shown in the diagram, draw the output waveform of the given circuit. 3 marks

[SECTION – C] **(07x3=21 marks)**

Q22. (I) Identify the circuit elements X and Y as shown in the given block diagram and draw the output waveforms of X and Y.



(II) If the centre tapping is shifted towards Diode D1 as shown in the diagram, draw the output waveform of the given circuit.



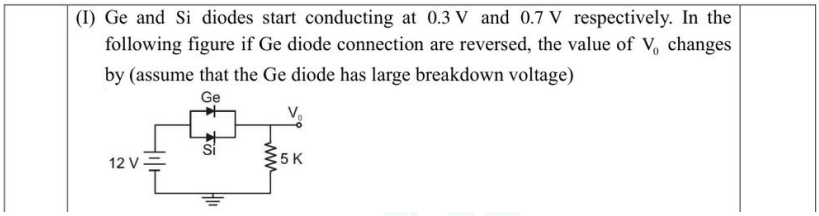
Q26. Find the expression for the capacitance of a parallel plate capacitor of plate area A and plate separation d when (I) a dielectric slab of thickness t and (II) a metallic slab of thickness t, where (t < d) are introduced one by one between the plates of the capacitor. In which case would the capacitance be more and why? 3 marks

Q27. (a) Using Gauss's law, deduce an expression for electric field at a point due to a uniformly charged infinite plane thin sheet. (b) Two large thin plane sheets, each having surface charge density sigma, are held close and parallel to each other in air. What is the net electric field at a point (i) inside and (ii) outside, the sheets? 3 marks

Q28. (i) A conductor of length l is connected across an ideal cell of emf E. Keeping the cell connected, the length of the conductor is increased to 2l by gradually stretching it. If R and R' are initial and final values of resistance and v_d and v_d' are initial and final values of drift velocity, find the relation between (i) R' and R and (ii) v_d' and v_d. (ii) When electrons drift in a conductor from lower to higher potential, does it mean that all the 'free electrons' of the conductor are moving in the same direction? — 3 marks

Section D
2 Case-study based questions of 4 marks each (with sub-parts)

Q29. [case context: forward/reverse biasing of a semiconductor diode — in forward bias p-side is at positive terminal and applied voltage drops mostly across the depletion region; in reverse bias n-side is positive] Ge and Si diodes start conducting at 0.3 V and 0.7 V respectively. In the following figure if Ge diode connection are reversed, the value of V_0 changes by (assume that the Ge diode has large breakdown voltage) [circuit: 12 V source, Ge and Si diodes in parallel, 5 K resistor] (A) 0.2 V (B) 0.4 V (C) 0.6 V (D) 0.8 V — 4 marks



Q30. [case context: photoelectric effect apparatus with emitter C, collector A, terminal B and microammeter] In the given diagram, if terminal B is shifted towards the left then how will it affect the reading of the microammeter? [for V.I. candidates: If the supplied voltage is decreased, then what will be effect on the reading of the microammeter?] — 4 marks

Section E
3 Long Answer questions of 5 marks each

Q31. (a) Draw a labelled diagram of a step-up transformer. State the principle on which it works and obtain the ratio of secondary voltage to primary voltage in terms of number of turns and currents in the two coils. (b) The ratio of the number of turns in the primary to the secondary of an ideal transformer is 1 : 5. If 5 kW power at 200 V is supplied to the primary, find (i) current in the primary, and (ii) output voltage. — 5 marks

Q32. (a) Using the relation for refraction at a curved spherical surface, derive the expression for lens maker's formula. (b) Three lenses L_1, L_2 and L_3, each of focal length 40 cm, are placed coaxially. The distance between L_1 and L_2 and between L_2 and L_3 are 120 cm and 20 cm respectively. An object is kept at a distance of 80 cm to the left of lens L_1. Find the distance of the final image formed from the object. — 5 marks

Q33. (a) State Faraday's law of electromagnetic induction. (b) Derive an expression for the self-inductance of an air-filled long solenoid of length l and cross-sectional area A having N turns. (c) A conducting rod of length 50 cm, with one end pivoted, is rotated with angular speed of 60 rpm in a uniform magnetic field of 4.0 mT directed perpendicular to the plane of rotation of rod. Find the emf induced in the rod. 5 marks

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