https://www.westbengalboard.com

(ENGLISH VERSION)

SECTION – II

GROUP – B

Answer the following questions in short (Alternatives are to be noted) :

$2 \times 5 = 10$

1. A carbon resistor is coloured with four different bands — red, green, orange and silver respectively. Find the range of its probable resistance. 2

OR

E.M.F. of an electrical cell is 2 volt. A 10 Ω resistance is joined at its two ends then potential difference is measured 1·6 volt. Find out the internal resistance and lost volt. 1 + 1

2. A copper wire of length l metre is bent to form a circular loop. If i amp current flows through the loop, find out the magnitude of magnetic moment of the loop. 2

OR

Write down the Biot-Savart law. Show its vector form. 1 + 1

3. Name any two electromagnetic waves. State any one similarity and one dissimilarity between them. 1 + 1

4. How many α and β-particles are emitted when U^{238} changes to Pb^{206} due to radioactivity ? Atomic number of U^{238} and Pb^{206} are 92 and 82 respectively. 1 + 1

https://www.westbengalboard.com
https://www.westbengalboard.com
https://www.westbengalboard.com
https://www.westbengalboard.com Scanned by CamScanner

https://www.westbengalboard.com

5. A TV tower is 120 m high. How much more height is to be added to it if its coverage range is to become double ? 2

OR

Draw a neat diagram of Amplitude Modulated Wave. Write down the formula of 'Modulation Index'. 1 + 1

GROUP – C

Answer the following questions in short (Alternatives are to be noted) :

$3 \times 9 = 27$

6. State Gauss' theorem. With the help of this theorem, find out the electrical intensity at any nearby point due to a uniformly charged thin and long straight wire. https://www.westbengalboard.com 1 + 2

OR

Define electrical dipole moment. An electrical dipole is placed within a uniform electric field (E) and is rotated to an angle $\angle\theta = 180°$. Find out the work done. 1 + 2

7. a) On what factors does the capacitance of a capacitor depend ?

b) Two capacitors of capacitances 20 μF and 60 μF are connected in series. If the potential difference between the two ends of the combination is 40 volt, calculate the terminal potential difference of each capacitor. 1 + 2

8. a) Derive an expression for the torque on a rectangular coil of area A carrying a current I and placed in a uniform magnetic field B. Indicate the direction of the torque acting on the loop.

b) Define electromagnetic unit of current. 2 + 1

OR

https://www.westbengalboard.com Scanned by CamScanner

https://www.westbengalboard.com

a) What do you mean by angle of dip at a place ? At what place on earth's surface will the horizontal and vertical components of earth's magnetic field be equal ? 1 + 1

b) Mention how the relative magnetic permeability differs for diamagnetic, paramagnetic and ferromagnetic substances. 1

9. a) What is wavefront of a wave ?

b) Prove the laws of reflection by using Hygens' principle. 1 + 2

OR

In Young's double slit experiment, what is the effect on the interference pattern if,

i) the distance between the two slits is halved.

ii) the distance between the screen and the plane of slits is doubled.

iii) one of the slits is covered with translucent paper. 1 + 1 + 1

10. a) In case of refraction write down the relation between critical angle and refractive index of the denser medium. 1

b) For minimum deviation δ_m, assuming that angle of incidence = angle of emergence, show that the refractive index of the material of the prism is $\mu = \sin\left(\frac{\delta_m + A}{2}\right) / \sin\frac{A}{2}$, where A is refractive angle of the prism. 2

OR

a) An object of height 2·5 cm is placed perpendicularly on the principal axis of a concave mirror of focal length f at a distance of $\frac{3}{4}f$. What will be the nature of the image of the object and its height ? 2

https://www.westbengalboard.com Scanned by CamScanner

https://www.westbengalboard.com

b) A person uses spectacles of power +2D. What type of defect of vision is it ?

11. a) Under what potential difference should an electron be accelerated to obtain de Broglie wavelength of 0·6 Å ? ($h = 6 \cdot 62 \times 10^{-34}$ J-s , $m_e = 9 \cdot 1 \times 10^{-31}$ kg)

b) Give an example of production of electron by photon. 2 + 1

OR

a) Write down Einstein's photoelectric equation.

b) Light-rays of wavelength λ and $\lambda/2$ are incident on a photosensitive metal surface. If the maximum kinetic energy of the emitted photoelectrons from the metal surface in 2nd case be 3 times the maximum kinetic energy of emitted photoelectrons in the 1st case, then determine the work function of the metal. 1 + 2

12. a) How are the characteristic *X*-rays spectrum formed ?

b) If the value of Rydberg constant of hydrogen is 109737 cm^{-1}, determine the longest and shortest wavelengths of the Balmer series, 1 + 2

OR

a) What is mean life of a radioactive element ?

b) Establish a relation between half-life and decay constant. 1 + 2

https://www.westbengalboard.com

https://www.westbengalboard.com

https://www.westbengalboard.com

https://www.westbengalboard.com

13. a) Draw the V-I characteristic curve for forward and reverse bias of a *p-n* junction diode. (Graph paper is not required)

b) What are the majority and minority carriers in a *p*-type semiconductor ?

c) Write down the symbol and truth table of OR gate. 1 + 1 + 1

14. a) Convert the binary number 10011 into decimal equivalent.

b) What is solar cell ? Why are Si and Ga-As preferred materials for solar cell ? Give its V-I characteristics. 1 + (1 + 1)

OR

a) Transistor — what does it mean ?

b) How is an *n-p-n* transistor used as an amplifier ? Show with its circuit diagram. https://www.westbengalboard.com 1 + 2

GROUP – D

Answer the following questions (Alternatives are to be noted) : 5 × 3 = 15

15. a) In a potentiometer experiment why is it necessary to use a long wire ?

Length and resistance of a potentiometer wire are 4 m and 10 Ω respectively. It is connected to a cell of *emf* 2 volt. Another cell when joined to this potentiometer and null point is measured at 250 cm. Find out the *emf* of the second cell.

b) In a metre bridge when the resistance in the left gap is 2 Ω and an unknown resistance in the right gap, the balance point is obtained at 40 cm from zero end. On shunting the unknown resistance with 2 Ω, find the shift of the balance point on the bridge. (1 + 2) + 2

OR

https://www.westbengalboard.com

https://www.westbengalboard.com

https://www.westbengalboard.com

https://www.westbengalboard.com

a) What is shunt ?

b) Explain Wheatstone bridge principle with the help of Kirchhoff's law. Does the principle of Wheatstone bridge change if the position of battery and galvanometer are interchanged ?

c) 36 cells each of internal resistance 0·5 Ω and *emf* 1·5 V each are used to send current through an external circuit of 2 Ω resistance. Find the best mode of grouping them for maximum current and the current through the external circuit. 1 + 2 + 2

16. a) State Lenz's law related to the electromagnetic induction.

b) What is eddy current ?

c) What is meant by 'self-inductance of a coil is 1 H' ?

d) Establish an expression for self-inductance of a solenoid. 1 + 1 + 1 + 2

OR

a) An *a.c.* source generating voltage $e = e_0 \sin\omega t$ is connected to a capacitor of capacitance C. Find the expression for the current i flowing through it. Plot a graph of e and i versus ωt.

b) Determine the resonance frequency ω_r of a series LCR circuit with $L = 2 \cdot 0\,\text{H}$, $C = 32\,\mu\text{F}$ and $R = 10\,\Omega$. What is the Q-value of this circuit ? 2 + 3

17. a) Two convex lenses of focal lengths f_1 and f_2 respectively are placed in contact with each other. Then what will be power of their equivalent lens ?

b) Write down the conditions for constructive interference.

c) The refractive index of glass is 1·55. What is its polarising angle ? Determine the angle of refraction for the polarising angle. 2 + 1 + 2

https://www.westbengalboard.com

https://www.westbengalboard.com

https://www.westbengalboard.com

https://www.westbengalboard.com

(HINDI VERSION)

SECTION – II

GROUP – B

निम्नलिखित प्रश्नों के उत्तर संक्षेप में दीजिए (वैकल्पिक प्रश्नों पर ध्यान दें) : $2 \times 5 = 10$

1. एक कार्बन प्रतिरोधक चार विभिन्न रंग क्रमशः लाल, हरा, नारंगी और चाँदी के रंग की पट्टियों से रंगा हुआ है। इस प्रतिरोधक के संभाव्य प्रतिरोध की मात्राओं के परास को ज्ञात कीजिए। 2

अथवा

एक विद्युतीय कोश का विद्युत वाहक बल (E.M.F.) 2 वोल्ट है। इसके दो अंतिम छोरों पर 10 Ω प्रतिरोध जोड़ने से इसके विभवांतर 1·6 वोल्ट होता है। आंतरिक प्रतिरोध तथा वोल्ट हानि की गणना कीजिए। 1 + 1

2. l मीटर लंबाई का एक तांबे के तार को मोड़कर एक गोलाकार कुण्डली बनाया गया। यदि इस कुंडली से i amp विद्युत धारा प्रवाहित होती है तो इस कुंडली का चुंबकीय आघूर्ण का परिमाण (magnitude) ज्ञात कीजिए। 2

अथवा

बायो-सावर्ट के नियम को लिखिए। इसके वेक्टर रूप को दिखाइए। 1 + 1

3. किन्हीं दो विद्युत-चुंबकीय तरंगों के नाम लिखिए। इनके बीच किसी एक समानता तथा एक असमानता का उल्लेख कीजिए। 1 + 1

https://www.westbengalboard.com

https://www.westbengalboard.com

https://www.westbengalboard.com