

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ASKED TO DO SO.

2017

TEST BOOKLET

TEST BOOKLET SERIES



Time allowed : $1\frac{1}{2}$ hours

Full marks : 100

Answer *all* the questions.

Questions are of equal value.

6396

Serial No.

Signature of the Candidate:

INSTRUCTIONS

Candidates should read the following instructions carefully before answering the questions:

1. This booklet consists of 12 pages including this front page. Verify the Page Nos. and bring at once to the Invigilator's notice any discrepancy.
2. Answers will have to be given in the Special Answer-Sheet supplied for the purpose.
3. Before you proceed to mark in the Answer-Sheet in response to various items in the Test Booklet, you have to fill in some particulars in the Answer-Sheet as per instructions sent to you in the Admit Card. **Do not fold the Answer-Sheet as this will result in error in your marks.**
4. All questions are of multiple-choice answer-type. You will find **four** probable answers (A), (B), (C) and (D) against each question. Find out which of the four answers appears to be correct or the best. Now darken the oval corresponding to the letter of the selected answer in the Answer-Sheet with **Black Ball Point Pen** as per instructions printed on the reverse of the Admit Card and in the Answer-Sheet.
5. If more than one oval is encoded for a particular answer, it will be treated as a wrong answer.
6. **There will be negative marking of $\frac{1}{3}$ mark for each wrong answer.**
7. **There is a blank page at the end of this Test Booklet for Rough Work.**
8. **The Special Answer-Sheet should be handed over to the Invigilator before leaving the Examination Hall. You are permitted to take away the used Test Booklet after completion of the examination.**

[Please Turn Over]

1. A hollow metal sphere is placed in a constant electric field. The force on a charge inside the hollow sphere is

- (A) zero
- (B) proportional to the external field
- (C) constant independent of the external field
- (D) None of the above

2. The resistance of a Si sample

- (A) increases with increase in temperature.
- (B) remains constant with Change in temperature.
- (C) decreases with increase in temperature.
- (D) may increase or decrease with increase in temperature.

3. In the following circuit (Fig. 1), $R_1 = 2\Omega$, $R_2 = 3\Omega$ and $R_3 = 6\Omega$. If the battery has an emf of 4 V and internal resistance 1Ω , the rate of internal energy loss (in Joule/sec) in the battery is

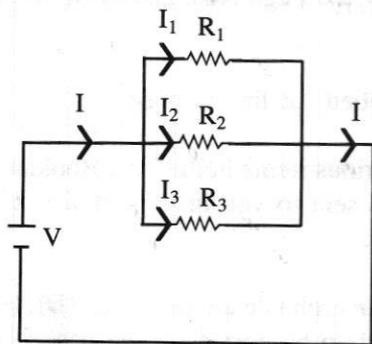


Figure 1

- (A) 1
- (B) 2
- (C) 3
- (D) 4

4. To use a galvanometer as a voltmeter, one has to

- (A) connect a high resistance in series with the galvanometer.
- (B) connect a low resistance in series with the galvanometer.
- (C) connect a low resistance in parallel with the galvanometer.
- (D) connect a high resistance in parallel with the galvanometer.

5. A steady current of 2 Amps. is passed through a silver voltameter for half an hour. If the mass of silver deposited is 4.18 g, the electrochemical equivalent of silver is approximately

- (A) 1.16 mg/C
- (B) 0.58 g/C
- (C) 2.32 mg/C
- (D) 1 g/C

6. The magnetic field necessary in a cyclotron of radius r for a particle of mass m and charge q to be accelerated to a velocity v is

- (A) $mv/(qr)$
- (B) $mv^2/(qr)$
- (C) $mv^2/(qr^2)$
- (D) $mv/(qr^2)$

7. A very long wire is carrying a current i . The magnetic field at a distance r from the wire is

- (A) $\mu_0 i^2/(2\pi r)$
- (B) $\mu_0 i/(2\pi r)$
- (C) $\mu_0 i^2/(2\pi r^2)$
- (D) $\mu_0 i/(2\pi r^2)$

8. Paramagnetic substances have

- (A) atoms with permanent magnetic dipole moments.
- (B) nuclei with permanent magnetic dipole moments.
- (C) atoms with zero magnetic dipole moments.
- (D) atoms with closed electron shells.

9. The sensitivity of a tangent galvanometer is maximum if the deflection is

- (A) 30°
- (B) 45°
- (C) 60°
- (D) sensitivity is constant

10. A circuit contains an inductance of value 20 mH and a certain capacitance. The circuit has the resonant angular frequency 1000 rad/s. The value of the capacitance is

- (A) 5.0×10^{-5} F
- (B) 1.30×10^{-6} F
- (C) 5.0×10^{-6} F
- (D) 1.30×10^{-5} F

11. Which of the following statements is *not* true?

- (A) Ultraviolet rays have longer wavelength than gamma rays.
- (B) Red light has longer wavelength than yellow light.
- (C) X-rays have longer wavelength than ultraviolet rays.
- (D) Radio waves have longer wavelength than infrared rays.

12. If the phase difference at a point between two waves having the same frequency is constant at all times, the two waves are called

- (A) incoherent
- (B) coherent
- (C) uniform
- (D) sinusoidal

13. Light from a source with wavelength 590 nm falls on a pair of slits. If the separation between the slits is 0.135 mm, the fringe width is approximately

- (A) 0.17 cm
- (B) 0.35 cm
- (C) 0.50 cm
- (D) 0.76 cm

14. The direction of polarization of two polaroids make an angle 30° between themselves. The fraction of intensity of unpolarized light that is transmitted by the combination is

- (A) $1/2$
- (B) $1/4$
- (C) $\sqrt{3}/2$
- (D) $3/8$

15. A point source of light is at a distance 50 cm from a screen. The distance at which a thin converging lens of focal length 8 cm must be placed so as to obtain a sharp image of the source on the screen is

- (A) 10 cm
- (B) 15 cm
- (C) 20 cm
- (D) 25 cm

16. At sunset and sunrise, the sun appears red because

- (A) light from the sun is predominantly red.
- (B) the scattering of light by the atmosphere is maximum for blue light.
- (C) the scattering of light by the atmosphere is minimum for blue light.
- (D) None of the above

17. Light of frequency 5×10^{14} Hz is incident on a metal and electrons of energy 1.3 eV are emitted. Taking Planck's constant to be 4×10^{-15} eVs, the work function of the metal is

- (A) 0.35 eV
- (B) 0.7 eV
- (C) 1.1 eV
- (D) 1.3 eV

18. In Bohr model of the hydrogen atom, the energy of the photon for the transition from the second to the first electron orbit is (where the symbols have their usual meaning)

- (A) 13.6 eV
- (B) 10.2 eV
- (C) 6.83 eV
- (D) 3.4 eV

19. A nucleus undergoes alpha decay. If ΔZ and ΔA denote the decreases in its atomic number and mass number respectively, then

- (A) $\Delta Z = -2, \Delta A = 4$
- (B) $\Delta Z = 2, \Delta A = 4$
- (C) $\Delta Z = -1, \Delta A = 0$
- (D) $\Delta Z = 2, \Delta A = 2$