

Space for rough work

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CANDIDATE ANSWER BOOKLET JEE

CANDIDATE DETAILS

NAME OF STUDENT

DATE OF EXAMINATION / /

CLASS

BOARD

TIME DURATION : To :

READ THE INSTRUCTIONS CAREFULLY

- Please read these instructions carefully. A candidate who breaches any of the Examination Regulations will be liable to disciplinary action
- Examinations will be conducted during the allocated times shown in the examination timetable.
- Do NOT turn over the question paper until instructed at the time of commencement of the examination.
- Any unauthorised materials or devices found in your possession after the start of the examination will be confiscated, and you will be liable to disciplinary action.
- Handphones brought into the examination hall must be switched off at ALL times. If your handphone is found to be switched on in the examination hall, the handphone will be confiscated and retained for investigation of possible violation of regulations.
- Please check that you have the correct question paper and read the instructions printed on your examination question paper carefully.
- You are not allowed to communicate by word of mouth or otherwise with other candidates (this includes the time when answer scripts are being collected).
- Please raise your hand if you wish to communicate with an invigilator.
- Unless granted permission by an invigilator, you are not allowed to leave your seat.
- Once you have entered the examination hall, you will not be allowed to leave the hall until one hour after the examination has commenced.

QUESTION PAPER FORMAT

- Each question carries 4 marks.
- For correct answer, +4 marks. For wrong answer, -1 marks. For no attempt, 0 marks.
- All questions are compulsory.
- The question paper contains 25 objective type questions.
- Total time duration of the examination is 60 minutes.

SCORE CARD

+4

0

-1

Total Score

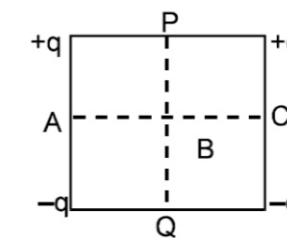
Pass Score

Result

Pass/Fail



1. There is a uniform electric field in X-direction. If the work done in moving a charge of 0.2 C through a distance of 2 metre along the line making an angle of 60° with X-direction is 4 joule, then the value of E is :
 (A) $\sqrt{3}$ N/C (B) 4 N/C (C) 5 N/C (D) 20 N/C
2. In a YDSE bi-chromatic light of wavelengths 400 nm and 560 nm are used. The distance between the slits is 0.1 mm and the distance between the plane of the slits and the screen is 1 m. The minimum distance between two successive regions of complete darkness is
 (A) 4 mm (B) 5.6 mm (C) 14 mm (D) 28 mm
3. If a uniformly charged spherical shell of radius 10 cm has a potential V at a point distant 5 cm from its centre, then the potential at a point distant 15 cm from the centre will be :
 (A) $\frac{V}{3}$ (B) $\frac{2V}{3}$ (C) $\frac{3}{2}V$ (D) 3V
4. For a prism of apex angle 45° , it is found that the angle of emergence is 45° for grazing incidence. Calculate the refractive index of the prism.
 (A) $(2)^{1/2}$ (B) $(3)^{1/2}$ (C) 2 (D) $(5)^{1/2}$
5. Figure represents a square carrying charges +q, +q, -q, -q at its four corners as shown. Then the potential will be zero at points



- (A) A, B, C, P and Q (B) A, B and C (C) A, P, C and Q (D) P, B and Q

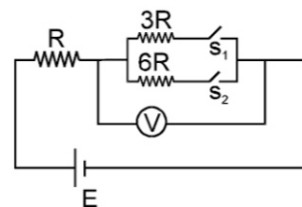
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6. A particle of charge Q and mass m travels through a potential difference V from rest. The final momentum of the particle is :

- (A) $\frac{mV}{Q}$ (B) $2Q\sqrt{mV}$ (C) $\sqrt{2m QV}$ (D) $\sqrt{\frac{2QV}{m}}$

7. In the circuit shown in figure reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then

- (A) $V_3 > V_2 > V_1$ (B) $V_2 > V_1 > V_3$
 (C) $V_3 > V_1 > V_2$ (D) $V_1 > V_2 > V_3$



8. The force required to stretch a steel wire of 1 cm^2 cross-section to 1.1 times its length would be ($Y = 2 \times 10^{11} \text{ Nm}^{-2}$)

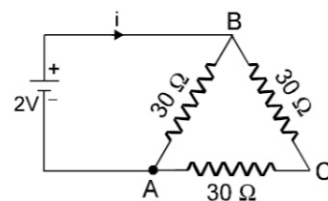
- (A) $2 \times 10^6 \text{ N}$ (B) $2 \times 10^3 \text{ N}$ (C) $2 \times 10^{-6} \text{ N}$ (D) $2 \times 10^{-7} \text{ N}$

9. An electric dipole consists of two opposite charges each of magnitude $1.0 \mu\text{C}$ separated by a distance of 2.0 cm . The dipole is placed in an external field of $1.0 \times 10^5 \text{ N/C}$. The maximum torque on the dipole is :

- (A) $0.2 \times 10^{-3} \text{ N-m}$ (B) $1.0 \times 10^{-3} \text{ N-m}$ (C) $2.0 \times 10^{-3} \text{ N-m}$ (D) $4.0 \times 10^{-3} \text{ N-m}$

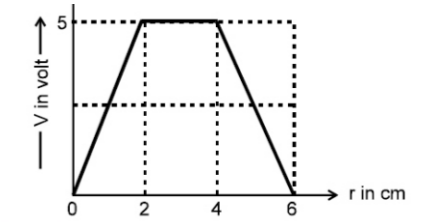
10. The current i in the circuit of fig. is -

- (A) $\frac{1}{45}$ amp. (B) $\frac{1}{15}$ amp.
 (C) $\frac{1}{10}$ amp. (D) $\frac{1}{5}$ amp.

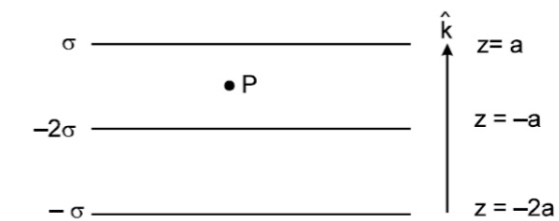


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11. The variation of potential with distance r from a fixed point is shown in Figure. The electric field at $r = 5$ cm, is :
- (A) (2.5) V/cm (B) (-2.5) V/cm
 (C) $(-2/5)$ cm (D) $(2/5)$ V/cm



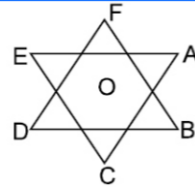
12. The electric potential V as a function of distance x (in metre) is given by
 $V = (5x^2 + 10x - 9)$ volt
 The value of electric field at $x = 1$ m would be :
 (A) -20 volt/m (B) 6 volt/m (C) 11 volt/m (D) -23 volt/m
13. The fundamental frequency of a closed organ pipe is same as the first overtone frequency of an open pipe. If the length of open pipe is 50 cm, the length of closed pipe is
 (A) 25 cm (B) 12.5 cm (C) 100 cm (D) 200 cm
14. A police van moving with velocity 22 m/s and emitting sound of frequency 176 Hz, follows a motorcycle which is moving towards a stationary car and away from the police van. The stationary car is emitting frequency 165 Hz. If motorcyclist does not hear any beats, then his velocity is
 (A) 33 m/s (B) 22 m/s (C) 11 m/s (D) 0
15. Three large parallel plates have uniform surface charge densities as shown in the figure. Find out electric field intensity at point P.



- (A) $-\frac{4\sigma}{\epsilon_0} \hat{k}$ (B) $\frac{4\sigma}{\epsilon_0} \hat{k}$ (C) $-\frac{2\sigma}{\epsilon_0} \hat{k}$ (D) $\frac{2\sigma}{\epsilon_0} \hat{k}$

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16. The electric force on $2\mu\text{C}$ charge placed at the centre O of two equilateral triangles each of side 10 cm, as shown in figure is P. If charge A, B, C, D, E & F are $2\mu\text{C}$, $2\mu\text{C}$, $2\mu\text{C}$, $-2\mu\text{C}$, $-2\mu\text{C}$, $-2\mu\text{C}$ respectively, then force acting on P is :
- (A) 21.6 N (B) 64.8 N (C) 0 (D) 43.2 N



17. Two parallel metal plates carry charges $+Q$ and $-Q$. A test charge placed between the plates experiences a force F . The plates are then moved apart so that the separation between them is doubled. The force on the test charge will now be
- (A) $F/2$ (B) F (C) $F/4$ (D) $2F$

18. A charged particle of charge q and mass m is released from rest in an uniform electric field E . Neglecting the effect of gravity, the kinetic energy of the charged particle after time 't' seconds is
- (A) $\frac{Eqm}{t}$ (B) $\frac{E^2q^2t^2}{2m}$ (C) $\frac{2E^2t^2}{mq}$ (D) $\frac{Eq^2m}{2t^2}$

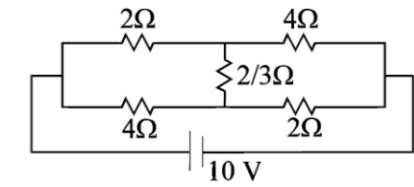
19. A soap bubble of diameter 8 mm is formed in air. The surface tension of liquid is 30 dyne/cm. The excess pressure inside the soap bubble is :
- (A) 150 dyne/cm² (B) 300 dyne/cm² (C) 3×10^{-3} dyne/cm² (D) 12 dyne/cm²

20. Two spherical conductors of radii 4 m and 5 m are charged to the same potential. If σ_1 and σ_2 are the respective values of the surface charge densities on the two conductors, then the ratio $\frac{\sigma_1}{\sigma_2}$ is :
- (A) $\frac{5}{4}$ (B) $\frac{4}{5}$ (C) $\frac{25}{16}$ (D) $\frac{16}{25}$

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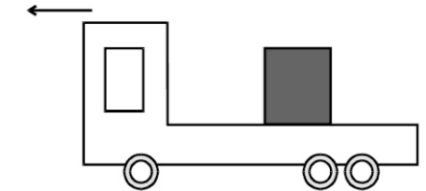
INTEGER TYPE QUESTIONS:

1. Find the current through $\frac{2}{3}\Omega$ resistance in the figure shown.



Answer:

2. The rear side of a truck is open and a box of 40 kg mass is placed 5 m away from the open end as shown in figure. The coefficient of friction between the box and the surface below it is 0.15. On a straight road, the truck starts from rest and accelerates with 2 ms^{-2} . At what distance from the starting point of the truck does the box fall off the truck? (Ignore the size of the box).



Answer:

36. In the figure shown the current through 2Ω resistor is

- (A) 2A
(B) 0A
(C) 4A
(D) 6A

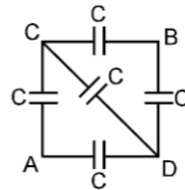


37. The plate separation in a parallel plate condenser is d and plate area is A . If it is charged to V volt then the work done in increasing the plate separation to $2d$ will be –

- (A) $\frac{3 \epsilon_0 AV^2}{2d}$ (B) $\frac{\epsilon_0 AV^2}{2d}$ (C) $\frac{2\epsilon_0 AV^2}{d}$ (D) $\frac{\epsilon_0 AV^2}{2d}$

38. The equivalent capacity between the points A and B in the adjoining circuit will be-

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

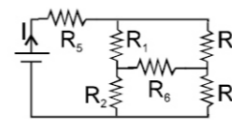


39. A stone is tied to a string of length l is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time, the stone is at its lowest position and has a speed u . The magnitude of the change in its velocity at it reaches a position where the string is horizontal is

- (A) $\sqrt{u^2 - 2gl}$ (B) $\sqrt{2gl}$ (C) $\sqrt{u^2 - gl}$ (D) $\sqrt{2(u^2 - gl)}$

40. In the given circuit, it is observed that the current I is independent of the value of the resistance R_6 . Then the resistance values must satisfy:

- (A) $R_1 R_2 R_5 = R_3 R_4 R_6$
(B) $\frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{R_1 + R_2} + \frac{1}{R_3 + R_4}$
(C) $R_1 R_4 = R_2 R_3$
(D) $R_1 R_3 = R_2 R_4 = R_5 R_6$



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21. A plano-convex lens, when silvered at its plane surface is equivalent to a concave mirror of focal length 28 cm. When its curved surface is silvered and the plane surface not silvered, it is equivalent to a concave mirror of focal length 10 cm, then the refractive index of the material of the lens is:

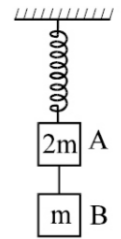
- (A) 9/14 (B) 14/9 (C) 17/9 (D) none

22. In the above question the radius of curvature of the curved surface of plano-convex lens is :

- (A) $\frac{280}{9}$ cm (B) $\frac{180}{7}$ cm (C) $\frac{39}{3}$ cm (D) $\frac{280}{11}$ cm

23. Two blocks A and B of masses $2m$ and m , respectively, are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in the figure. The magnitudes of acceleration of A and B, immediately after the string is cut, are respectively

- (A) g, g (B) $g, g/2$
(C) $g/2, g$ (D) $g/2, g/2$



24. Two mole of an ideal gas is expanded isothermally and reversibly from 1 litre to 10 litre at 300 K. The enthalpy change (in kJ) for the process is

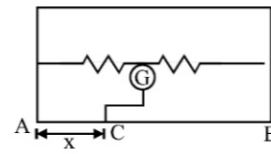
- (A) 11.4 kJ (B) -11.4 kJ
(C) 0 kJ (D) 4.8 kJ

25. In Young's double slit experiment maximum intensity is I than the angular position where the intensity becomes $\frac{I}{4}$ is:

- (A) $\sin^{-1}\left(\frac{\lambda}{d}\right)$ (B) $\sin^{-1}\left(\frac{\lambda}{3d}\right)$ (C) $\sin^{-1}\left(\frac{\lambda}{2d}\right)$ (D) $\sin^{-1}\left(\frac{\lambda}{4d}\right)$

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26. In the given circuit, no current is passing through the galvanometer. If the cross-sectional diameter of AB is doubled then for null point of galvanometer the value of AC would
 (A) x (B) x/2 (C) 2x (D) None

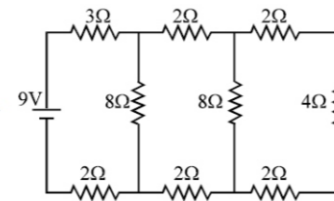


27. Let gravitation field in a space be given as $E = - (k/r)$. If the reference point is at d_i where potential is V_i , then relation for potential is :

(A) $V = k \log \frac{1}{V_i} + 0$ (B) $V = k \log \frac{r}{d_i} + V_i$ (C) $V = \log \frac{r}{d_i} + kV_i$ (D) $V = \log \frac{r}{d_i} + \frac{V_i}{k}$

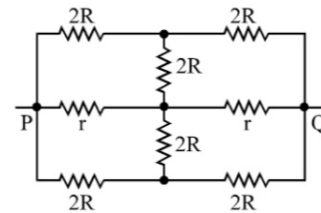
28. In the circuit shown in the figure, the current through :

- (A) the 3Ω resistor is 0.50 A (B) the 3Ω resistor is 0.25 A
 (C) 4Ω resistor is 0.50 A (D) the 4Ω resistor is 0.25 A



29. A metallic sphere floats in an immiscible mixture of water ($\rho_w = 10^3 \text{ kg/m}^3$) and a liquid ($\rho_L = 13.5 \times 10^3$) with (1/5)th portion by volume in the liquid. The density of the metal is :
 (A) $4.5 \times 10^3 \text{ kg/m}^3$ (B) $4.0 \times 10^3 \text{ kg/m}^3$ (C) $3.5 \times 10^3 \text{ kg/m}^3$ (D) $1.9 \times 10^3 \text{ kg/m}^3$

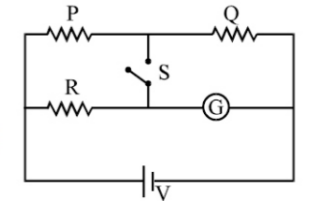
30. The effective resistance between the points P and Q of the electrical circuit shown in the figure is
 (A) $2Rr / (R + r)$ (B) $8R(R + r)/(3R + r)$
 (C) $2r + 4R$ (D) $5R/2 + 2r$



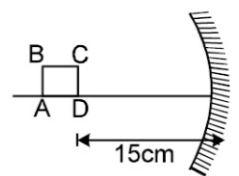
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31. A horizontal pipe line carries water in a streamline flow. At a point along the pipe where cross-sectional area is 10 cm^2 , the velocity of water is 1 m/s and pressure is 2000 Pa . The pressure of water at another point where cross-sectional area is 5 cm^2 , is : (Density of water = 1000 kg/m^3)
 (A) 250 Pa (B) 500 Pa (C) 1000 Pa (D) 2000 Pa

32. In the circuit shown, $P \neq R$, the reading of the galvanometer is same with switch S open or closed. Then
 (A) $I_R = I_G$ (B) $I_P = I_G$ (C) $I_Q = I_G$ (D) $I_Q = I_R$



33. A square ABCD of side 1mm is kept at distance 15 cm in front of the concave mirror as shown in the figure. The focal length of the mirror is 10 cm. The length of the perimeter of its image will be :
 (A) 8 mm (B) 2 mm (C) 12 mm (D) 6 mm



34. If we ignore the presence of the sun, then there exists a point on the line joining the earth and the moon where gravitational force is zero. The point is located from the moon at a distance of (Given that earth is 81 times heavier than moon and the separation between earth and moon $4 \times 10^8 \text{ m}$) :
 (A) $8 \times 10^7 \text{ m}$ (B) $4 \times 10^6 \text{ m}$ (C) $4 \times 10^7 \text{ m}$ (D) $8 \times 10^6 \text{ m}$

35. One mol of non-ideal gas undergoes a change of state ($2.0 \text{ atm}, 3.0 \text{ L}, 95 \text{ K}$) to ($4.0 \text{ atm}, 5.0 \text{ L}, 245 \text{ K}$) with a change in internal energy (ΔU) = 30.0 L-atm . The change in enthalpy (ΔH) of the process in L-atm.
 (A) 40.0 (B) 42.3 (C) 44.0 (D) not defined, because pressure is not constant

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