Dhaka Board-2017

Physics Second Paper (Creative)
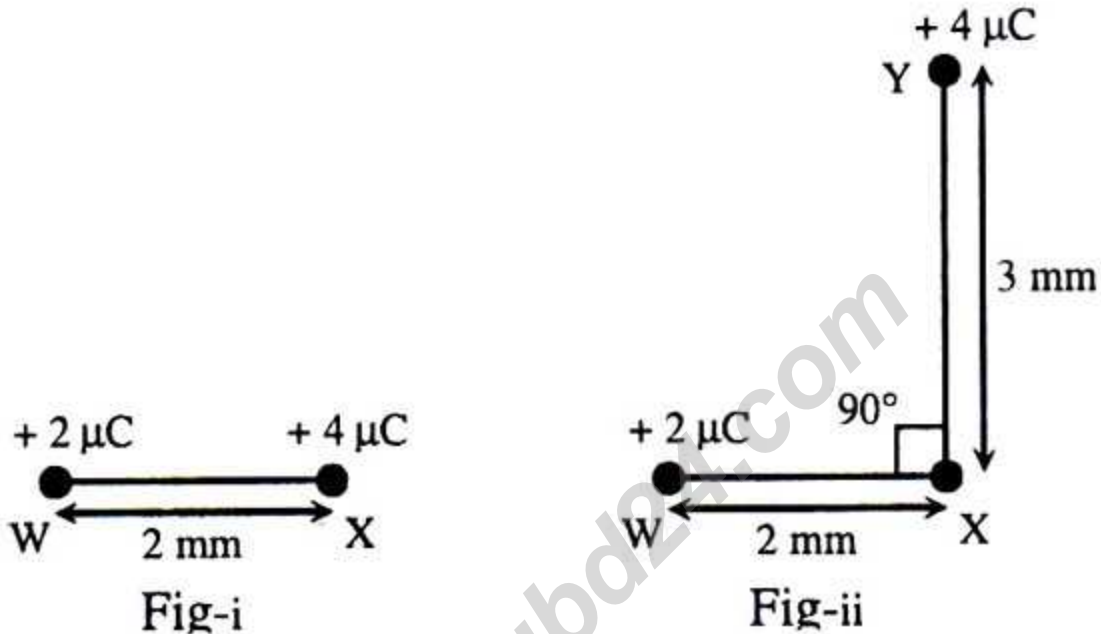
Sub Code : 1 7 5

Time: 2Hrs 35 min   Full marks: 50

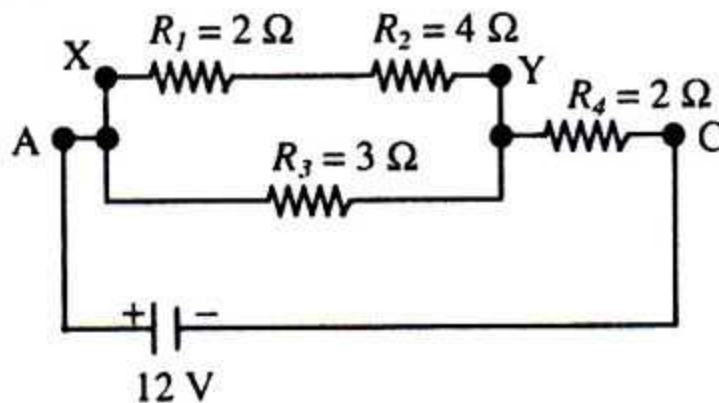*[Read the following stems and answer **any five** of the following questions:]*

1. ▶

+ 4 μC
Y

3 mm

+ 2 μC   + 4 μC   + 2 μC   90°
W   2 mm   X   W   2 mm   X

Fig-i   Fig-ii

Two point charges are stationary on W and X point in Fig(i)

a. What is capacitance?   1
b. Describe the importance of internal resistance in a circuit. 2
c. Find the force inflicted on +2 μC charge.   3
d. If +2 μC charge is kept stationary on point w and +4μC charge is moved to point Y Fig (ii), will there be a potential difference between Fig (ii) and Fig (i)?   4

2. ▶ Observe the circuit:

$R_1 = 2\ \Omega$ $R_2 = 4\ \Omega$
X ⌇⌇⌇⌇   ⌇⌇⌇⌇ Y
                                        $R_4 = 2\ \Omega$
A   ⌇⌇⌇⌇ C
 $R_3 = 3\ \Omega$
        ⌇⌇⌇⌇

12 V

$$R_1 = R_4 = 2\ \Omega$$
$$R_2 = 4\ \Omega;\ R_3 = 3\ \Omega.$$

a. Write Gauss's law.   1

b. Explain that the potential difference and electromotive force of a circuit are not the same.   2

c. Find the flow of electric current in the circuit.   3

d. Draw the voltage current graphs of AC and XY sections with appropriate values.   4

3. ★ Sara and Nuba were studying radioactive elements. They started their calculations at the same time. Their intact molecules vs. time graphs are given below:
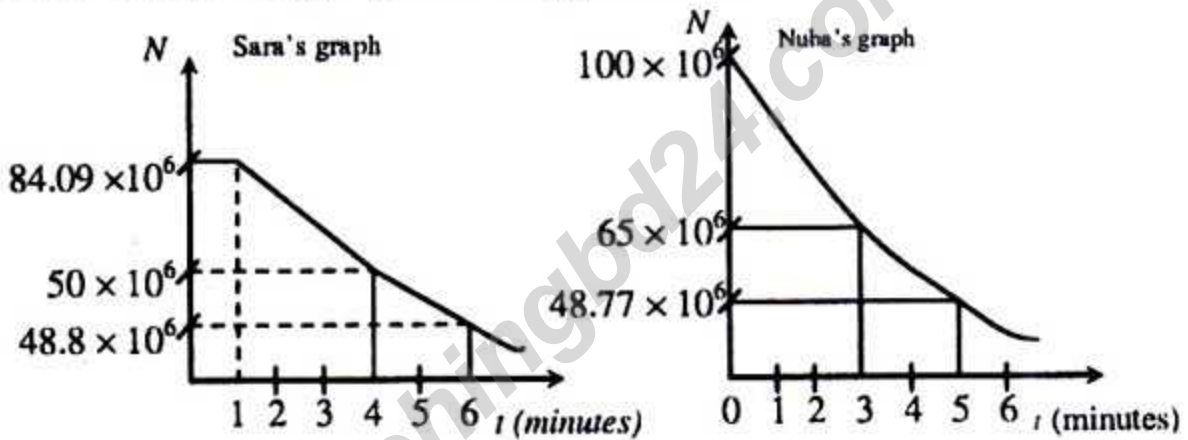
a. What is mass error?   1

b. Explain the origin of X and γ rays.   2

c. Find Nuba's corrosion constant from the graph.   3

d. Which element will break down first? Explain.   4

4. ▶
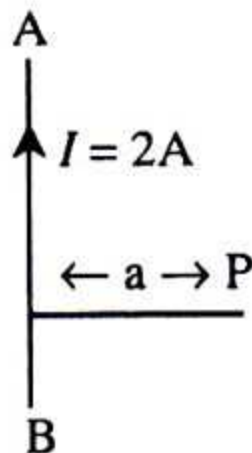
From wire AB = 6 m, the magnetic field at P is 2.0×10^{-5} T. It is situated 'a' distance away. After twisting the wire thrice to form a coil and flowing the same amount of electricity, Affan says that the magnetic field at the centre is greater than 2.0×10^{-5} T. The magnetic permeability is $4\pi \times 10^{-7}$ T.m.A^{-1}.

a. What is a supernova?   1
b. The threshold frequency of a metal is 6.1×10^{-14} Hz–Explain.   2
c. Find the value of 'a'.   3
d. Determine if Affan's observations were correct using calculations.   4

5. ★
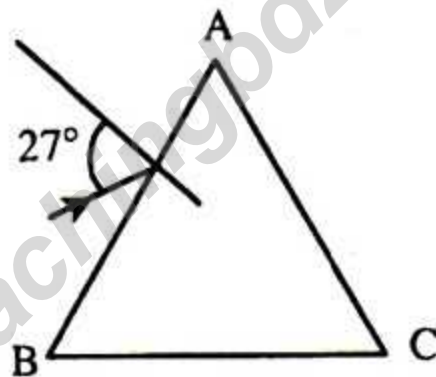
ABC is a glass prism. Here, AB = BC = CA. Its refractive index is 1.5. The incident angle on the reflective plane is 27°.

a. What is polarization of light?   1
b. Why is the reflection in a reflective microscope brighter? 2
c. Determine its minimum deviation angle.   3
d. Determine if the light ray will be emitted from AC plane. 4

6. ▶ In the diagram a common ammeter with n-p-n circuit is shown. Its internal resistance is 40 Ω. Its current gain is 75. Its $R_L = 60$ Ω and collector current is 5 mA.
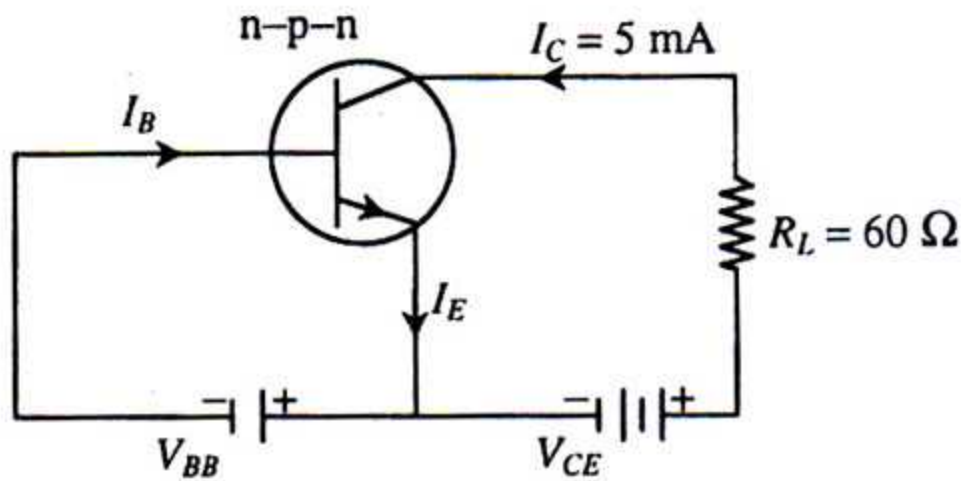
a. What is hexadecimal number system?   1
b. Draw a digital and analogue signal.   2
c. Find the current amplification factor of the circuit.   3
d. Determine if it is possible to get 100% voltage gain from the circuit.   4
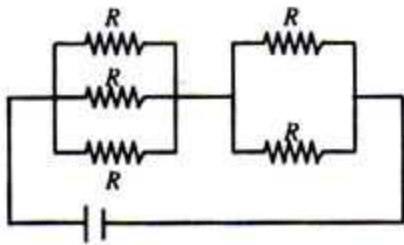
7. ▶ Suppose that scientists found a planet 370 light years away. They sent a 50 year old turtle at 0.7C velocity to the planet. Its mass 30kg and average longevity is 450 years. Light year= 9.46×10^{15} m.

a. What is photon?   1
b. What will the sky look like to people in an aircraft? Explain.   2
c. Find the energy when the turtle is in motion.   3
d. Will the turtle be alive when it reaches the planet? Calculate your answer.   4

8. ★ Shahid built an engine and claimed that it was a Carnot engine. It stores one-fourth of the heat from its source and expels the rest 300 J in the heat receiver. Shahid saw that the temperature of the heat source and heat receiver is 350 K and 310 K.

a. Write the second law of thermodynamics.   1
b. Why is heat dissipation non- reversible?   2
c. Find the temperature of the heat source.   3
d. If his claim is incorrect, what changes would we need to make it a Carnot engine? Explain.   4

Physics Second Paper (MCQ)   Sub Code : 1 7 5

Time : 25 Minutes   Full Marks : 25

[N.B. Fill the circle of the correct answer with a black ball point pen. Each question bears 1 mark.]

1.

What is the total resistance?

(a) $\frac{1}{3}R$ (b) $\frac{1}{2}R$

(c) $\frac{5}{6}R$ (d) $5R$

2. ★ **The horizontal component of the Earth's magnetic field is-**

i. $H = B\cos\delta$

ii. $H = V\cot\delta$

iii. $H = \sqrt{B^2 + V^2}$

Which is correct?

(a) i and ii   (b) ii and iii

(c) i and iii   (d) i, ii and iii

3. What is the velocity of a charge of 10 N.C^{-1} and magnetic field of 5T?

(a) 0.5 m.s^{-1} (b) 1.0 m.s^{-1}

(c) 5.0 m.s^{-1} (d) 10.0 m.s^{-1}

N.B: Answer is 2 m.s^{-1}.

4. Which is the correct formula of magnetic flux?

(a) $\phi = AB\sin\theta$

(b) $\phi = AB\tan\theta$

(c) $\phi = AB\cos\theta$

d. $\phi = AB\cot\theta$

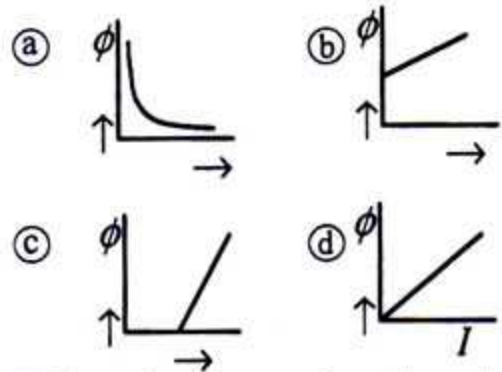**5. What is the root average square value if the equation is $I = 100\sin 625t$?**

(a) 63.7 A   (b) 70.71 A

(c) 100 A   (d) 625 A

6. Which is a medium ray?

(a) yellow   (b) red

(c) blue   (d) green

7. ★ **Which graph expresses the relationship of magnetic flux and electric flow?**

8. What is the refractive index of kerosene? Given, $C_o = 3 \times 10^8$ m.s^{-1} and $C_k = 2.08 \times 10^8$ m.s^{-1}.

(a) 1.33 (b) 1.40

(c) 1.44 (d) 1.51

9. For minimum deviation–

i. $i_1 = i_2$ ii. $A = 60°$

iii. $r_1 = r_2$

Which is correct?

(a) i and ii   (b) ii and iii

(c) i and iii   (d) i, ii and iii

10. Which formula is correct of lens power, if its unit is diopter?

(a) $P = \dfrac{1}{f(cm)}$ (b) $P = \dfrac{1}{f(m)}$

(c) $P = \dfrac{1}{f(mm)}$ (d) $P = \dfrac{1}{f(nm)}$

11. The ratio of magnetic field and alternating current is–

(a) The permeability of electricity of medium

(b) The permeability of magnets of medium

(c) The velocity of medium

(d) The speed of light through a medium

12. The path difference of two points of a wave is $\frac{\lambda}{4}$. What is the phase difference?
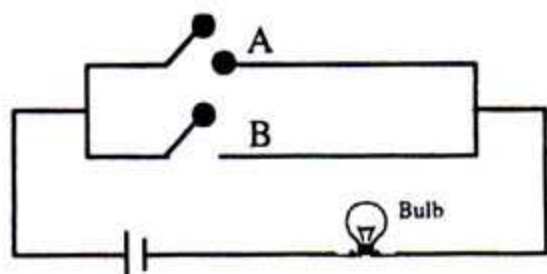
(a) $\dfrac{\pi}{2}$ (b) π

(c) 2π (d) 8π

A photon with wavelength 6630 A is incident on a sodium plate. Its threshold wavelength is 6800 Å, and Planck's constant is $h = 6.63 \times 10^{-34}$ J-s

Answer the below questions 13-14:

13. ★ What is photon energy?
    ⓐ 2×10^{-19} J ⓑ 3×10^{-19} J
    ⓒ 4×10^{-19} J ⓓ 5×10^{-19} J

14. ★ What is the electromotive force of sodium?
    ⓐ 2×10^{-19} J
    ⓑ 2.235×10^{-19} J
    ⓒ 2.925×10^{-19} J
    ⓓ 3.5×10^{-19} J

15. 1 eV is how many joules?
    ⓐ 6.7×10^{-34} J ⓑ 9.1×10^{-31} J
    ⓒ 1.6×10^{-31} J ⓓ 1.6×10^{-19} J

16.


The diagram indicates which gate below?
    ⓐ OR Gate ⓑ NOR Gate
    ⓒ NOT Gate ⓓ AND Gate

17. What is junction diode used as?
    ⓐ Switch ⓑ Rectifier
    ⓒ Amplifier ⓓ Acceletor

18. Which has a relation with event horizon?
    ⓐ Planet ⓑ Galaxy
    ⓒ Satellite ⓓ Star

19. Which formula is incorrect?
    ⓐ $E = hf$
    ⓑ $I = I_s + I_g$
    ⓒ $F = \dfrac{1}{4\pi\epsilon_0} \dfrac{q_1 q_2}{d}$
    ⓓ $C = \dfrac{Q}{V}$

20. Which indicates the first law of thermodynamics?
    ⓐ $\Delta Q = \Delta U + \Delta W$
    ⓑ $\Delta W = \Delta Q + \Delta U$
    ⓒ $\Delta Q = \Delta W - \Delta U$
    ⓓ $\Delta W = \Delta Q - \Delta U$
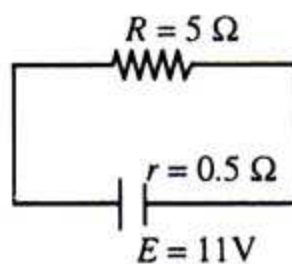
21. What is the efficiency of a Carnot engine from 120°C and 30°?
    ⓐ 20.90% ⓑ 22.90%
    ⓒ 75.00% ⓓ 80.00%

22. ★ The stored energy of a charged capacitor is—
    i. $U = \dfrac{1}{2}QV^2$
    ii. $U = \dfrac{1}{2}CV^2$
    iii. $U = \dfrac{1}{2}\dfrac{Q^2}{C}$

    Which is correct?
    ⓐ i and ii ⓑ ii and iii
    ⓒ i and iii ⓓ i, ii and iii

23.
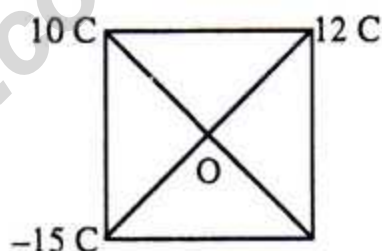
What charge should be placed at the fourth point to make the center voltage zero?
    ⓐ −7 C ⓑ − 3 C
    ⓒ 5 C ⓓ 7 C

24. The resistance of a filament of a bulb is 50 Ω and the voltage difference is 250 V. What amount of current will flow?
    ⓐ 2 A ⓑ 4 A
    ⓒ 5 A ⓓ 8 A

25.

The value of current flow is?
    ⓐ 1 A ⓑ 2 A
    ⓒ 2.2 A ⓓ 2.5 A

| Ans. | 1 | ⓒ | 2 | ⓐ | 3 | * | 4 | ⓒ | 5 | ⓑ | 6 | ⓐ | 7 | ⓓ | 8 | ⓒ | 9 | ⓒ | 10 | ⓑ | 11 | ⓓ | 12 | ⓐ | 13 | ⓑ |
| | 14 | ⓒ | 15 | ⓓ | 16 | ⓐ | 17 | ⓓ | 18 | ⓓ | 19 | ⓒ | 20 | ⓐ | 21 | ⓑ | 22 | ⓑ | 23 | ⓐ | 24 | ⓒ | 25 | ⓑ | | |