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Name: _____ Class: _____ Index No. : _____



ST JOSEPH'S INSTITUTION
2016 PRELIMINARY EXAMINATION
SECONDARY 4 (O-LEVEL PROGRAMME)

PHYSICS

Paper 1 Multiple Choice

5059 / 1

19 August 2016

1 hour

Additional Materials: Multiple Choice Answer Sheet

(1130 – 1230 hr)

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on the cover page of this Question Paper and the Answer Sheet.
 Write in soft pencil on the Multiple Choice Answer Sheet.
 Do not use staples, paper clips, highlighters, glue or correction fluid.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C and D**.
 Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
 Any rough working should be done in this Question Paper.
 The use of an approved scientific calculator is expected, where appropriate.

At the end of the examination, submit the Question Paper and Answer Sheet **SEPARATELY**.

	Total 40
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- 1 The formula used to calculate a gas constant, k is given below.

$$pV = k$$

where p = pressure of gas
 V = volume of gas
 k = gas constant

Which of the following is a possible unit for the gas constant?

- A kg m s^{-1}
 B J s^{-1}
 C N
 D N m

- 2 A micrometer is used to measure the thickness of a book that has 200 identical pages, including its front and back cover.
 With the jaws completely closed, the micrometer reading is shown in Fig 2.1.
 With the jaws closed around the book, the micrometer reading is shown in Fig 2.2

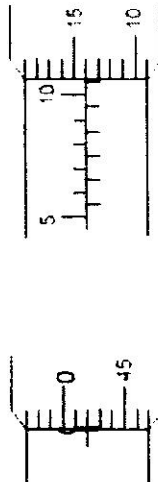


Fig. 2.1

Fig. 2.2

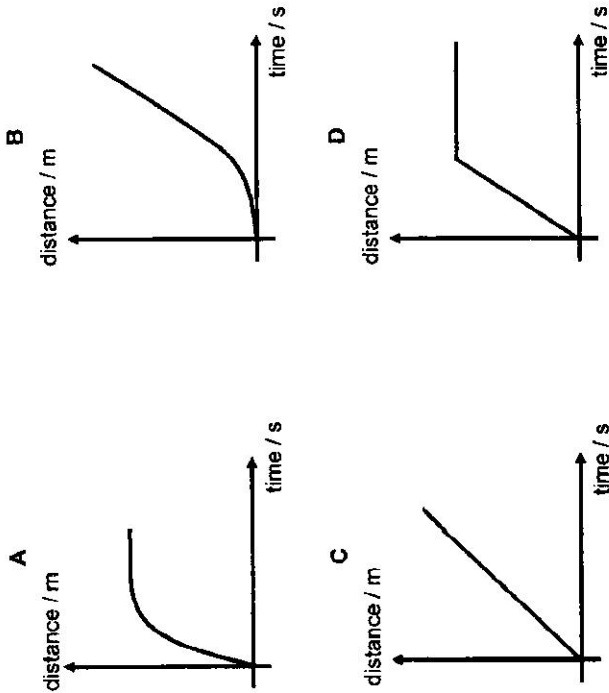
What is the thickness of the book?

- A 0.0533 mm B 10.64 mm C 10.66 mm D 11.12 mm

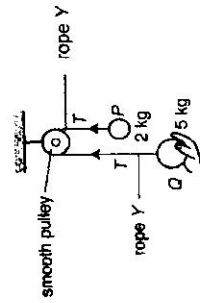
- 3 An object is propelled vertically upward with an initial speed of 20 m/s.
 Ignoring air resistance, what is the magnitude of the displacement of the object 3.0 s later?

- A 5.0 m
 B 10 m
 C 15 m
 D 20 m

- 4 A car moves forward in a straight line.
If the driving force is constant, which of the following graphs correctly shows how the distance of the car changes with time?



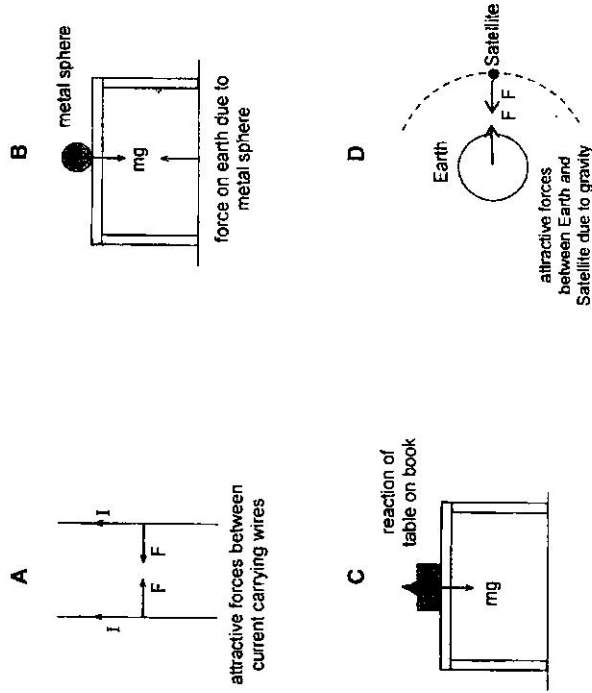
- 5 Two metal spheres P and Q are attached together to the same rope Y which goes round a smooth pulley as shown below. Steven places his hand to support sphere Q with a 30 N force so that the system is stationary. Take $g = 10 \text{ N/kg}$.



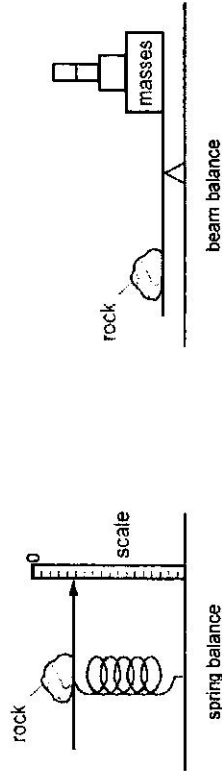
What is the magnitude of the tension, T ?

- A 20 N
B 30 N
C 50 N
D 80 N

- 6 Which of the following pairs of forces is not a valid example of action and reaction forces according to Newton's third law of motion?



- 7 An astronaut conducted the same experiment as shown below on Mars and on the Moon. She placed the same rock on a spring balance and then on a beam balance. The gravitational field strength of Mars is larger than the Moon.



Which of the following options is correct when the experiment was conducted on the Moon?

scale readings of spring balance	masses needed on beam balance
greater than in Mars	more than in Mars
same as in Mars	less than in Mars
smaller than in Mars	less than in Mars
smaller than in Mars	same as in Mars

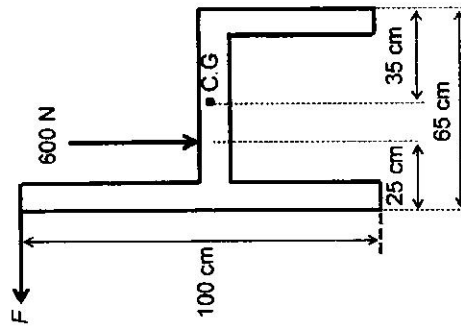
- A
B
C
D

- 8 A mass of liquid of density ρ is thoroughly mixed with an equal mass of another liquid of density 2ρ . The final volume of the mixture is the sum of the volumes of the two liquid.

What is the density of the liquid mixture?

- A $\frac{4}{3}\rho$ B $\frac{3}{2}\rho$ C $\frac{5}{3}\rho$ D 3ρ

- 9 The diagram below shows the dimensions of a chair. A boy sits on the chair and exerts a 600 N force on it as shown. The figure also shows the position of the centre of gravity (C.G.) of the chair.



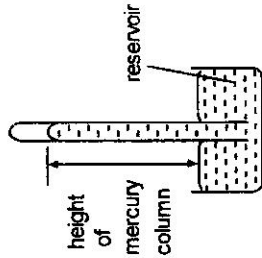
If the mass of the chair is 5.0 kg, what is the magnitude of the horizontal force, F , needed to overturn the chair?

- A 150 N
B 165 N
C 240 N
D 258 N

- 10 With reference to question 9, which of the following statements will not help to prevent the chair from overturning?

- A Lower the C.G. of the chair.
B Use a heavier chair.
C The boy leaning forward.
D Increase the base area of the chair.

- 11 The diagram shows a simple mercury barometer.



Which of the following does not cause the height of the mercury column to vary?

- A changes in atmospheric pressure
B changes in the temperature of the mercury
C changes in the value of gravitational field strength
D evaporation of mercury from the barometer reservoir

- 12 Which sequence represents, in the correct order, the transformation of useful energy in a nuclear power station?

- A nuclear energy $\rightarrow$ chemical energy $\rightarrow$ light energy $\rightarrow$ electrical energy
B nuclear energy $\rightarrow$ gravitational potential energy $\rightarrow$ kinetic energy $\rightarrow$ electrical energy
C nuclear energy $\rightarrow$ kinetic energy $\rightarrow$ thermal energy $\rightarrow$ electrical energy
D nuclear energy $\rightarrow$ thermal energy $\rightarrow$ kinetic energy $\rightarrow$ electrical energy

- 13 When Peter sleeps, his body has a power output of 60 W. He sleeps from 10.00 pm to 7.00 am.

How much energy has he expended?

- A 1.5×10^{-1} J
B 3.2×10^3 J
C 5.4×10^2 J
D 1.9×10^6 J

- 14 A sealed container filled with gas, is submerged into some hot water.

Which of the following describes the change in the density of the gas and the speed of the molecules?

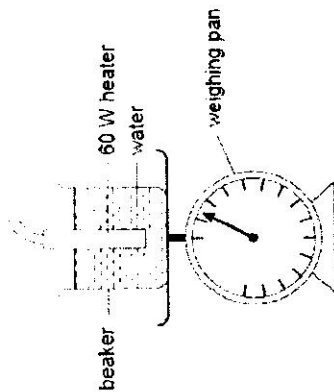
	the density of gas	the speed of the molecules
A	denser	faster
B	less dense	same speed
C	less dense	slower
D	remains unchanged	faster

- 15 A fixed mass of air is trapped inside a cylinder by a piston. The piston is pushed in slowly so that the temperature remains constant.

Which of the following explains the increase of pressure of the air in the cylinder?

- A Pushing in the piston speeds up the air molecules.
- B The air molecules collide more frequently with one another.
- C The air molecules collide more frequently with the wall of container.
- D There is less wall surface for the molecules to collide with.

- 16 The following set-up is used to measure the specific latent heat of vaporisation of water.



Three readings are taken by the weighing pan as shown below.

m_1 = reading before heating
 m_2 = reading at 3 minutes after water boils
 m_3 = reading at 8 minutes after water boils

Which calculation gives the best estimation of the specific latent heat of vaporisation of water in J/kg?

- A $\frac{300}{m_2 - m_3}$
- B $\frac{480}{m_1 - m_3}$
- C $\frac{10800}{m_1 - m_2}$
- D $\frac{18000}{m_2 - m_3}$

- 17 Which of the following does not change when a solid is melting?

- A average speed of molecules
- B density of the mixture
- C intermolecular forces of attraction
- D internal energy of the molecules

- 18 The change of the resistance of a copper wire is assumed to be directly proportional to the change of its temperature. At 20 °C, the resistance of the wire is 0.51 Ω. When the wire is placed in a beaker of boiling water, its resistance is equal to 2.91 Ω. The wire is used to measure the temperature of a hot drink.

What is the temperature of the hot drink if the resistance of the wire is 2.55 Ω?

- A 48 °C
- B 68 °C
- C 85 °C
- D 88 °C

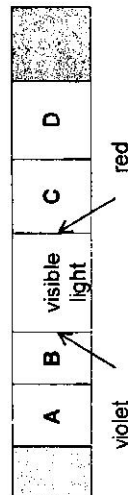
- 19 Wi-Fi is the name of a popular wireless networking technology that uses radio waves to provide wireless high-speed internet and network connections.

Which statement below correctly describes the type of waves that Wi-Fi uses?

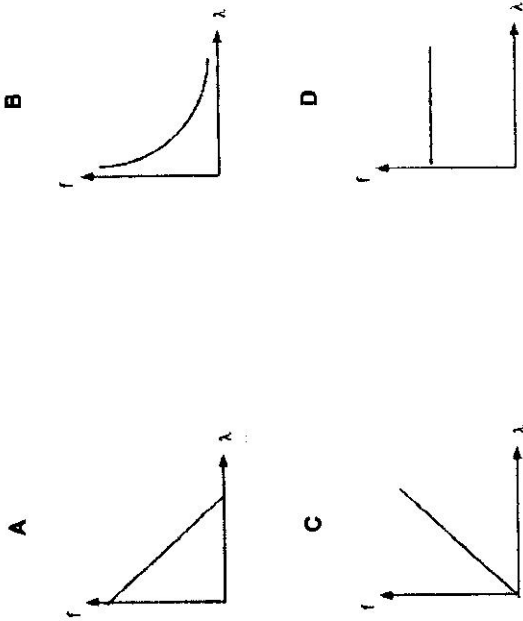
- A They cannot be reflected.
- B They cannot travel through a vacuum.
- C They have the same speed as gamma rays in air.
- D The speed of the waves increase with increasing frequency.

- 20 The diagram below shows an electromagnetic spectrum and it is not drawn to scale. The visible light spectrum is marked. One of the sections of the spectrum has the characteristic: "Able to transfer heat from high temperature region to low temperature region."

Which section is it?



- 21 Which graph shows the correct relationship between the frequency, f and the wavelength, λ of a wave that is travelling in a uniform material?



- 22 A piece of white paper cannot be used as a plane mirror.

What is the reason for this?

- A The paper is white in colour.
 B The light rays falling on the surface of the paper do not obey the laws of reflection.
 C The surface of the paper absorbs most of the light falling on it.
 D The surface of the paper is not smooth enough to allow regular reflection of light.

- 23 A ray of light travels from air to water along the normal at the point of incidence.

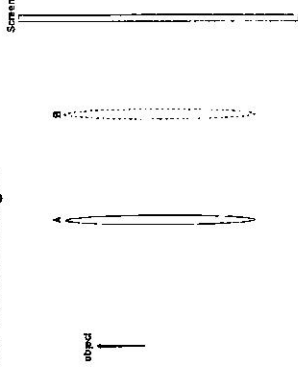
Which of the following properties of light will change?

- (1) speed
 (2) frequency
 (3) direction of travel

- A (1) only
 B (1) and (3) only
 C (3) only
 D (1), (2) and (3)

- 24 When the lens is placed at A, a sharp image is formed on the screen. The image is real, inverted and magnified. After the lens is moved to B, another sharp image is formed on the screen.

What are the properties of the latter image?



- A diminished and inverted
 B diminished and upright
 C magnified and inverted
 D magnified and upright

- 25 A ray of light in a glass block is incident on a boundary with air at an angle of incidence of 30° . The critical angle at this boundary is 32° .

What happens to the ray of light at the boundary?

- A It is partly refracted along the boundary and partly reflected back into the glass.
 B It is partly refracted in the air and partly reflected back into the glass.
 C It is totally reflected back into the glass.
 D It is totally refracted into the air.

- 26 A flash of lightning and the corresponding sound of thunder are detected 6.0 s apart. A student calculates that the lightning struck about 1800 m away.

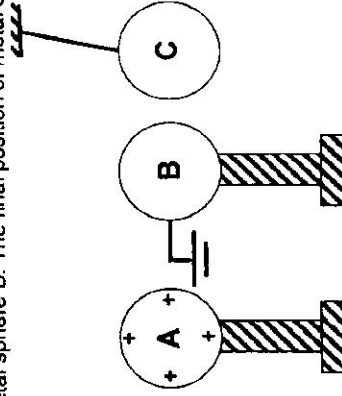
On which assumption is the calculation based on?

- A Light reaches us almost instantaneously, but sound travels at 300 m/s.
 B Light travels 300 m/s faster than sound.
 C Light travels 300 times faster than sound.
 D The sound of the thunder was emitted 6.0 s after the flash.

- 27 A musical note, of the same pitch, is played first on a flute and then on a trumpet. Which one of the following correctly compares the notes produced by the two instruments?

A different frequency and different speeds
 B different frequency and the same speeds
 C same frequency but different speeds
 D same frequency and same speeds

- 28 The diagram below shows a positively charged metal sphere A placed next to a neutral metal sphere B. Metal sphere B is earthed and metal sphere C is then freely suspended next to metal sphere B. The final position of metal sphere C is as shown.



What could be the charge of metal sphere C?

A positively charged only
 B positively charged or neutral
 C negatively charged only
 D neutral

- 29 Which of the following statements correctly defines electric field direction?

A It is the direction of the electric force acting on a small negative point charge.
 B It is the direction of the electric force acting on a small positive point charge.
 C It points away from a negatively charged object towards a positively charged object.
 D It points away from a positively charged object towards a negatively charged object.

- 30 Why are birds able to rest on an overhead transmission line without being electrocuted?

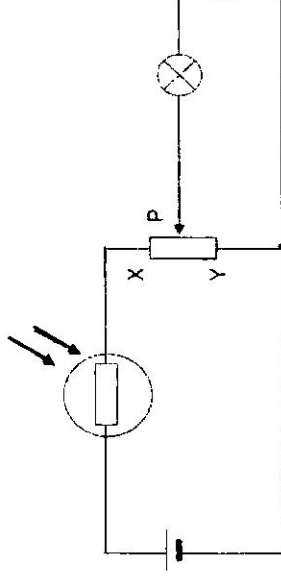
A The bodies have very high resistance.
 B The current is too small.
 C The air between the feathers is a very good electrical insulator.
 D There is no potential difference between their feet.

- 31 A resistance wire, X, is connected to a battery and an ammeter in series. The reading of the ammeter is 1.60 A. The resistance wire, X, is then replaced with resistance wire, Y. The length and the diameter of resistance wire, Y, is double that of resistance wire, X.

If the two resistance wires are made of the same material, what is the new reading on the ammeter?

A 0.20 A
 B 0.40 A
 C 1.60 A
 D 3.20 A

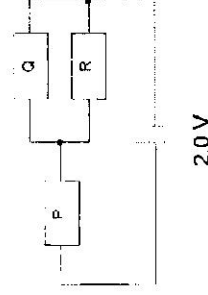
32



Which arrangement will cause the bulb, as shown in the circuit above, to be the brightest?

A Light is incident on the LDR and P is moved to X.
 B Light is incident on the LDR and P is moved to Y.
 C The LDR is covered and P is moved to X.
 D The LDR is covered and P is moved to Y.

- 33 The diagram below shows 3 resistors connected to a cell of 2.0 V. The resistance of both P and Q are 2.0 Ω and the current flowing in resistor P is 0.80 A.

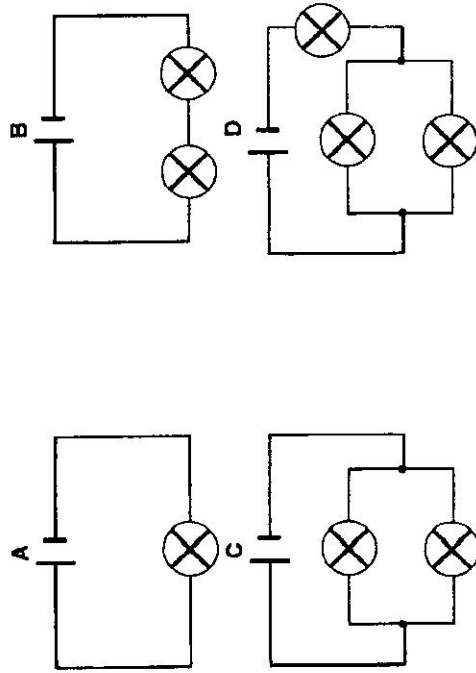


What is the resistance of R?

A 0.40 Ω
 B 0.67 Ω
 C 1.0 Ω
 D 1.5 Ω

- 34 Identical light bulbs are connected to a cell with an e.m.f. of 3.0 V.

Which of the following arrangements will result in the smallest total power output?



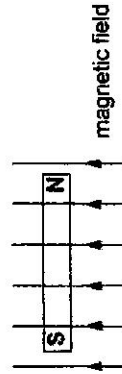
- 35 An appliance is used in a damp environment. The insulation of the wiring is damaged.

What is/are the possible risk(s) that could happened to the appliance?

- (I) The fuse blows
(II) The user gets an electric shock
(III) Electrical fire occurs

- A (I) only
B (II) only
C (I) and (II) only
D All of the above

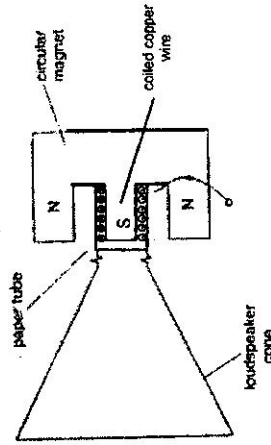
- 36 The diagram shows a bar magnet placed in a uniform magnetic field.



What will happen to the magnet if it is allowed to move freely?

- A It will remain stationary.
B It will turn 90° anticlockwise.
C It will turn 90° clockwise.
D It will turn 180° clockwise.

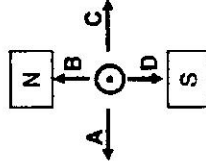
- 37 The diagram shows the side view of a loudspeaker, which consists of magnets and a coiled copper wire amongst other items. Direct current is flowing in the speaker's coil in the direction as shown below.



What is the direction of the force experienced by the coil?

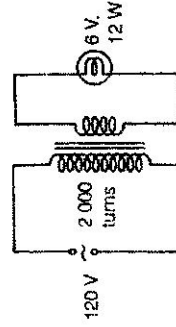
- A into the page B no force is induced
C to the left D to the right

- 38 The diagram below shows an induced current, flowing through a conductor as it is moved between two magnets.



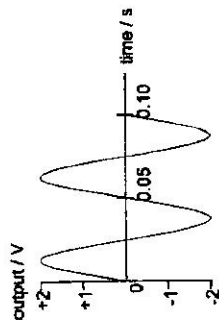
Which arrow indicates the direction of movement of the conductor?

- 39 A bulb, rated 6.0 V, 12 W is connected to a transformer as shown in the diagram below. The brightness of the bulb turns out dimmer than expected, which of the following is a possible number of turns in the secondary coil?



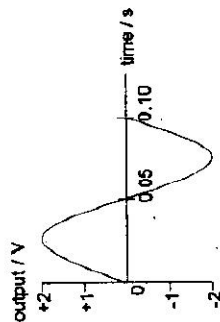
- A 90 B 120
C 200 D 1000

- 40 The graph shows the output of an a.c. generator. The coil in the generator rotates 20 times in one second.

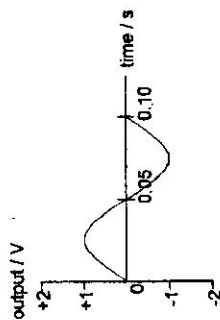


Which graph shows the output when the coil rotates 10 times in one second?

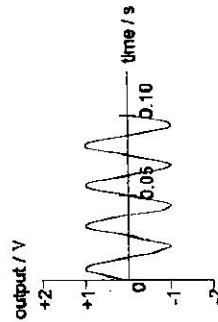
A



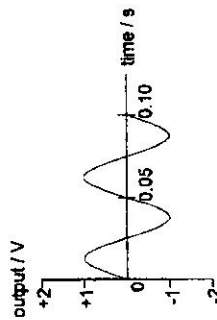
B



C



D



ST JOSEPH'S INSTITUTION
2016 PRELIMINARY EXAMINATION
SECONDARY 4 (O-LEVEL PROGRAMME)

PHYSICS (MARKING SCHEME)

5059

PAPER 1

Q1	Q2	Q3	Q4	Q5
D	C	C	B	A

Q6	Q7	Q8	Q9	Q10
C	D	A	B	A

Q11	Q12	Q13	Q14	Q15
D	D	D	D	C

Q16	Q17	Q18	Q19	Q20
D	A	D	C	C

Q21	Q22	Q23	Q24	Q25
B	D	A	A	B

Q26	Q27	Q28	Q29	Q30
A	D	B	B	D

Q31	Q32	Q33	Q34	Q35
D	A	B	B	D

Q36	Q37	Q38	Q39	Q40
B	C	A	A	B