

## SOUTH WEST REGIONAL MOCK EXAMINATION GENERAL EDUCATION

The Teachers' Resource Unit (TRU) in collaboration with the Regional Pedagogic Inspectorate of Science and the South West Association of Physics Teachers (SWAPT)	<b>Subject Code</b> 0780	<b>Paper Number</b> 1
CANDIDATE NAME ..... CANDIDATE NUMBER ..... CENTRE NUMBER .....	<b>Subject Title</b>  <b>PHYSICS</b>	
<b>ADVANCED LEVEL</b>	<b>DATE: MONDAY</b> <b>20/03/2023 - MORNING</b>	

**Time Allowed: One hour thirty minutes (1 ½ hrs)**

### INSTRUCTIONS TO CANDIDATES:

1. USE A SOFT HB PENCIL THROUGHOUT THIS EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

**Before the Examination begins:**

3. Check that this question booklet is headed "Advanced Level – 0780 Physics Paper 1".
4. Insert the information required in the spaces provided above.
5. Without opening the booklet, pull out the answer sheet carefully from inside the front cover of this booklet. Take care that you do not crease or fold the answer sheet or make any marks on it other than those asked for in these instructions.
6. Insert the information required in the spaces provided on the answer sheet using your HB pencil:

**Candidate Name, Centre Number, Candidate Number, Subject Code Number and Paper Number.**

**How to answer questions in this examination:**

7. Answer ALL the 50 questions in this examination. All questions carry equal marks.
8. Non-programmable calculators are allowed.
9. For each question there are four suggested answers, A, B, C and D. Decide which answer is correct. Find the number of the question on the Answer sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen. For example, if C is your correct answer, mark C as shown below:

( A ) ( B ) (  C  ) ( D )

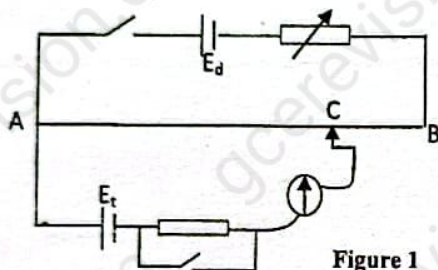
10. Mark only one answer for each question. If you mark more than one answer, you will score zero for that question. If you change your mind about an answer, erase the first mark carefully, and then mark your new answer.
11. Avoid spending much time on any question. If you find a question difficult, move to the next question. You can come back to this question later.
12. Do all rough work in this booklet using, where necessary, the blank spaces in the question booklet.
13. Mobile phones are **NOT ALLOWED** in the examination room.
14. You must not take this booklet and answer sheet out of the examination room. All question booklets and answer sheets will be collected at the end of the examination

SECTION 1 (Thirty-five questions)

Question: 1 – 35

Directions: Each of the thirty-five questions or incomplete statements in this section is followed by four suggested answers. Select the best answer in each case.

- Which of the following set of quantities contains two vectors?
  - Torque, pressure and surface area
  - Magnetic flux, torque and electric field intensity
  - Moments, pressure and electric field intensity
  - Speed, surface area and moments
- When ice at  $0^\circ\text{C}$  melts to form water at the same temperature, which of the following is correct?
  - Work is done by the system
  - The ice absorbs latent heat of fusion
  - No work is done on the system.
  - The internal energy of the system decreases.
- Figure 1 shows a potentiometer circuit.



Which of the following is correct?

- The circuit can be used to measure rapidly changing temperatures.
  - For the balanced length to be obtained,  $E_d$  must be changing during the experiment
  - If no balance length is obtained, then the wire AB is non-uniform
  - The circuit can be used to compare the emfs of two cells.
- When two bodies P and Q are in thermal equilibrium with each other, it implies that
    - the two bodies emit the same amount of energy to the surroundings
    - the two bodies are at the same temperature
    - either P or Q can be used as a thermometer.
    - If P and Q are brought in contact, thermal energy will flow between them.
  - Which of the following electromagnetic radiations is diffracted most on passing through a narrow aperture?

A	Micro waves
B	Ultraviolet rays
C	X-rays
D	Gamma rays

- A sinusoidal a.c. of r.m.s. voltage 10 V is applied across a  $50\ \mu\text{F}$  capacitor. The peak charge on the capacitor is:

A	$7 \times 10^{-4}\ \text{C}$
B	$5 \times 10^{-4}\ \text{C}$
C	$7 \times 10^{-4}\ \text{C}$
D	$4 \times 10^{-4}\ \text{C}$

- Which of the following is an advantage of alternating voltage over direct voltage?
  - No energy is lost during stepping down or stepping voltages
  - Alternating voltages can be stepped up or down
  - Electric shocks are less dangerous for ac voltages
  - Alternating voltages can be used in all appliances

- Figure 2 shows three forces acting at a point.

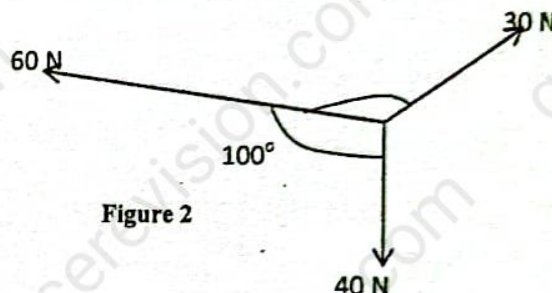


Figure 2

The resultant force is:

A	38.8 N at $12^\circ$ from 60 N force
B	78.1 N at $53^\circ$ from the horizontal.
C	50.0 N upwards
D	38.8 N at $22^\circ$ from 60 N force

- Assuming the charge on the electron is  $-1.6 \times 10^{-19}\ \text{C}$ , the number of electrons hitting the screen of a TV tube each second when the beam current is 1 mA is:

A	$6.25 \times 10^{15}$
B	$6.81 \times 10^{14}$
C	$6.01 \times 10^{14}$
D	$7.20 \times 10^{15}$

- The terminal speed  $v$ , of a ball falling in air can be estimated by  $v = \sqrt{\frac{mg}{kA\rho}}$  where  $m$  is the mass of the ball,  $A$  is the cross-sectional area,  $\rho$  is the density of air,  $g$  is acceleration of free fall and  $k$  is a constant. Which of the following is correct about  $k$ ?

A	$k$ has units of $\text{m}^2\ \text{s}$
B	$k$ has units of $\text{m}^2\ \text{s}^{-1}$
C	$k$ has no units
D	$k$ has units of $\text{m}^2\ \text{s}^{-2}$

11. Which of the following comparisons of the various fields is Not correct?

		Gravitation	Electric	Magnetic
A	Direction of field line	From test mass towards planet	From positive to negative charge	From north to south pole
B	Field set up by	A massive body	Electric charge	Magnet or current carrying wire
C	Field acts on	Test mass	Test charge	Magnet or wire carrying current
D	Shielding	Possible to prevent a planet from acting on test mass	Possible to shield charge from electric field influence	Impossible to shield material from magnetic field influence

12. A parallel beam of monochromatic light of wavelength 500 nm is incident normally on a diffraction grating. The grating has 600 lines per millimetres. The maximum order of diffraction excluding the centre bright fringe is

A	B	C	D
2	3	4	1

13. An electric kettle has a 3 kW heating element and a specific heat capacity of  $400 \text{ J kg}^{-1} \text{ K}^{-1}$ . 1 kg of pure water at  $25^\circ\text{C}$  is put in it. The heater is switched on and 15 minutes later, only 0.4 kg is left in the kettle. The water boils at  $100^\circ\text{C}$ . The heat supplied during this time is:

A	$3.1 \times 10^6 \text{ J}$
B	$3.7 \times 10^5 \text{ J}$
C	$4.0 \times 10^6 \text{ J}$
D	$2.7 \times 10^6 \text{ J}$

14. An object of mass 20 g travelling at a speed of  $5 \text{ m s}^{-1}$  hits another object of mass 45 g moving  $3.5 \text{ m s}^{-1}$  in the same direction. The two objects move together after collision. What is the loss in kinetic energy?

A	B	C	D
0.08 J	0.02 J	0.07 J	0.05 J

15. Figure 3 shows small loudspeakers R and S operating as in phase sources of sound, radiating notes of equal intensity and frequency. XYZ is a line parallel to RS with Y equidistant from R and S and the distance d between RS and XYZ are each large compared with the wavelength of the sound. The variation of the of sound intensity along XZ is investigated using a small microphone which is connected to an amplifier and hence to a suitable indicator.

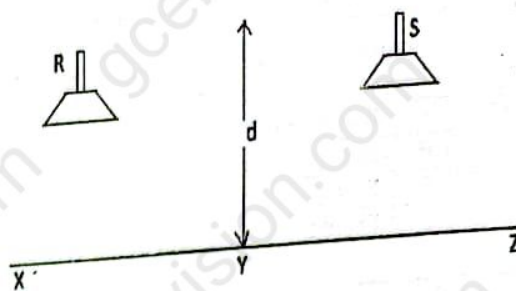


Figure 3

The observations reveal:

- A) maximum intensity at Y and several other positions along XYZ.  
 B) uniform (non-zero) intensity along the entire length XYZ.  
 C) maximum intensity at Y and gradually fall on either side.  
 D) zero intensity along the entire length XYZ

16. An electron of charge, e, and mass, m, moving with speed, v, perpendicular to a magnetic field of strength, B, describes a circle of radius, r, given by:

A	B	C	D
$r = \frac{ev}{Bm}$	$r = \frac{Bv}{em}$	$r = \frac{mv}{Be}$	$r = \frac{Bm}{ev}$

17. What is the coefficient of friction between the 6 kg mass and the horizontal support in Figure 4 given that both masses accelerate at  $5.0 \text{ m s}^{-2}$ ?

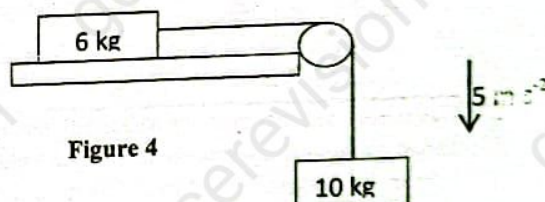
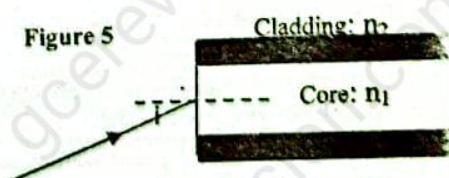


Figure 4

A	B	C	D
0.60	0.10	0.31	0.80

18. A cylindrical core of material of refractive index  $n_1$  is completely surrounded by a cladding of material of refractive index,  $n_2$ . If light is incident at an angle i as shown in figure 5;



The condition for light ray to be totally internally reflected is

A	$\sin i > n_1/n_2$
B	$\sin i > n_2/n_1$
C	$\sin i < n_2/n_1$
D	$n_2 > n_1$

19. Following thermodynamics' second law, for any process that may occur in an isolated system, which one of following is applied?

A	Entropy decreases.
B	Entropy remains constant
C	Entropy increases.
D	Entropy can remain constant or entropy can increase

20. For a single electron, the electric field strength at 0.1 nm away from the charge is:

A	$1.4 \times 10^{11} \text{ N C}^{-1}$
B	$2.4 \times 10^{11} \text{ N C}^{-1}$
C	$5.4 \times 10^{11} \text{ N C}^{-1}$
D	$1.4 \times 10^{11} \text{ N C}^{-1}$

21. The fundamental frequency of transverse vibrations of a wire fixed at both ends is 300 Hz. If the tension in the wire is doubled, the new fundamental frequency is:

A	B	C	D
600 Hz	150 Hz	424 Hz	300 Hz

22. Which of the following is true for an object describing circular motion?

- A) The velocity of the object is always directed towards the centre of the circle.  
 B) The object's velocity and acceleration are in constant evolution  
 C) The object can accelerate meanwhile its velocity is constant.  
 D) The object's speed and acceleration are in constant evolution

23. Gas is enclosed in a cylinder whose volume may be varied by moving a piston. When the gas volume is  $0.01 \text{ m}^3$ , its pressure is 100 kPa. The gas is next cooled at constant pressure to a volume of  $0.006 \text{ m}^3$ . The work done on the gas is

A	B	C	D
0.4 J	500 J	0.5 J	400 J

24. Which of the following statements about an n-type semiconductor **NOT** correct?

- A) It is an intrinsic semiconductor  
 B) Majority charge carriers are electrons.  
 C) It is electrically neutral.  
 D) It has a hall voltage polarity that is the reverse of that for a p-type semiconductor.

25. Which of the following statements is true about electromagnetic waves?

- A) The magnetic field component defines the plane of polarization of an electromagnetic wave.  
 B) The electric and magnetic field components are out of phase with one another.  
 C) They are composed of electric and magnetic fields which both vary sinusoidally with time

- D) The electric and magnetic field components are perpendicular to each other and both parallel to the direction in which the wave is travelling.

26. An athlete accelerates uniformly at  $2.5 \text{ m s}^{-2}$  from rest along a straight line in a 100 m race and hits a maximum velocity of  $8 \text{ m s}^{-1}$ . How much time does the athlete take to complete the race?

A	B	C	D
14.1 s	3.2 s	12.5 s	10.9 s

27. A ball is projected with an initial velocity,  $u = (2i + 3j) \text{ m s}^{-1}$  and after some time  $t$ , it covers a vertical distance  $y$  and a horizontal distance  $x$ . Suppose the initial velocity is instead  $(2i + 4j) \text{ m s}^{-1}$ , then the vertical and horizontal distances covered by the ball in the same time  $t$ , will be:

	Vertical distance	Horizontal distance
A	Equal to $y$	Equal to $x$
B	Greater than $y$	Equal to $x$
C	Less than $y$	Greater than $x$
D	Equal to $y$	Less than $x$

28. The answer to why planets orbit the sun can be explained by

A	Kepler's 2 <sup>nd</sup> Law
B	Kepler's 3 <sup>rd</sup> Law
C	Kepler's 1 <sup>st</sup> Law
D	Newton's Law of Universal Gravitation

29. An object of mass 100 kg is moving at  $50 \text{ km h}^{-1}$ . What force is needed to bring the object to rest over a distance of 50 m?

A	B	C	D
100 N	193 N	174 N	2500 N

30. In an a.c circuit containing a capacitor and a resistor (C-R), the voltage across the capacitor leads the current by

A	B	C	D
$\frac{\pi}{2}$	$\pi$	$-\frac{\pi}{2}$	$-\pi$

31. In which of the following set does the expression Y define the quantity X

	X	Y
A	Magnetic field intensity	Negative potential gradient
B	Capacitance	Charge flowing per unit time
C	Inductance	Time rate of change of e.m.f
D	Gravitational field intensity	Force per unit mass

32. 25 J of heat energy is transferred to a sample of ideal gas at constant pressure. As a result, the internal energy of the gas is:

A	increased by 25 J
B	increased by more than 25 J
C	increases by less than 25 J
D	Remains constant

33. A radioactive element of half-life 5 minutes has  $4.0 \times 10^{21}$  atoms remaining after 15 minutes. The initial number of atoms of the sample is

A	$3.2 \times 10^{22}$
B	$1.2 \times 10^{22}$
C	$4.2 \times 10^{22}$
D	$3.2 \times 10^{21}$

34. A copper wire of length,  $l$  and diameter,  $d$ , has resistance,  $R$ . What is the resistance of a copper wire of length,  $2l$ , and diameter  $2d$ ?

A	B	C	D
$R$	$\frac{1}{2}R$	$2R$	$4R$

35. In figure 6, AD is a uniform beam of length 5 m resting on supports at B and C.

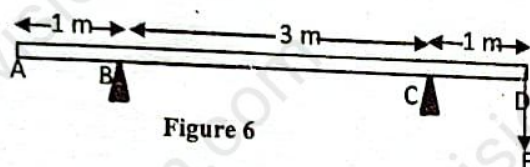


Figure 6

If the beam has a weight of 200 N, what would be the minimum downward force  $F$ , applied at D which would lift the beam clear from the support at B?

A	B	C	D
200 N	150 N	250 N	300 N

### SECTION - II (Ten questions)

#### Multiple Selection

#### Questions 36 - 45

Directions: For each group of questions below ONE or TWO of the responses given is/are correct. Then choose:

- A: if 1 and 2 are correct;  
 B: if 2 and 3 are correct;  
 C: if 1 only is correct;  
 D: if 3 only is correct.

#### DIRECTIONS SUMMARIZED

A	B	C	D
1,2	2,3	1 only	3 only

36. Which of the following statement(s) define(s) the e.m.f of a device?
- The energy converted from electrical, to other forms, per unit charge entering the device.
  - The ratio of the electrical power the device generates to the current it delivers.
  - The energy converted to electrical, from other forms, per unit charge leaving the device.
37. An oscillatory system is said to be naturally damped if
- Only air resistance and friction act on it.
  - The amplitude of the oscillation stays constant

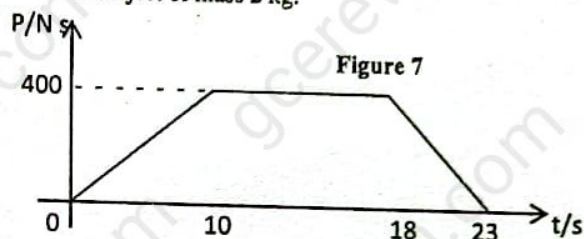
3. No net force acts on it

38. The stability of the nucleus depends on:
- the binding energy per nucleon
  - the neutron to proton ratio following the stability line
  - its activity

39. A parallel beam of monochromatic light is incident normally on a plane diffraction grating. The number of spectral orders observable can be increased by:

- using light of shorter wavelength.
- using a grating with a fewer lines per metre.
- using a grating with a larger area.

40. Figure 7 represents the momentum-time graph for an object of mass 2 kg.



Which of the following is true?

- The magnitude of the accelerating force is half that of the decelerating force.
- The total displacement of the particle is 6200 m.
- The area on the graph represents the work done in displacing the object.

41. Which of the following statement(s) is/are true?

- A homogeneous equation must be correct
- A homogeneous equation can be wrong because it contains a unitless constant.
- A correct equation must be homogeneous.

42. Resistors of resistance  $12 \Omega$ ,  $8 \Omega$ ,  $6 \Omega$  are connected in series and later connected in parallel.

- combined conductance of the series connection is 33 mS.
- combined conductance of the series connection is 38 mS.
- combined conductance of the parallel connection is 0.38 S.

43. A particle oscillates with simple harmonic motion of amplitude 5.0 cm and a maximum speed of  $25 \text{ cm s}^{-1}$ .

- The particle's period is 1.3 s.
- The particle's maximum acceleration is  $1.2 \text{ m s}^{-2}$ .
- The particle's maximum acceleration is  $4.2 \text{ m s}^{-2}$ .

44. Doppler's effect occurs

- Only when the source moves.
- Only when both source and observer move.
- Whenever there is relative motion between the source and the observer

45. In the alpha-particle scattering experiment, which of the following deductions Y, corresponds to the observation in X

	X	Y
1	Most of the $\alpha$ -particles passed through undeflected	Most of the atom is empty space
2	A few of the $\alpha$ -particles were deflected through small angles	The positively charged nucleus is located at the center and is small.
3	Very few of the $\alpha$ -particles were deflected through large angles	The nucleus is positively charged

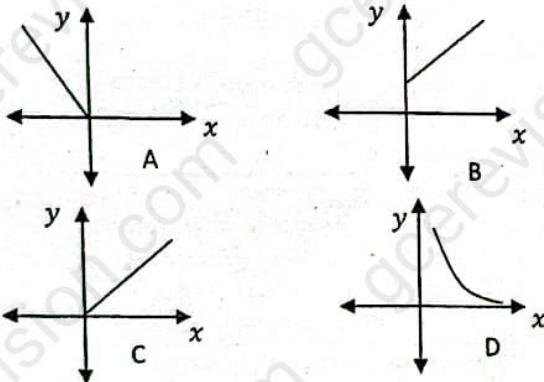
**SECTION - III : [Five questions]**

Questions 46 - 50

Directions: Each question in this section consists of four lettered graphs A - D. For each numbered question, select the graph which best fits the relationship between  $x$  and  $y$

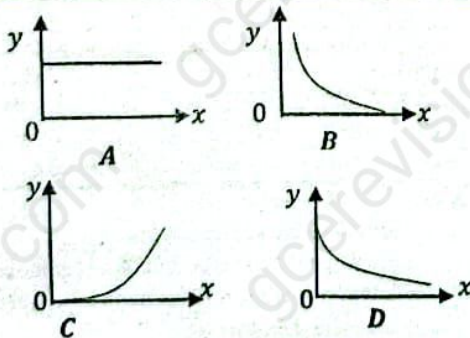
46.

y	x
The reciprocal of the distance from an object to a camera	The reciprocal of the distance from the lens to the film.



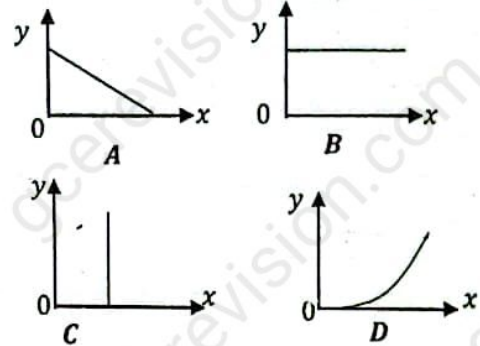
47.

y	x
The gravitational field intensity	The distance from the surface of the earth



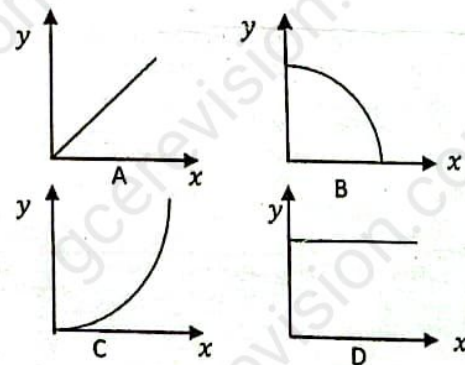
48.

y	x
Refractive index of a glass prism	Reciprocal of speed of light



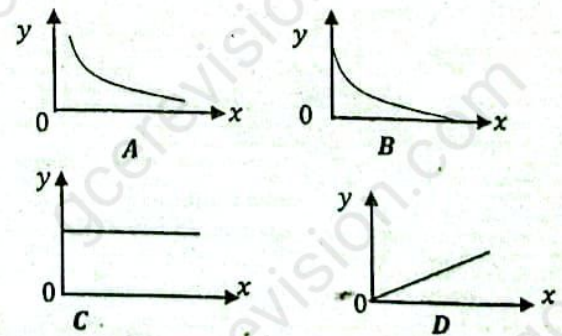
49.

y	x
Potential energy of a body executing simple harmonic motion	time



50.

y	x
Root mean square speed of gas particles	Density of a fixed mass of gas at constant pressure



**END**

**GO BACK AND CHECK YOUR WORK**