## Candidates' Performance

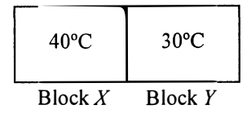
**Paper 1**

Paper 1 consists of two sections, multiple-choice questions in Section A and conventional questions in Section B. All questions in both sections are compulsory.

**Section A** (multiple-choice questions)

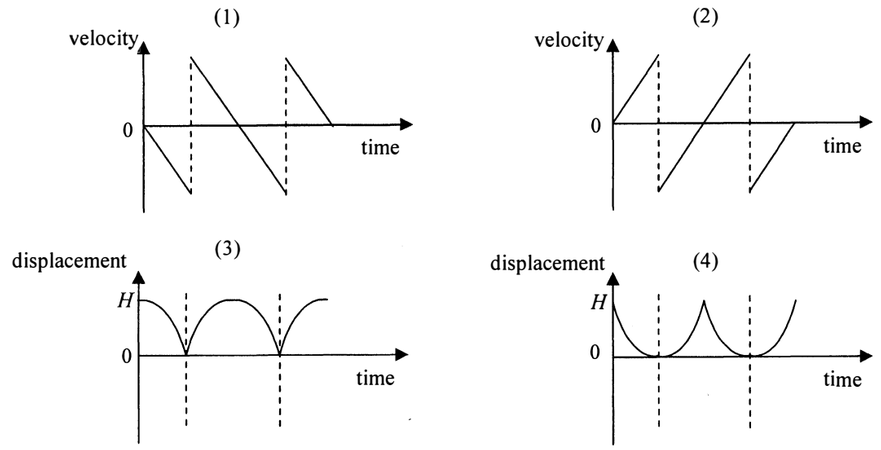
Section A consisted of 36 multiple-choice questions and the mean score was 21. Candidates' performance in the following items revealed some of their weaknesses:

1. Two metal blocks $X$ and $Y$ of the same mass and of initial temperatures 40°C and 30°C respectively are in good thermal contact as shown. The specific heat capacity of $X$ is greater than that of $Y$. Which statement is correct when a steady state is reached ? Assume no heat loss to the surroundings.



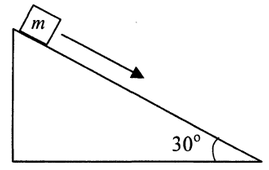

| | | |
|---|---|---|
| A. | The temperature of block $X$ is higher than that of block $Y$. | (5%) |
| B. | Their temperature becomes the same and is lower than 35°C. | (12%) |
| * C. | Their temperature becomes the same and is higher than 35°C. | (63%) |
| D. | Their temperature becomes the same and is equal to 35°C. | (20%) |

7. Which of the following graphs (velocity-time and displacement-time) best represent the motion of a ball falling from rest under gravity at a height $H$ and bouncing back from the ground two times ? Assume that the collision with the ground is perfectly elastic and neglect air resistance. (Downward measurement is taken to be negative.)




| | | |
|---|---|---|
| * A. | (1) and (3) only | (63%) |
| B. | (1) and (4) only | (17%) |
| C. | (2) and (3) only | (14%) |
| D. | (2) and (4) only | (6%) |

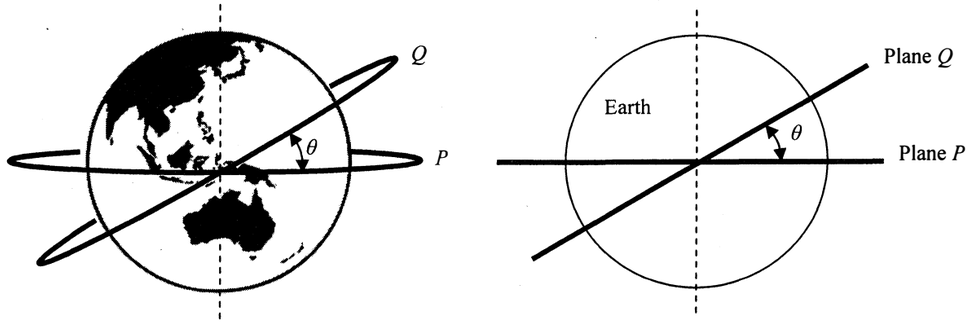
10. A block of mass $m$ resting on a 30° incline is given a slight push and slides down the incline with a uniform speed. Which of the following statements about the block's motion on the incline is/are correct ?




(1) There is no net force acting on the block.
(2) The frictional force acting on the block is 0.5 $mg$.
(3) If the block is given a greater initial speed, it will slide down the incline with acceleration.

A. (1) only (18%)
B. (3) only (13%)
* C. (1) and (2) only (55%)
D. (2) and (3) only (14%)

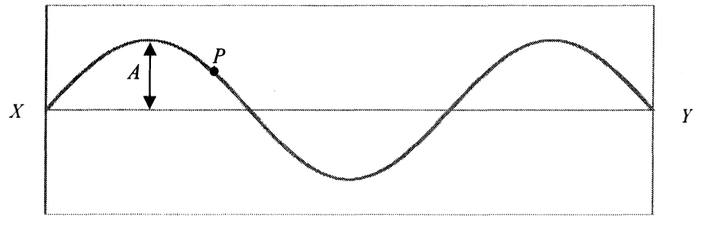
14. Two satellites move in circular orbits of the same radius $R$ around the Earth (mass $M$ ). The orbits are in two different planes $P$ and $Q$ as shown. Plane $P$ coincides with the Earth's equator while plane $Q$ is inclined to the equator at $\theta$. Which statement is **INCORRECT** ?




A. The speed of satellite $P$ is $\sqrt{\frac{GM}{R}}$. (8%)
B. The centripetal force acting on satellite $Q$ is pointing along the plane $Q$. (16%)
C. The acceleration of both satellites is the same in magnitude. (18%)
* D. The period of satellite $Q$ is longer than that of satellite $P$. (58%)

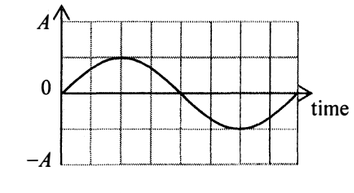


18. A stationary wave is formed on a string fixed at both ends $X$ and $Y$. The following is a snapshot of the string at time $t = 0$. The amplitude of vibration at an antinode is $A$.

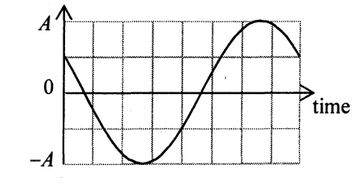



Which of the following shows the displacement-time graph of point $P$ on the string for one period ? (Upward displacement is taken as positive.)

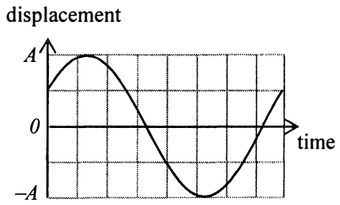
A. (8%)



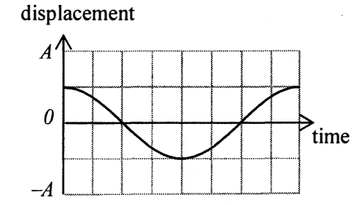

B. (12%)




C. (18%)




* D. (62%)

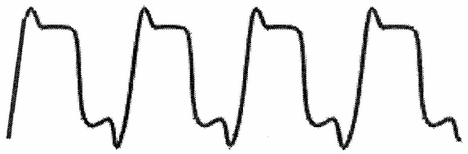


22. The figure shows the waveforms of sound notes generated by a violin, a piano and a tuning fork. The scale is the same in time and intensity axes for all three waveforms.

(I)

(II)

(III)

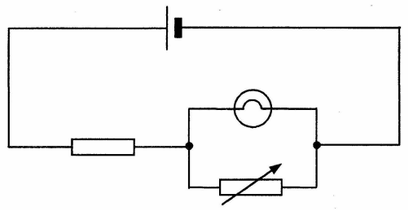


Which of the following about the sound notes are correct ?

(1) They all have the same pitch.
(2) The qualities of sound of (II) and (III) are different.
(3) (I) is generated by the tuning fork.

| | | |
|---|---|---|
| A. | (1) and (2) only | (14%) |
| B. | (1) and (3) only | (7%) |
| C. | (2) and (3) only | (25%) |
| * D. | (1), (2) and (3) | (54%) |

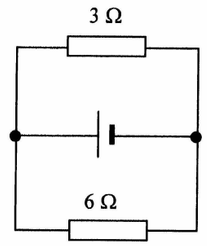
27. What will happen if the variable resistor is set to zero in the circuit below ?



| | | |
|---|---|---|
| A. | The light bulb will burn out. | (6%) |
| * B. | The light bulb will not light up. | (69%) |
| C. | The brightness of the light bulb will increase. | (19%) |
| D. | The brightness of the light bulb will remain unchanged. | (6%) |



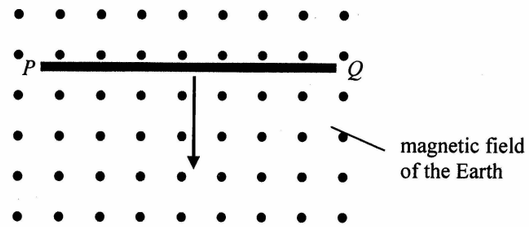
28.




In the above circuit, the cell has e.m.f. 12 V and internal resistance 2 Ω. What is the current in the 6 Ω resistor ?

| | | |
|---|---|---|
| A. | 0.5 A | (7%) |
| * B. | 1.0 A | (42%) |
| C. | 1.5 A | (21%) |
| D. | 2.0 A | (30%) |

32. A copper rod $PQ$ is placed horizontally as shown below. It is released and then falls vertically, cutting across the magnetic field of the Earth pointing out of the paper. Neglect air resistance. Which of the following statements is/are correct ?




(1) A voltage is induced across $PQ$.
(2) A steady induced current is generated in the rod.
(3) Due to the effect of the Earth's magnetic field, the copper rod falls with an acceleration less than the acceleration due to gravity.

| | | |
|---|---|---|
| * A. | (1) only | (47%) |
| B. | (3) only | (14%) |
| C. | (1) and (2) only | (26%) |
| D. | (2) and (3) only | (13%) |

**Section B** (conventional questions)

| Question Number | Performance in General |
|---|---|
| 1 | Parts (a) and (c) were well answered but only the more able candidates managed to answer part (b). In (a), some candidates wrongly used 4200 J $kg^{-1}$ $°C^{-1}$ for the specific heat capacity of steam. In (b), many candidates failed to take into account the energy released by water from 100°C to temperature $T$ in their calculation. |
| 2 | Satisfactory. In (a), most candidates were able to apply Boyle's law but some of them did not know the relation between the bubble's volume and its radius or the formulae for calculating a spherical volume. In (b), few candidates stated the constant average speed (kinetic energy) of gas molecules and realised the gas pressure caused by collisions of gas molecules on a surface. |
| 3 | Most candidates answered part (a) correctly. In (a)(ii), many candidates made the correct choice while a few concluded this from exact explanation $v^2 \propto r$. In (b), some candidates misunderstood that the centripetal force remained constant while the friction became smaller. Only a few pointed out that the reduced friction was not enough to provide the centripetal force required to keep the car moving in the circular lane. |
| 4 | Satisfactory. Part (a)(i) was well answered. In (a)(ii)(iii), some candidates failed to sketch the variation of the speed of Train $A$ correctly and therefore they were unable to determine the two trains' separation using the area under the graph. Candidates' performance in (b) was fair. In (b)(i), many candidates did not apply the principle of conservation of momentum correctly in the situation concerned. In (b)(ii), only the more able ones identified the correct velocities to be used in finding the rate of change of momentum of Train $A$. |
| 5 | Parts (a) and (b)(i) were well answered but candidates' performance in (b)(ii) was poor. In (a)(i), some candidates had difficulties in working out a correct equation relating the horizontal component of the tension of the string to the force exerted by the hunter (60 N). Weaker candidates did not know that the tension could be found by the resolution of forces. In (a)(ii), some candidates did not give the correct unit for energy. In (b)(ii), only the more able candidates found the height of the coconut from the ground at the moment the arrow hit it by considering the coconut's vertical motion. The majority of candidates considered the motion of the arrow and worked out only the height of the coconut/arrow above the position where the arrow left the hunter's hand. |
| 6 | Part (a) was poorly answered. Not many candidates identified the correct positions of the anti-nodal line $L_1$ and nodal line $L_2$ by drawing a smooth curve through the points for each line. Many candidates wrongly drew straight lines for $L_1$ and $L_2$. Only the more able ones correctly pointed out that the separation between $L_1$ and $L_2$ would increase when $S_1S_2$ was reduced slightly in separation. Candidates' performance in (b) and (c) was satisfactory. Many failed to give the correct path difference at $Q$. In (d), the majority of candidates were able to obtain the numerical answer using the equation $\Delta y = \lambda D/a$ but some mixed up the meaning of $\Delta y$ (fringe separation) and $a$ (slit separation). |
| 7 | Parts (a) and (b) were well answered. In (a)(i), many candidates wrongly drew the image and light ray in dotted lines. Some wrongly spelled the word 'diminished'. In (a)(ii), the light ray $r$ was often drawn wrongly after passing through the lens so that it reached the head of the image instead of the tail. In (b)(ii), many candidates failed to explain why the image was dimmer. They failed to point out the difference in brightness of the images in terms of the light energy per unit area. Few understood that a constant amount of light for different sizes of image yields different brightness levels. Some of them wrongly thought that a magnified image was equivalent to a brighter one. |
| 8 | Candidates' performance in parts (a) and (b) was fair. In (b), many candidates wrongly substituted 550W as the power consumed in the calculation and got a wrong answer – 88 Ω. Some of them did not understand the concept of greater power consumption when two resistors are connected in parallel. In (c), a few candidates did not read the question carefully and calculated the resistance of $R_2$ only. |



| Question Number | Performance in General |
|---|---|
| 9 | Poor. In (a), most candidates failed to point out that water can provide a conducting path or lower the resistance for an electric current. In (b), only a few candidates correctly explained why the human body would not get an electric shock if one of the conducting wires in the shaver circuit was touched. Most of them wrongly reasoned that the conducting wires were isolated from the high voltage. Some candidates did not understand the action of transformers and wrongly thought that current went to the earth in the primary coil because of low resistance. |
| 10 | Unsatisfactory. Many candidates failed to draw a clear diagram to show the experimental setup. Some of them used apparatus other than that provided in the question. They also suggested stronger magnets or increasing the length of the magnet as factors affecting e.m.f. induced. Not many were able to express their answers in an organised manner. Some overlooked the fact that the conducting wire could use as a conductor. Some candidates mistook the light-beam galvanometer as a power supply. They wrongly thought that the galvanometer could function as a CRO. Many candidates did not state the expected result or observation of the factors affecting the e.m.f.. |
| 11 | Parts (a) and (b) were well answered. In (a), a few candidates wrote the equation with wrong notation. In (b), weaker candidates made mistakes in converting units like u, MeV and J. Candidates' performance in part (c) was fair. Many were weak in calculation with moles and they mixed up curie (Ci) and disintegrations per second (or Bq) when expressing the activity. |

The mean mark achieved by the candidates was slightly higher than 50%. Most markers agreed that there was appropriate balance between questions testing basic knowledge and those testing higher-order skills.

**Paper 2**

Paper 2 consisted of four sections. Each section contained eight multiple-choice questions and one structured question which carried 10 marks. Section A contained questions on 'Astronomy and Space Science', Section B on the 'Atomic World', Section C on 'Energy and Use of Energy' and Section D on 'Medical Physics'. Candidates were required to attempt all questions in two of the four sections.

| Question | Popularity (%) | Performance in General |
|---|---|---|
| 1 | 28 | Unsatisfactory. In (a)(i), many candidates did not state Stefan's Law $L = \sigma(4\pi R^2)T^4$ correctly. Most of them proved the relation starting from $\frac{L_S}{L} = \frac{T_S^4 R_S^2}{T^4 R^2}$. Part (a)(ii) was well answered. Only a few candidates failed to find $R$ because they misused the relation in (a)(i) or copied wrong data. In (b)(i), some candidates wrongly applied the equation $d = \frac{1}{p}$ to predict the change of radius. Very few applied brightness = $\frac{L}{4\pi d^2}$ to explain explicitly that the luminosity should increase if distance increases for the same brightness. Some candidates mixed up luminosity and brightness. Part (b)(ii) was well answered. Candidates' performance in (c) was poor. Most of the them tried to compare the brightness of the Sun and supernova explosion by using either $d = \frac{1}{p}$ or $L = \sigma(4\pi R^2)T^4$. |

| Question | Popularity (%) | Performance in General |
|---|---|---|
| 2 | 63 | Fair. In (a), quite a number of candidates stated the reason as the 'negative charge' of electrons. In (b), candidates were not familiar with angular momentum. Part (c)(i) was well answered. Some candidates did not know the meaning of 'quantum number'. A few misunderstood the situation as a photoelectric effect. Most candidates knew that an electron can return to $n = 1$ from $n = 3$ in two different pathways. However, many failed to recognise that there are three possible transitions. |
| 3 | 80 | Satisfactory. In (a), some candidates mixed up the percentage of absorption (26.8%) of solar power with the percentage reaching the ground (73.2%). In (b), most candidates correctly gave solar energy and electrical energy in the energy conversion of a solar cell. However, quite a number of them wrongly included heat and chemical energy as intermediate steps. Few candidates gave a correct way to improve energy absorption. Some thought that a black surface could increase the absorption of radiation and did not realise that this would not yield more electrical energy. Performance in (c)(i) was satisfactory. Few candidates gave a correct reason in (c)(ii). Some held that it was not *required* to have full power. In (d), many candidates knew that wind power is the most feasible in Hong Kong. Some mentioned that there were suitable sites in Hong Kong to build windmills but they did not explain why these sites were suitable. |
| 4 | 29 | Unsatisfactory. In (a)(i), many candidates failed to use the graph to get the time that ultrasound travelled within each layer. Some candidates mixed up the time of $AC$ with the time of individual layers. In (a)(ii), some candidates wrongly applied the acoustic impedance of soft tissue, which is in fact redundant. Quite a lot of them gave a wrong unit for density (e.g. kg $m^{-1}$, kg $m^{-2}$, kg $m^3$). The performance in (b)(i) was poor. Many candidates did not state clearly the location where reflection occurs. Not many explained how a 2-D image is produced. Part (b)(ii) was well answered. Some candidates thought that radiation is equivalent to ionizing radiation and did not realise that ultrasound is in fact one kind of radiation. |



**School-based Assessment**

All school candidates sitting for HKDSE Physics have to participate in School-based Assessment (SBA). For the 2012 examination, 15291 students from 441 schools submitted their SBA marks this year. The schools were divided into twenty four groups and the implementation of SBA by the teachers in each group was monitored by a District Coordinator (DC). The DCs were also responsible for reviewing the submitted samples of students' work.

A statistical moderation method was adopted to moderate the SBA scores submitted by schools. Outlier schools after statistical moderation were identified for further follow-up by the SBA Supervisor. 63.6% of schools fall into the 'within the expected range' category, with 20.1% of schools having marks slightly higher than expected, and 16.3% of schools having marks slightly lower than expected.

This is encouraging as the data shows that the majority of the teachers do have a good understanding about the SBA implementation, and hence the marking standards are generally appropriate.

Some schools were visited by the DCs to gather first-hand information on the implementation of SBA in schools. From the feedback of teachers and the DC's reports, the assessment process was smooth and effective in general. SBA marks were submitted on time and all requirements of SBA were met. The major observations for this year's SBA are:

1. The experiments selected for assessment were of an appropriate level of difficulty for students and relevant to the curriculum. The majority of teachers used 3 experiments each year for assessment, which was more than the minimum requirement. It was encouraging to observe that many teachers assessed process skills and report-writing separately.

2. Most reports were satisfactorily marked. Besides indicating marks awarded to different parts of the reports, teachers are advised to provide assessment criteria and written feedback in the reports wherever appropriate in order to enhance assessment for learning.

3. It is worth noting that more and more schools are incorporating various ICT tools in SBA, such as including data-logging experiments in the experiment list, allowing students to use EXCEL to draw graphs and analyse data, and providing students with digital cameras to take pictures of the experimental setup instead of drawing it. These tools help students to save time when doing repeated measurements.

4. Assessment tasks in most schools were either selected from the Sample SBA Tasks produced for this subject or practical workbooks available. However, there were a few cases in which the experiments chosen for assessment might not be assessing the practical skills desired (e.g. studying the properties of waves using a slinky spring). These tasks are teaching and learning activities that require little manipulation of scientific apparatus for experimentation or making measurements. The assessment aims and skills required were reiterated in the SBA Conference and follow-up by respective DCs was done. Teachers are expected to exercise professional judgement in selecting and devising tasks/worksheets that allow students to demonstrate their performance.