Surname	Initial(s)
Signature	

Paper Reference(s)

5019 5047 Edexcel GCSE

Additional Science (5019)

Physics (5047)

P2 – Topics 9 to 12

Foundation and Higher Tier

Friday 12 June 2009 – Morning

Time: 20 minutes

Materials required for examination Multiple Choice Answer Sheet HB pencil, eraser and calculator

Items included with question papers Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so. Mark your answers on the separate answer sheet.

Foundation tier candidates: answer questions 1 - 24. **Higher tier candidates:** answer questions 17 - 40. All candidates are to answer questions 17 - 24.

Before the test begins:

Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:

For each question, choose the right answer, A, B, C or D and mark it in HB pencil on the answer sheet. For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

Do any necessary calculations and rough work in this booklet. You may use a calculator if you wish.

You must not take this booklet or the answer sheet out of the examination room.

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Turn over

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FORMULAE

You may find the following formulae useful.

average velocity = $\frac{\text{displacement}}{\text{time}}$	$v = \frac{s}{t}$
acceleration = $\frac{\text{change in velocity}}{\text{time}}$	$a = \frac{(v-u)}{t}$
force = mass \times acceleration	$F = m \times a$
momentum = mass × velocity	$p = m \times v$
change in potential energy = mass \times gravitational field strength \times change in height	$PE = m \times g \times h$
kinetic energy = $\frac{1}{2} \times mass \times (velocity)^2$	$KE = \frac{1}{2} \times m \times v^2$
electrical energy = voltage × current × time	$E = V \times I \times t$
$power = \frac{work \ done}{time \ taken}$	$P = \frac{W}{t}$
work done = force \times distance moved in the direction of the force	$W = F \times s$

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Questions 1 to 16 must be answered by Foundation tier candidates only. Higher tier candidates start at question 17.

Radioactivity and its uses

- 1. A sheet of paper stops almost all
 - A alpha rays
 - **B** beta rays
 - C X-rays
 - **D** gamma rays
- 2. Gamma rays sterilise bandages because
 - A they make the bandages white
 - **B** they heat the bandages to a high temperature
 - **C** they make small holes in the bandages
 - **D** they kill any bacteria on the bandages
- **3.** The diagram represents a lithium atom.



Particle X is

- A an electron
- **B** a proton
- C an isotope
- **D** a nucleus
- 4. Which of these is an electromagnetic wave?
 - A alpha radiation
 - **B** a neutron
 - **C** gamma radiation

D a proton

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Static electricity

- 5. Adam rubs a plastic strip with a dry cloth. The plastic strip becomes negatively charged because
 - A magnetic N poles move
 - **B** magnetic S poles move
 - C electrons move
 - **D** protons move
- 6. The diagram shows two plastic strips before and after Adam rubs them with a dry cloth.



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After rubbing, the plastic strips

- A have like charges and repel each other
- **B** have like charges and attract each other
- **C** have unlike charges and repel each other
- **D** have unlike charges and attract each other

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Nuclear power

- 7. Energy is released in a nuclear reactor when
 - A atoms are burned
 - **B** a nucleus splits
 - **C** two atoms join together
 - **D** electrons move faster
- 8. The generator in a nuclear power station transfers kinetic energy into
 - A nuclear energy
 - **B** chemical energy
 - C electrical energy
 - **D** potential energy

Physics of fun

Use this information to answer questions 9 and 10.

Some students investigate a roller coaster ride. The diagram shows part of the ride.



- 9. The roller coaster car has most gravitational potential energy at
 - AWBXCYDZ

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The students discuss the energy of the roller coaster car as it moves between W and Y. 10.



Who is correct?

A	Ann
B	Bev

- В С
- Chris
- D Dave
- 11. The students time a roller coaster car as it moves between W and Y. These are the students' results.

1st measurement	2nd measurement 3rd measurement		4th measurement	5th measurement
5.6 s	5.4 s	5.2 s	10.8 s	5.4 s

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The average value they should use is

Α	4.3 s
B	5.4 s
С	8.0 s
D	10.8 s

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12. The students compare the average speeds of a red car and a blue car on the ride.



How much faster is the blue car compared to the red car?

Α	1.5 m/s
В	3.0 m/s
С	9.0 m/s
D	12 m/s

Investigating motion

13. The diagram shows the resultant force on a ball as it is kicked.



The resultant force will make the ball

- A accelerate upwards
- **B** accelerate downwards
- C stay still
- **D** move at a steady speed

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14. A different ball is falling through the air. The diagram shows the forces acting on the ball.



The resultant force on the ball is

- A 10 N downwards
- **B** 2 N downwards
- C 10 N upwards
- **D** 2 N upwards
- 15. A ball falls 20 m in a time of 2 seconds. What is the average speed of the ball?
 - **A** 40 m/s
 - **B** 11 m/s
 - C 10 m/s
 - **D** 0.1 m/s
- 16. A ball falls at constant speed.Which of these could show the forces on it?



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Higher tier candidates start at question 17 and answer questions 17 to 40. Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Bumper cars

The picture shows some bumper cars.



- 17. Riding in a bumper car can be dangerous.Even so, many young people do ride in bumper cars.One reason why young people are willing to take the risk is that
 - A modern bumper cars are more dangerous
 - **B** they watch more television than their parents
 - **C** their friends urge them to go on the ride
 - **D** they live longer than their parents

18. When two bumper cars collide the force on one car is

80 N

The force on the other car is

 $\begin{array}{c|c} \mathbf{A} & 80 \text{ N} \\ \mathbf{B} & 40 \text{ N} \\ \mathbf{C} & 80 \text{ N} \\ \mathbf{D} & 40 \text{ N} \end{array}$

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19. A force of 200 N moves a bumper car for 5 m. How much work is done?

- A 0.025 J
- **B** 40 J
- C 205 J
- **D** 1000 J
- **20.** Each bumper car has an electric motor. When the voltage across the motor is 120 V, the current is 2 A. How much energy is supplied to the motor in 5 seconds?
 - A 48 J
 - **B** 240 J
 - C 300 J
 - **D** 1200 J

Radioactivity and nuclear power

Use this information to help you answer questions 21 and 22.

A teacher measures the count rate of a radioactive source over three minutes. Here is a graph of her results.



21. The graph shows that

- A each minute the count rate decreases by 800
- **B** every three minutes the count rate decreases by 1400
- **C** the half-life is one and a half minutes
- **D** the count rate halves every minute

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- 22. At a time of 5 minutes the count rate will be about
 - A 0 becquerels
 - **B** 50 becquerels
 - C 100 becquerels
 - **D** 150 becquerels
- 23. Which of these is an advantage of using nuclear power instead of fossil fuels to generate electricity?
 - A Nuclear reactors do not produce carbon dioxide
 - **B** Oil is a lot cheaper than nuclear fuel
 - C Power stations using gas can be switched on and off quicker than nuclear power stations
 - **D** Nuclear waste will stay radioactive for thousands of years
- 24. In a nuclear reactor, the control rods are used
 - A to produce daughter nuclei
 - **B** to produce neutrons
 - **C** to absorb neutrons
 - **D** to absorb daughter nuclei

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only. Foundation tier candidates do not answer questions 25 to 40.

Investigating absorption of gamma rays

A teacher used this equipment to demonstrate how gamma radiation is absorbed by different thicknesses of lead.



25. Which row of the table is correct?

	the independent variable (the variable she changed)	the dependent variable (the variable she measured)
Α	thickness of lead sheet	amount of radiation
В	thickness of lead sheet	distance between the source and lead sheet
С	distance between the source and lead sheet	amount of radiation
D	amount of radiation	thickness of lead sheet

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26. These are some of the teacher's results.She measured the average background radiation at the start and finish of her demonstration. It was 30 counts per minute.

	thickness of lead (cm)	0 (no lead)	1	2	3	4
1st attempt	amount of radiation (counts per minute)	200	190	150	100	60
2nd attempt	amount of radiation (counts per minute)	206	188	140	106	58

The correct conclusion from the teacher's results is that

- A the background radiation level doubled during the experiment
- **B** background radiation decreases with time
- C lead does not absorb gamma radiation
- **D** gamma radiation is not completely absorbed by 4 cm of lead

Radioactive tracers

Doctors investigate the thyroid gland using radioactive iodine. This isotope is usually represented by

$^{131}_{53}$ **I**

- 27. How many neutrons are there in one nucleus of this isotope?
 - A 53
 - **B** 78
 - **C** 131
 - **D** 184

28. A solution containing the isotope is injected into a patient. The radiation is monitored outside the patient's body. This isotope is chosen because

	the radiation emitted is	the half-life is
Α	alpha	a few days
В	beta and gamma	a few days
С	alpha	a few years
D	beta and gamma	a few years

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Energy from the nucleus

29. Which of these describes the processes in a nuclear chain reaction?



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30. Amit and Jody compare nuclear fuels with fossil fuels.

Nuclear waste products can be Many people have been killed or stored for four or five years and then pumped safely into the sea. injured in coal mines but no one has been hurt by nuclear fuels. Amit Jody Who is correct? Α Amit only

- B Jody only
- both Amit and Jody С
- D neither

31. Which row of the table is correct for nuclear fusion?

	in nuclear fusion small nuclei join together	nuclear fusion takes place
Α	and absorb energy	in the Sun
В	and absorb energy	in nuclear power stations
С	and release energy	in the Sun
D	and release energy	in nuclear power stations

32. Which row of the table correctly shows two conditions needed for fusion to take place?

	density of fusion material	temperature of fusion material
Α	much higher than when solid	extremely low
В	much higher than when solid	extremely high
С	much lower than when solid	extremely low
D	much lower than when solid	extremely high

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Investigating motion

A group of students investigate the motion of a glider moving on an air track. The glider moves over a cushion of air and so there is very little friction.



The students produce this graph for part of one glider's motion.



- **33.** What is the acceleration of the glider?
 - $\begin{array}{cc} \mathbf{A} & 2 \ cm/s^2 \\ \mathbf{B} & 3 \ cm/s^2 \end{array}$
 - C 4 cm/s^2
 - **D** 12 cm/s²

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34. The students try a different experiment. The glider has a mass of 0.4 kg. The resultant force on the glider is 2.0 N. What is the acceleration?

A	0.2 m/s^2
B	0.8 m/s^2
С	5.0 m/s^2
D	50 m/s^2

35. The students find this graph of the motion of a skydiver.



The momentum of the sky diver when he reaches terminal velocity is 7200 kg m/s. What is the mass of the skydiver?

- A 120 kg
- **B** 240 kg
- C 360 kg
- **D** 2400 kg

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36. The students discuss how the skydiver reaches terminal velocity.



Funfair rides

37. The picture shows a vertical drop ride. The passengers and the car are lifted by an electric motor.



The gravitational potential energy gained is 660 kJ. The motor is connected to a 440 V supply. It takes 1 minute to lift the passengers and the car.

Assuming that there are no energy losses, what is the current in the motor?

0.025 A Α В 25 A С 45.8 A D 1500 A

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38. Julie and Kim ride horses on the roundabout and discuss circular motion.





- A Julie only
- **B** Kim only
- **C** both Julie and Kim
- **D** neither

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Use this information to answer questions 39 and 40.

Some students investigate rides at a funfair. The diagram shows part of the track of a roller coaster ride.



A roller coaster car has a mass of 600 kg. Gravitational field strength is 10 N/kg. The roller coaster car loses 120 000 J of gravitational potential energy as it falls from **X** to **Y**.

39. What is the height of **X** above **Y**?

Α	2 m
B	20 m
С	200 m
D	2000 m

40. The car is stopped at **X** before it rolls down to **Y**. What is the increase in velocity of the car between **X** and **Y** assuming there are no energy losses due to friction?

- A 10 m/s
- **B** 14 m/s
- C 20 m/s
- **D** 200 m/s

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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