Initial(s)

Surname

Signature

Paper Reference(s)50195047Edexcel GCSEAdditional Science (5019)Additional Science (5019)Physics (5047)P2 – Topics 9 to 12Foundation and Higher TierThursday 5 June 2008 – MorningTime: 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.



W850/R1536/57570 6/6/5/2/52,600



Turn over



This publication may be reproduced only in accordance with Edexcel Limited copyright policy. ©2008 Edexcel Limited.

# FORMULAE

You	may	find	the	foll	owing	formul	lae usefu	1.
					0			

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 $\times$ velocity	$p = m \times v$
change in gravitational $=$ mass $\times$ gravitational field strength $\times$ change in height potential energy	$PE = m \times g \times h$
kinetic energy = $\frac{1}{2} \times \text{mass} \times (\text{velocity})^2$	$KE = \frac{1}{2} \times m \times v^2$
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  $W = F \times s$ 

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

#### **Nuclear Power**

Andy and Joe use the Internet to research power stations.

- 1. In a nuclear power station, kinetic energy is converted into electrical energy in
  - A a transformer
  - **B** a turbine
  - C a generator
  - **D** a reactor
- 2. Andy learns that nuclear power stations are powered by
  - A a controlled chain reaction
  - **B** an uncontrolled chain reaction
  - **C** a controlled nuclear fusion reaction
  - **D** an uncontrolled nuclear fusion reaction
- **3.** Nuclear power stations are sometimes said to be "greener" than coal-fired power stations because
  - A the reactor does not produce carbon dioxide
  - **B** no fuel is needed
  - C nuclear reactors do not produce any heat
  - **D** nuclear power stations are silent
- 4. One problem with nuclear power stations is that the waste products from the reactors will
  - A continue producing electricity for years
  - **B** be very acidic
  - **C** stay radioactive for years
  - **D** make an unpleasant smell

## **Road Safety**

Alison and Jill are researching road safety.

They find out about stopping distances from the Highway Code.

Thinking distance is the distance that a car travels after the driver has seen a hazard and before she starts to brake.

Braking distance is the distance that the car travels from when the brakes are applied until it stops. Stopping distance = thinking distance + braking distance



5. What is the thinking distance when a car is travelling at 30 mph?

- A
   6 m

   B
   9 m

   C
   14 m

   D
   23 m
- 6. What is the stopping distance when a car is travelling at 40 mph?
  - A
     12 m

     B
     24 m

     C
     36 m

     D
     38 m

- 7. Which of these could increase a driver's reaction time?
  - A icy roads
  - **B** poor brakes
  - C worn tyres
  - **D** using a mobile phone
- 8. A car crashes into a wall. Which of these is **not** designed to reduce injury to the driver **during** the crash?
  - A a crumple zone
  - **B** an air bag
  - C a seat belt
  - **D** the tread pattern on the tyres

### **Vertical Drop Rides**

Mike and his friends visit a theme park. They try a vertical drop rollercoaster ride.



Reference: Florida Review and Travel Guide (www.floridareview.co.uk)

The diagram below shows a side view of part of the ride.



- 9. Work is done on the car as it rises up section Q. The work done on the car equals
  - A the weight of the car
  - **B** the acceleration of the car
  - **C** the power of the electric motor
  - **D** the energy transferred to the car

- 10. The force pulling the vertical drop car down section **S** is
  - A friction
  - **B** air resistance
  - C gravity
  - **D** potential energy
- 11. The vertical drop car has most kinetic energy at the end of section
  - A P
  - B Q
  - C R D S
- **12.** Which row of the table shows two places where the gravitational potential energy of the car is the same?

	1 <sup>st</sup> place on the ride	2 <sup>nd</sup> place on the ride
A	halfway along <b>P</b>	halfway along <b>R</b>
В	halfway up ${f Q}$	halfway down <b>S</b>
С	halfway up ${f Q}$	halfway along <b>R</b>
D	halfway along <b>R</b>	halfway down <b>S</b>

## **Uses of Radioactivity**

- **13.** Strawberries exposed to gamma radiation will keep fresh longer than untreated strawberries. This is because the gamma radiation
  - **A** heats the strawberries
  - **B** makes the strawberries glow in the dark
  - **C** kills the bacteria on the strawberries
  - **D** splits the atoms in the strawberries
- 14. Which type of radiation is used to destroy cancer cells?
  - A gamma radiation
  - **B** alpha radiation
  - C microwave radiation
  - **D** neutron radiation

- 15. Alpha particles are used in some smoke detectors. This is because alpha particles have
  - A high kinetic energy
  - **B** low mass
  - C low chemical energy
  - **D** high ionizing ability
- 16. Which row of the table is correct for gamma rays?

	they are emitted from	most are stopped by
Α	the nucleus of an atom	thin paper
В	the nucleus of an atom	many centimetres of lead
С	a hot filament	thin paper
D	a hot filament	many centimetres of lead

#### 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.

## Electrostatics

Paul and Jim are investigating static electricity.

Paul charges a plastic strip by rubbing it with a dry cloth.

The strip becomes negatively charged.

Paul holds the negatively charged strip below a negatively charged balloon.



17. Which row of the table correctly shows the direction of the electrostatic forces?

	direction the strip pushes the balloon	direction the balloon pushes the strip
Α	1	1
В	1	$\downarrow$
С	$\downarrow$	$\downarrow$
D	$\downarrow$	1

- 18. During rubbing the plastic strip becomes negatively charged when it
  - A gains electrons
  - **B** loses electrons
  - C gains protons
  - **D** loses protons

#### **Radioactivity Measurements**

Dave's teacher measures the count rate of a radioactive source over a period of time. Here is a graph of the results.



**19.** What is the count rate after one hour?

- A 800 counts per minute
- **B** 600 counts per minute
- C 400 counts per minute
- **D** 200 counts per minute
- 20. When the time is 4 hours the count rate will be about
  - A 100 counts per minute
  - **B** 50 counts per minute
  - C 25 counts per minute
  - **D** 0 counts per minute

## **Investigating Forces**

Donna and Alan are investigating forces.

They use this apparatus to measure the force needed to pull a wooden block up a slope.



They find the average force when different weights are put on the wooden block. These are some of their results.

weight of block (N)	6	7	8	9	10
average force needed to pull block up slope (N)	3.5	4.1	4.7		5.9

21. The average force needed to pull the block with a 9 N weight is likely to be

A	5.0 N
B	5.3 N
С	5.5 N
D	5.6 N

22. Which row of the table lists the variables that they considered in their investigation?

	kept constant (to ensure a fair test)	the variable that they changed (the independent variable)	the variable that they measured (the dependent variable)	
Α	weight of block	angle of slope	pulling force	
В	angle of slope	weight of block	pulling force	
С	angle of slope	pulling force	weight of block	
D	pulling force	weight of block	angle of slope	

23. These are the readings from the newton meter for a block weighing 7 N.

	1 <sup>st</sup> try	2 <sup>nd</sup> try	3 <sup>rd</sup> try	4 <sup>th</sup> try	5 <sup>th</sup> try	6 <sup>th</sup> try
pulling force in N	4.0	4.1	4.2	4.1	4.2	4.0

These readings show that the method used

- A is reliable
- **B** has no error
- C is not a fair test
- **D** should not be used to justify a conclusion
- **24.** Alan uses a force of 4.0 N to pull the block along the wooden board for a distance of 0.50 m. The work done by Alan on the block is
  - A
     2.0 J

     B
     4.5 J

     C
     8.0 J

     D
     20 J

## **TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS**

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

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

### **Electric Motor Investigation**

Jane and Alison are investigating electric motors. They use an electric motor to lift masses. The motor is connected in a circuit as shown.



- 25. A mass of 0.2 kg is lifted through 0.3 m. Gravitational field strength is 10 N/kg. The gravitational potential energy gained by the 0.2 kg mass is
  - A
     0.06 J

     B
     0.6 J

     C
     2 J

     D
     6 J
- **26.** With a different mass, Jane finds that the energy input to the motor is 30 J. The voltage across the motor is 6.0 V and it lifts the mass for 10 seconds. The average current in the motor is
  - A
     0.50 A

     B
     3.0 A

     C
     5.0 A

     D
     18 A

- 27. The gravitational potential energy gained by the mass as it is lifted is not equal to the energy input to the electric motor. This is because
  - A some energy is always destroyed in energy transfers
  - **B** some energy is created in the electric motor
  - **C** some energy is created in the mass
  - **D** some energy is transferred as thermal energy in the motor
- **28.** A mass gains 20 J of gravitational potential energy when it is raised by a different electric motor.

The output power of the motor is 4 W. How long did it take to raise the mass?

 A
 0.2 s

 B
 5 s

 C
 50 s

 D
 80 s

#### **A Radioactivity Investigation**

Anne and Peter watch their teacher demonstrate an experiment using a source of beta particles. This is the apparatus she used to investigate the absorption of beta particles by sheets of aluminium.



**29.** Anne and Peter discuss the dangers of ionising radiation.



Who is correct?

- A Anne only
- **B** Peter only
- C both Anne and Peter
- **D** neither

**30.** These are the teacher's results.

thickness of aluminium sheet (mm)	0	2	4	6	8	10	20
reading (counts per minute): 1 <sup>st</sup> attempt	150	90	53	30	28	27	29
reading (counts per minute): 2 <sup>nd</sup> attempt	147	93	51	32	27	28	30

Why does the reading from the radiation detector not reach zero?

- A aluminium is not dense enough to stop beta particles
- **B** aluminium sheets reflect beta particles
- **C** the experiment is not valid
- **D** some of the radiation is due to background radiation

**31.** The beta emitter used in the experiment was a radioactive isotope of the element strontium, Sr.

This isotope has 38 protons and 52 neutrons in the nucleus of one of its atoms. This is represented by



**32.** The diagram shows the number of protons and neutrons in the nucleus of an atom.



Which of these shows an isotope of this?





B





D

## The Atom

Jane and Susie are researching atomic structure and nuclear reactions. They learn about a famous experiment in which alpha particles pass close to gold nuclei. Each gold nucleus has a positive charge.

**33.** Which of these could be the path of an alpha particle passing very close to a gold nucleus?



- **34.** Scientific theories are only accepted as correct when
  - A a famous scientist carries out the experiment
  - **B** the experimental results are published in a scientific journal
  - C the experimental results are released to the media
  - **D** the same results are obtained by other scientists

**35.** Toppling dominoes can be used to illustrate nuclear reactions. Which of these arrangements best illustrates an uncontrolled chain reaction?



**36.** Scientists are finding it very difficult to produce the conditions necessary for controlled nuclear fusion on Earth.

Which row of the table correctly shows two of the problems?

	the ions in the plasma	the temperatures required
Α	attract each other	are extremely low
B	attract each other	are extremely high
С	repel each other	are extremely high
D	repel each other	are extremely low

## **Investigating acceleration**

Julia and Alec are investigating how the motion of an object changes with different size forces.

**37.** They produce this velocity-time graph for the motion of a motorcycle.



What is the acceleration of the motorcycle?

A	$4 \text{ m/s}^2$
B	$6 \text{ m/s}^2$
С	$8 \text{ m/s}^2$
D	$12 \text{ m/s}^2$

**38.** The diagram shows the forces acting on a model car of mass 2 kg.



The acceleration of the car will be

Α	$1.0 \text{ m/s}^2$
B	$1.5 \text{ m/s}^2$
С	$2.0 \text{ m/s}^2$
D	$4.0 \text{ m/s}^2$

**39.** Julia uses a computer simulation to analyse the motion and forces on a skydiver after he jumps from his plane.

	the direction of motion of the skydiver	the direction of the resultant force on the skydiver	the direction of the acceleration of the skydiver is
А	upwards	upwards	upwards
В	downwards	upwards	downwards
С	upwards	upwards	downwards
D	downwards	upwards	upwards

Which row of the table is correct for the skydiver as his parachute opens?

**40.** Alec is using a computer simulation to analyse the motion of a car. The car is accelerating steadily. Here are two screenshots of the information he used.





The acceleration of the car is

A	$4.0 \text{ m/s}^2$
B	$5.0 \text{ m/s}^2$
С	$6.0 \text{ m/s}^2$
D	$7.5 \text{ m/s}^2$

## **TOTAL FOR HIGHER TIER PAPER: 24 MARKS**

END

**BLANK PAGE** 

**BLANK PAGE**